2010 Western Section Code Questions

The answers to the following questions are not the official interpretations of the Western Section or that of the IAEI and that the local AHJ is the final authority on any issue.

Thanks to the Code Panel members for their time and effort in answering these questions: Mark Earley, Ron Janikowski, Richard Loyd, Chuck Mello, Dave Williams, John Stacey, Alan Manche, Dave Kendall, Jeff Fecteau, Tim McClintock, Tom Moore, Marcus Sampson, Phil Simmons, Charlie Trout, Ray Weber & Don Offerdahl. Thanks also to Don Iverson of NEMA for collecting the questions over the year.

1. Does Section 210.12 cover the lighting in the kitchen and the bathroom?
No. Kitchen and bathroom are not included in the laundry list of areas in 210.12(B) nor are they similar to the areas listed.

2. Is the electrical inspector responsible for cable TV, phone, and fiber optic installations?
Yes: For cable TV see Article 820 – "Community Antenna Television and Radio Distribution Systems"
For Phone see Article 800 – "Communications Systems"
For Fiber optic installations see Article 770 – "Optical Fiber Cables and Raceways"

3. Why is MTW not listed in the Ampacity Tables or the conduit fill table?
MW is an machine tool wire oil resistant It is listed in 310.104(A) formerly 310.13(A) It is not listed in 310.15B(16) formerly 310.16 because it is not listed for use in earth, conduit or cable. However, many cables carry a multiple listing such as THHN/THWN/MTW.

4. My grounding electrode system consists of a water pipe, a UFER, and a ground rod. My service conductors are 500kcmil copper. Can I run a 1/0 cu grounding electrode conductor to the water pipe, then a #4 cu conductor from the water pipe to the UFER, then a #6 cu from the UFER to the ground rod?
Yes. The Code references are 250.53(C), 260.66 and Table 250.66. For electrodes in general, the minimum size GEC or bonding conductor is based on the size of the service entrance conductors for services and the derived feeder conductors for a separately derived system and refers the user to Table 250.66. For a 500 Kcmil service entrance conductor Table 250.66 indicates a minimum size GEC or bonding conductor of 1/0 copper of 3/0 aluminum. Section 250.66(A), (B) and (C) provide guidance on specific grounding electrodes. 260.66(A) says that where the sole electrode connection is a rod, pipe or plate the largest size GEC required shall be 6 AWG copper or 4 AWG aluminum. 250.66(B) says that where the sole electrode connection is a concrete encased electrode, then the maximum size GEC is 4 AWG copper. These rules apply for direct connection as a GEC or where

installing bonding conductors to electrodes to form a grounding electrode system per 250.53(C) as was stated in this question.

> *250.53(C) Bonding Jumper. The bonding jumper(s) used to connect the grounding electrodes together to form the grounding electrode system shall be installed in accordance with 250.64(A), (B), and (E), shall be sized in accordance with 250.66, and shall be connected in the manner specified in 250.70.*
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> *250.66 (A) Connections to Rod, Pipe, or Plate Electrodes. Where the grounding electrode conductor is connected to rod, pipe, or plate electrodes as permitted in 250.52(A)(5) or (A)(7), that portion of the conductor that is the sole connection to the grounding electrode shall not be required to be larger than 6 AWG copper wire or 4 AWG aluminum wire.*
> *(B) Connections to Concrete-Encased Electrodes. Where the grounding electrode conductor is connected to a concrete-encased electrode as permitted in 250.52(A)(3), that portion of the conductor that is the sole connection to the grounding electrode shall not be required to be larger than 4 AWG copper wire.*

5. What is the proper termination point for the grounding electrode conductor on a residential service? Is it the meter base or first point of disconnect in the service?
The NEC allows the grounding electrode conductor to be terminated at either location.
250.24(A)(1) 250.24 Grounding Service-Supplied Alternating-Current Systems.
(A) System Grounding Connections. A premises wiring system supplied by a grounded ac service shall have a grounding electrode conductor connected to the grounded service conductor, at each service, in accordance with 250.24(A)(1) through (A)(5).
(1) General. The grounding electrode conductor connection shall be made at any accessible point from the load end of the service drop or service lateral to and including the terminal or bus to which the grounded service conductor is connected at the service disconnecting means.
Many utility companies would not accept the grounding electrode conductor termination to be located in the meter base. 250.24(A)(1).

6. Should the inspector require that all fixtures be lamped at the time of the final inspection to insure the correct type of lamp is installed according to the listing of the fixture?
Yes, 110.3(B) Installation and Use. Page 32 Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling. The job cannot be finaled until the work is complete.
An example would be 100 watt bulbs used in 60 watt fixtures.

7. Can a dry type transformer be loaded to its full rating (i.e. can a 75 kva transformer be used with 75kva of load) or is the maximum load 80%?
Answer: 100%
NEC Reference: NEC 450.3(A) – Overcurrent sized at 125%

8. Can USE cable with dual rated conductors (RHH, RHW or THWN) be taken into a structure? An example would be from the load side of a meter base to a main disconnect. Reference 338.2, 338.10(B)(4)(a) and the UL White Book for Service Entrance Cable.

No, USE cable is not permitted for use inside a structure per the UL White Book where it states "Types USE and USE-2 are not suitable for use in premises." Section 338.2 states that Type USE cable is not require to have the flame retardant covering as SE Cable would. Section 338.10(B)(4)(a) allows the use of SE Cable inside a structure when utilizing the installation requirements of Part II of Article 334, NM Cable.

9. I have a 3000 amp generator with no main breaker, the conductors from the generator terminals to the first distribution switchboard is over 115% of the nameplate current of the generator. The overcurrent protection is set at 3200 amps. Is this OK?
Section 240.21(G) provides requirements for protection of conductors from generator terminals. It refers to Section 445.13, which requires the conductors to be sized at 115% of the nameplate current rating of the generator. These conductors would have an ampacity of 3450 amperes. A 3200 A overcurrent device would adequately protect the conductors

10. A lot of the new ceiling fan/ lights are equipped with a remote device. If this remote device is mounted on the wall in the traditional wall switch location, is it an acceptable alternative?
Yes, IF: Device is wider than 2" the box shall have double volume allowance as described in Table 314.16(A). See 314.16(B)(4). This was new to the 2008 edition.
I also assume manufacturer has listed the product for that use.

11. What would be the proper way to bond a rigid metal 90-degree "ell" used in-between rigid PVC conduit on a service installation?
Response: 250.80 Service Raceways and Enclosures.
Metal enclosures and raceways for service conductors and equipment shall be connected to the grounded system conductor if the electrical system is grounded or to the grounding electrode conductor for electrical systems that are not grounded.
Exception: A metal elbow that is installed in an underground nonmetallic raceway and is isolated from possible contact by a minimum cover of 450 mm (18 in.) to any part of the elbow shall not be required to be connected to the grounded system conductor or grounding electrode conductor.

12. Are there differences on how a 15 and 20 amp receptacle is constructed?
One has a side slot for a 20 Amp cord cap and the other does not. Also, the 15 Amp receptacles have the provision for back mounting holes that will accept 14 AWG solid copper wire as the connection means. 20 Amp receptacles would only be able to be connected using the wire binding screw terminals. Internally the connecting clips and other parts as well as the overall molding is essentially the same. Since 15 Amp receptacles can be installed on 20 Amp branch circuits, where there is more than one receptacle, these are tested from 20 Amp rated overcurrent devices for the branch circuit. For more information see the Category Code (CCN) RTRT, Receptacles for Plugs and Attachment Plugs on page 340 of the 2010 White Book

13. Does the equipment for the new requirement for intersystem bonding in 250.94 have to be weather-proof?
Section 250.94 addresses the intersystem bonding termination requirement and does not include any requirement for the device to be weather-proof nor does it require corrosion protection for the

termination device. The UL White Book reference to Grounding and Bonding Equipment (KDER) on Page 202 of the 2010 White Book addresses these connections.
250.94 Bonding for Other Systems. An intersystem bonding termination for connecting intersystem bonding and grounding conductors required for other systems shall be provided external to enclosures at the service equipment and at the disconnecting means for any additional buildings or structures. The intersystem bonding termination shall be accessible for connection and inspection. The intersystem bonding termination shall have the capacity for connection of not less than three intersystem bonding conductors. The intersystem bonding termination device shall not interfere with opening a service or metering equipment enclosure. The intersystem bonding termination shall be one of the following:
(1) Exposed nonflexible metallic raceways
(2) An exposed grounding electrode conductor
(3) Approved means for the external connection of a copper or other corrosion-resistant bonding or grounding conductor to the grounded raceway or equipment
This section was amended in the 2011 NEC but the answer would be the same.

14. Are 6 disconnects considered "grouped" at one location if one of the disconnects is located just around the corner of a building (due to space limitations)?
Yes, 110.22 Page 36 110.22 Identification of Disconnecting Means.
(A) General. Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. The marking shall be of sufficient durability to withstand the environment involved.
If the one disconnect that is around the corner was not evident. It would be required to have some signage to indicate that there is a disconnect around the corner and what it is for.

15. Does a circuit breaker used to control the lighting in a tenant area have to have the SWD mark on the breaker?
Answer: Yes
NEC Reference: NEC 240.83(D) –

16. Can you install metallic-sheathed cable (such as MC) in PVC conduit in a slab in a medical facility?
Reference: 330.10(7), 330.12(2) and 517.13
Maybe
"Medical Facility" is not defined whether it is a patient care area or a non-patient care area.
If it is a non-patient care area then yes, MC Cable can be installed in PVC Conduit in a slab per 330.10(7). The MC Cable shall be identified for direct burial per 330.12(2) even if it is in a raceway. (300.5(B) Wet Location includes concrete slabs in direct contact with the earth)
In a patient care area MC Cable can be run in a PVC Conduit as long as the MC Cable is identified as a MC Cable with a ground wire and the armor has an approved ground path per 517.13. If the PVC conduit is in a slab on grade then the MC Cable shall also be approved for a wet location and a jacketed product would be needed. This is not a commonly stocked product by the cable manufacturers.

17. The main service disconnect switch in a 277/480 volt panelboard is rated 1200 amperes. The calculated load would allow 900 amp fuses. Would GFI protection of equipment (GFPE) be required since the fuses are less than 1000 amperes?
Yes. Section 230.95 requires GFPE for each service disconnect rated 1000 amperes or more. It goes on further to state that the rating is the rating of the largest fuse that can be installed. Note this does not state "that is installed" as it does for a circuit breaker.

18. Does a utility-required disconnect (pedestal breaker) meet the requirements of 230.70(A)? What is the minimum distance that this device can be from the structure?
YES
230.70 General. Means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors.
A Location. The service disconnecting means shall be installed in accordance with 230.70(A)(1), (A)(2), and (A)(3).
1 Readily Accessible Location. The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the service conductors.
Contractor should review the local Utility rules. Rural Co-op's require the meter/disconnect to be located near their supply. The conductors that serve the building become feeders and fall under the rules of Article 225 – "Outside branch circuits and feeders". See 225.32 "Location" the same requirements for disconnecting means as to readily accessible location apply.
No minimum distance exists.

19. What size of equipment grounding conductor is required for a 480 volt, 3-phase, 7.5 HP, 11amp motor fed by # 14 THHN conductors? Is NEC 250.122(D)(1) applicable?
Yes, 14AWG 250.122(A) "(In no case does the EGC have to be larger than the circuit conductors.

20. What is the difference between weather-resistant receptacles and standard ones? Why were the standard ones acceptable in the past but are suddenly no good anymore? As an AHJ, how do I answer the argument from builders about the ever-increasing cost of complying with an NEC that appears to have no consideration for the economic impact of its requirements?
The formulation of the face plastic exposed to the weather has been changed to provide greater UV resistance to deterioration and the internal components have better protection from corrosion due to exposure to the elements outdoors. The receptacles have to be marked "weather resistant" or "WR" on the face so that this marking is visible after complete installation including the cover plate. See the UL White Book under Category Code RTRT Receptacles for Plugs and Attachment Plugs on page 340 of the 2010 White Book for more information on these receptacles. The substantiation for the change was the experience and supporting evidence that receptacles exposed to weather for long periods of time deteriorated and created a hazard due to cracked or broken pieces. The change to the Code and product standard was in answer to the documented hazards.

> *Weather-resistant Receptacles — Receptacles for use in wet and damp locations in accordance with Article 406 of the NEC. Weather-resistant receptacles are identified by the words "Weather Resistant" or the letters "WR" where they will be visible after installation with the cover plate secured as intended.*

21. A landing lug gutter has a high available fault current. I want to add some lugs for a new service tap. Do the new lugs have to have fault current ratings that are compatible with the available fault current of the gutter?
Yes. If the gutter listing includes the lugs and the gutter is listed for the available fault current marked on the equipment. Need to see the UL listing or E file number to determine what can be used. Standard used for evaluation is UL 870 White Book (ZOYX) Page 455. The UL white book references wire way 366,376,378 and 645 NEC. I believe these gutters are rated at 100ka sccr. Sections 110.10 (110.24-2011) and 110.3(B).

22. Can SO cord be dropped from a bar joist to a display shelf (end cap) and hard-wired to a junction box on that display unit or does it have to be installed in conduit?
No, 400.8(1),(4),(6) Page 248
 # (1) does not allow cords to be used as a substitute for fixed wiring.
 # (4) does not allow cords to be attached to the building surface
 # (6) does not allow cords to be installed in raceways unless permitted otherwise in this code

23. What is the "service factor" that is required to be marked on Fire Pumps?
NFPA 20
3.3.42 Service Factor. A multiplier of an ac motor that, when applied to the rated horsepower, indicates a permissible horsepower loading that can be carried at the rated voltage, frequency, and temperature.
For example, the multiplier 1.15 indicates that the motor is permitted to be overloaded to 1.15 times the rated horsepower.

24. Is a conduit seal required within 18" of a fluorescent light fixture installed in a Class 1, Division 2 location, if the light fixture is listed for a Class 1 Division 2 location, but is not explosion proof?
Reference 501.15(B) and the UL White Book (IFUX)
Yes, an explosionproof conduit seal will be required to be used at the boundary of the Class 1 Division 2 location per 501.15(B). Per the UL White Book, only luminaires for Class 1, Division 1 are provided with seals between the lamp chamber and the wiring chamber.

25. What is the difference between a fuel cell and a solar cell?
The main difference is the solar cell converts light to electrical energy and fuel cell uses a fuel to generate electrical energy. The definitions from the NEC are:
Solar cell: The basic photovoltaic device that generates electricity when exposed to light.
Fuel cell: An electrochemical system that consumes fuel to produce an electric current. The main chemical reaction used in a fuel cell for producing electric power is not combustion. However, there may be sources of combustion used within the overall fuel cell system such as reformers/fuel processors.

26. A solenoid valve for an automatic irrigation pump oilier has 15" leads that will not reach the j-box. Can these leads be spliced in a "C" Condulet fitting?
YES, IF: Reference 314.16(C)(2). Only those conduit bodies that are durably and legibly marked by the manufacturer with their volume shall be permitted to contain splices, taps, or devices. The

maximum number of conductors shall be calculated in accordance with 314.16(B). Conduit bodies shall be supported in a rigid and secure manner.

27. Are general-use Rigid Metal Conduit compression-type fittings allowed in a Class 1 Division 2 location?
Response: Yes, 501.10(B)(4) all wiring methods permitted in 501 10(A) which only permits threaded RMC and IMC

28. NEC 690.47(D) states "as close as practical" for the GEC run to earth from the rooftop PV arrays. Does this mean if it is a shorter run by cutting across the attic space that I cannot make a longer run across the top of the roof to the edge and then down to earth?
The requirement for "as close as practical" applies to location of the grounding electrode. The grounding electrode conductor is not to have an excessive length due to placement of the grounding electrode but where the grounding electrode in the earth meets the requirement, then the routing of the grounding electrode conductor is to be completed as a normal installation. If this means running along the roof top and down the outside wall, that is acceptable. There is no requirement to penetrate the roof or run through the attic to shorten the overall length of the grounding electrode conductor. It should be noted that this section was deleted in the 2011 NEC.

> *(D) Additional Electrodes for Array Grounding. Grounding electrodes shall be installed in accordance with 250.52 at the location of all ground- and pole-mounted photovoltaic arrays and as close as practicable to the location of roof-mounted photovoltaic arrays. The electrodes shall be connected directly to the array frame(s) or structure. The dc grounding electrode conductor shall be sized according to 250.166. Additional electrodes are not permitted to be used as a substitute for equipment bonding or equipment grounding conductor requirements.*
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> *The structure of a ground- or pole-mounted photovoltaic array shall be permitted to be considered a grounding electrode if it meets the requirements of 250.52. Roof-mounted photovoltaic arrays shall be permitted to use the metal frame of a building or structure if the requirements of 250.52(A)(2) are met.*

29. My water pipe ground clamp accepts up to a #2 wire size. Can I attach a lug to it to accept a larger conductor?
I think many of us have seen this application at least once. It would be permitted, if the water pipe clamp is listed for that application. My guess that would be a no.
110.3(B).

30. I want to wire a 75 KVA, 3-phase, 480-volt primary, 208-volt secondary transformer, with both sets of the wiring in the same conduit from a large j-box. There is OC protection on the primary conductors. Is this a NEC violation?
Yes, 240.4(F) Page 84 requires the secondary to be protected.
(F) Transformer Secondary Conductors. Single-phase (other than 2-wire) and multiphase (other than delta-delta, 3-wire) transformer secondary conductors shall not be considered to be protected by the primary overcurrent protective device.
If this was less than 25ft. it is possible that the tap rules could be used if the conduit and the box were sized right. Also 310.15(B)(2)(a) Adjustment Factors may require larger conductors.

31. Does the emergency generator for a high-rise building need to be sized for the locked-rotor current of the fire pump in addition to the other emergency loads it will carry?
NO
NEC 695.3
(D) On-Site Standby Generator as Alternate Source. An on-site standby generator(s) used as an alternate source of power shall comply with (D)(1) through (D)(3). [20:9.6.2.1]
(1) Capacity. The generator shall have sufficient capacity to allow normal starting and running of the motor(s) driving the fire pump(s) while supplying all other simultaneously operated load(s). [20:9.6.1.1]
Automatic shedding of one or more optional standby loads in order to comply with this capacity requirement
shall be permitted.

32. Is a standard wire-nut approved for a wet location as in an outside j-box? Is there a listed wet location wire-nut other than the ones approved for direct burial or in below grade j-boxes?
Reference: UL White Book (ZMWQ)
No, a standard wire connector (Wire Nut is a register trade name for Ideal) is not approved for a "Wet Location". Manufactures obtain additional listings for a "Wet Location". (See the UL White Book ZMWQ). Wire Connectors that are listed for direct burial may not be approved for "exposed" wet locations where the sun is present. Yes there are wire connectors that are approved for a wet location when used above grade.

33. What code requirements apply to an outdoor vending machine location?
All the general requirements apply (i.e. GFCI protection, weather-resistance, branch circuit ratings, etc.). Additional specific requirements are in 422.51 for GFCI protection as part of a vending machine if cord-connected. As you heard this morning the GFCI receptacle must be readily accessible by the code. The plug GFCI device is not covered by the NEC but may be by the listing.

34. Does the requirement for eight foot clearance above roofs with less than a 4/12 pitch only apply to non-utility owned services or feeders since the utility has a four foot minimum requirement?
NO even if utility owned EC must install mast to meet code requirements.
Refer to the local Utility rules prior to installing any overhead conductors to review their rules for utility owned drops. They may be higher than NEC.
See 225.19 Clearance (A) Above roofs for branch circuits and feeders customer owned.
And 230.24(A) clearances above roof for services.
Review exceptions in both cases you may get some relief.

35. Does a building ground ring need to be sized per 250.66 or is the minimum size of #2cu per 250.52 sufficient for any size service?
#2 is the minimum required 250.50 states All grounding electrodes as described in 250.52(A)(1) through (A)(7) that are present at each building or structure served shall be bonded together to form the grounding electrode system. Nd where none are present then you must install one (4) through (7) Note# often engineers will exceed the minimum.

36. Should the lightning protection system ground terminals be bonded to the electrical grounding electrode system?

The lightning protections grounding electrode system is required to be bonded to the grounding electrode system for the electrical system by 250.106 and by NFPA 780 section 4.14.1 and 4.14.1.1. The main reasons for this is to ensure all paths that lighting energy may take are provided with a low impedance path to earth and also that all noncurrent carrying parts of grounded equipment change in potential as close to equal as possible so that there is a minimal difference in potential between them during a lighting event.

> *250.106 Lightning Protection Systems.*
> *The lightning protection system ground terminals shall be bonded to the building or structure grounding electrode system.*
> *4.14 Common Grounding.*
> *4.14.1 General. All grounding media and buried metallic conductors that can assist in providing a path for lightning currents in or on a structure shall be interconnected to provide a common ground potential.*
> *4.14.1.1 This interconnection shall include lightning protection, electric service, communications, and antenna system grounds, as well as underground metallic piping systems.*

37. Does the NEC allow the Grounding Electrode Conductor to be connected to the cold water pipe at the water heater area if it is the only accessible point in a finished basement for a service upgrade to avoid unnecessary damage to finished ceilings?

No, Section 250.52 tells you what qualifies as a grounding electrode. 52(A)(1) applies to the metal underground water pipe. Section 250.64(F) requires the grounding electrode conductor to be routed to the electrode. There are no exceptions to this rule.

38. What rating is needed for a disconnect switch for a long-time rated X-ray machine?

660.5 Page 548 A disconnecting means of adequate capacity for at least 50 percent of the input required for the momentary rating, or 100 percent of the input required for the long-time rating, of the X-ray equipment, whichever is greater, shall be provided in the supply circuit. The disconnecting means shall be operable from a location readily accessible from the X-ray control.

39. Are hold-down clips or screws required for PV system back-fed breakers?

2008 NEC-NO
NEC 690.64(B)5
(6) Fastening. Listed plug-in-type circuit breakers backfed from utility-interactive inverters complying with 690.60 shall be permitted to omit the additional fastener normally required by 408.36(D) for such applications.
2011 NEC-Yes
NEC 690.10(E) – Stand Alone System
(E) Back-fed Circuit Breakers. Plug-in type back-fed circuit breakers connected to a stand-alone inverter output in either stand-alone or utility-interactive systems shall be secured in accordance with 408.36(D).
2011 NEC-No
NEC 705.12(D) – Interactive

(6) Fastening. Listed plug-in-type circuit breakers backfed from utility-interactive inverters that are listed and identified as interactive shall be permitted to omit the additional fastener normally required by 408.36(D) for such applications

40. Can I use a 4-foot long piece of 1" liquidtite flexible metal conduit, with listed fittings, as an equipment-grounding conductor on a 40-amp circuit where flexibility is not required?
Reference: 350.60 and 250.118(6)
Per 350.60, where flexibility is not required after installation, Liquidtight Flexible Metal Conduit, Type LFMC, is permitted to be used as an equipment grounding conductor when installed in accordance with 250.118(6). 250.118(6)c allows Trade Size 1" to go up to 60-amp circuit and 250.118(6)d states that the length of LFMC can not exceed 6 feet. So all is well.

41. A high-rise structure requires a fire pump. Is the pump required to have an emergency generator? Is it required to be on an emergency system?
Section 695.3 requires connection of a fire pump to a reliable power source. If the source is not reliable then 695.3(B) requires an alternate source, which may be a generator. Article 695 does not require this generator to be an Article 700 emergency system. The need for an emergency system may be required by the AHJ or may be part of another code. If deemed necessary as an emergency system then NEC installation requirements would apply.

42. Does the NEC require any energy code mandate for sealing openings from the outside to inside of structures or for outside walls to openings into interior walls?
NO not in the NEC. The only mention of sealing appears in 300.7 for sealing raceways exposed to different temperatures to prevent condensation and 368.234(A) for sealing busway sections. Contractor must be aware of the Local and State energy codes for his/her trade.

43. An accessory building (shed) needs an electrical disconnect switch. If the outside electric panel feeding the building is within sight (less than 50') does this rule still apply?
Response: no, 225.31 and 225.32 Location.
225.31 Disconnecting Means.
Means shall be provided for disconnecting all ungrounded conductors that supply or pass through the building or structure.
225.32 The disconnecting means shall be installed either inside or outside of the building or structure served or where the conductors pass through the building or structure. The disconnecting means shall be at a readily accessible location nearest the point of entrance of the conductors. For the purposes of this section, the requirements in 230.6 shall be utilized.
Exception No. 1: For installations under single management, where documented safe switching procedures are established and maintained for disconnection, and where the installation is monitored by qualified individuals, the disconnecting means shall be permitted to be located elsewhere on the premises.
Exception No. 2: For buildings or other structures qualifying under the provisions of Article 685, the disconnecting means shall be permitted to be located elsewhere on the premises.
Exception No. 3: For towers or poles used as lighting standards, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 4: For poles or similar structures used only for support of signs installed in accordance with Article 600, the disconnecting means shall be permitted to be located elsewhere on the premises.

44. Can a non-metallic conduit, containing 100Hz secondary circuit conductors, be strapped to a grounded metal surface?

No. For neon signs sections 600.12(A) and (B) would apply depending on the voltage. 600.12(A) requires the wiring comply with 600.31 and 600.12(B) requires compliance with 600.32. For secondary circuits under 1000 Volts, 600.31 does not have a minimum spacing requirement or frequency considerations. Where the secondary wiring is over 1000 Volts, 600.32 applies. 600.32 indicates that where the frequency is less than 100 Hz, then the minimum spacing of the raceway to metal surfaces is 11/2 inches. That distance increases to 13/4 inches when the frequency is over 1000 Hz.

600.32 (4) Spacing from Grounded Parts. Other than at the location of connection to a metal enclosure or sign body, nonmetallic conduit or flexible nonmetallic conduit shall be spaced no less than 38 mm (1½ in.) from grounded or bonded parts when the conduit contains a conductor operating at 100 Hz or less, and shall be spaced no less than 45 mm (1¾ in.) from grounded or bonded parts when the conduit contains a conductor operating at more than 100 Hz.

45. Do the receptacles in a detached garage need to be tamper-resistant?

Yes, 406.11, 210.52(G) 2008 NEC, The 2011 NEC in section 406.12 does have a few exceptions that could apply. (1) Receptacles installed more than 5.5 feet above the floor. (2) Receptacles that are a part of a listed luminaire. (3) A single receptacle or a duplex for appliances that can't be easily moved. (4) Nongrounding type receptacles used as replacements.

406.11 Tamper-Resistant Receptacles in Dwelling Units. In all areas specified in 210.52, all 125-volt, 15- and 20-ampere receptacles shall be listed tamper-resistant receptacles.

210.52(G) applies to attached garages and detached garages.

In the 2011 NEC 210.52(G) includes accessory buildings.

2011

406.12 Tamper-Resistant Receptacles in Dwelling Units. In all areas specified in 210.52, all nonlocking-type 125-volt, 15- and 20-ampere receptacles shall be listed tamper-resistant receptacles.

Exception: Receptacles in the following locations shall not be required to be tamper-resistant:

(1) Receptacles located more than 1.7 m (5½ ft) above the floor.

(2) Receptacles that are part of a luminaire or appliance.

(3) A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord-and-plug connected in accordance with 400.7(A)(6), (A)(7), or (A)(8).

(4) Nongrounding receptacles used for replacements as permitted in 406.4(D)(2)(a).

46. What is the minimum height for a disconnect switch or main breaker from earth?

Currently there are no provisions in the NEC for minimum height except for Moble Homes 550.11(A) 24in. from floor.

There are requirements for the disconnect switch location and maximum height.

404.8 (A) Location.

47. When installing a panel for pool equipment, receptacles, and lighting, can I install a 2-pole, 50-amp, GFCI at the "feeder" level, instead of providing the GFCI protection with 20-amp single-pole and double-pole breakers at the "branch" level?
The reference is in 680.22(B).
2008 NEC
No prohibition – but probably not a good idea as the leakage current from all of the branch circuits will add into the feeder device establishing a strong possibility to trip.
NEC 680.22(B)
(B) GFCI Protection. Outlets supplying pool pump motors from branch circuits with short-circuit and ground-fault protection rated 15 or 20 amperes, 125 volt or 240 volt, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel.

2011 NEC
NO prohibition
NEC 680.21(C)

48. Does a long run of PVC in the earth below the frost line need expansion fittings below grade or where exiting the earth?
Reference: 352.44 and 300.5(J)
A PVC raceway below grade is restricted to the strength of the earth. In other words the PVC conduit cannot expand or contract because of the confinement of the earth. Therefore expansion fittings are not usually used when conduit is direct buried. 300.5(J) says that raceways need to be protected against the earth settlement or movement. This occurs when the raceway comes out of the ground to the meter. Usually an expansion fitting is used between the meter and the raceway.

49. Does the NEC have any requirement for smoke detector locations and if they are required to be hard-wired or battery operated for new or remodel work?
The NEC addresses the electrical installation of smoke detectors not their locations as that is outside of the scope of the NEC. Likewise the permitted use of hard-wired or battery-powered smoke detectors is outside the scope of the NEC. The information you are looking for would be in NFPA 101, Life Safety Code. Additional information is available in NFPA 72, National Fire Alarm and Signaling Code.

50. What is the ampacity of (4) #3 AWG THHN copper conductors installed in EMT where the majority of the circuit length is located 4 inches above a rooftop in direct sunlight and the installation is located in the City of Green Bay, Wisconsin.? What about Detroit, Michigan??
New to the 2008 NEC.
Reference 310.15(B)(2)(c) and Table 310.15(B)(2)(c) Ambient Temperature adjustment for conduits exposed to sunlight on or above rooftops.
Find chart or City listing for "Annual High Temperature". I found the ASHREA chart on the Internet at www.copper.org.
From City listing the average high temperature for Green Bay is 87 degrees F and Detroit is 89 degrees F.
(4) #3 THHN CU from table 310-16 = 110 amps 90 degree column

Then lookup where 4" above roof fits in Table 310.15(B)(2)(c). Row 3 temperature adjustment adder shows 30 degrees F to be added to the City average high temperature.
Results:
Green Bay = 87F + 30F = 117 degrees F
Detroit = 89F + 30F = 119 degrees F
Then use the Temperature correction factors at the bottom of Table 310.16 to determine the adjustment factor for each City.

51. Do we have to have Warning tape in a ditch if the conductors are in conduit?
No, only direct buried conductors and cables
300.5(D (3) Service Conductors. Underground service conductors that are not encased in concrete and that are buried 450 mm (18 in.) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 300 mm (12 in.) above the underground installation.
52. What is the ampacity of seven, #8 AWG, type FEPB DC simultaneously energized crane motor conductors operating at an ambient of 37 degrees C and at a 30-minute rating?
*From Table 610.14(A) the ampacity of 8 AWG type FEPB simultaneously energized conductors at a 30 minute rating is 69 Amps. This ampacity is limited to no more than 4 conductors and also is based on an ambient condition of 30° C. Note 1 to the table indicates that for 5 to 8 conductors simultaneously energized have an ampacity at 80% of the table or 69 * 0.8 = 55.2 Amps. Next we need to correct for the ambient temperature. The correction factor for 37° C is 0.91. Taking the 55.2 Amps and multiplying by 0.91 provides a final ampacity of 50.232 Amps.*

53. What must I use for a grounding electrode for a separately-derived system in a wood-frame building with only a metal water line available? Can I connect to the nearest available water piping?
The 2011 NEC has the same requirement but the subsections are different.
250.30(A)(7) (4) Grounding Electrode. The grounding electrode shall be as near as practicable to and preferably in the same area as the grounding electrode conductor connection to the system. The grounding electrode shall be the nearest one of the following:
(1) Metal water pipe grounding electrode as specified in 250.52(A)(1)
(2) Structural metal grounding electrode as specified in 250.52(A)(2)
Exception No. 1: Any of the other electrodes identified in 250.52(A) shall be used where the electrodes specified by 250.30(A)(7) are not available.
Exception No. 2 to (1) and (2): Where a separately derived system originates in listed equipment suitable for use as service equipment, the grounding electrode used for the service or feeder equipment shall be permitted as the grounding electrode for the separately derived system.

54. If I add outlets in a bedroom under the 2008 NEC using the existing wiring in the room, would Sections 210.12 and 406.11 apply?
210.12 in the 2008 NEC would not apply unless you install a new branch circuit.
210. 12 in the 2011 NEC would apply for existing branch circuit extensions.
406.11 Tamper-Resistant Receptacles in Dwellings Units would apply.

55. I am working on a residential remodel and want to add a twin ("Piggy-back") breaker to an existing 42 circuit panel. I did a load calculation and there is lots of capacity. Is this allowed per 408.54?
Is it Marked CTL
Is the panel marked for acceptance of the breaker type?
When was the panel manufactured?

56. Is it OK to use MC cable straps to secure MC cable in steel stud construction?
Reference: 330.30
It is the call of the AHJ to approve all installations. 330.30(A) states that MC Cable shall be supported and secured by staples, cable ties, straps, hangers, or similar fittings or other approved means designed and installed not to damage the cable. There is no reason that a cable clamp cannot be used with steel studs as long as it is has not damage the MC cable.

57. NEC 110.26(C) requires panic hardware and door swing in the direction of travel in electric rooms with equipment rated 1200 amps or more that contain OC devices, switching devices, or control devices when the doors are located 25' or less from the edge of the equipment. Does this mean that door distances greater than 25' are exempt from this requirement?
First, the requirement in 110.26(C)(3) addresses doors located within 25 feet of the edge of the work space not from edge of the equipment. Second, the personnel doors covered by this requirement are those doors "intended for entrance to and egress from" the work space. Lastly, the answer is yes. Doors located further than 25 feet need not comply with this requirement from an NEC standpoint.

58. Section 230.2 requires one service for a building. A residence has a property line- located pedestal with two 200-amp breakers tied together each of which feeds two 200-amp MB panels in the large residence. Do these two panels have to be located side-by-side or can they be in different areas of the house?
Answer: NO unless in Wisconsin (see state code)
Code references: Article 225 outside branch circuits and feeders
225.31 for disconnecting means
225.32 for location of disconnecting means. Same as for a Service inside or outside nearest the point of entrance.
225.33 for number of disconnects not more than 6
225.34 for grouping of disconnects if using the 6-disconnect rule
225.36 for suitable as service equipment.

59. **A 12" length of Liquid tight Flexible Metal Conduit is utilized for flexibility to feed a hanging explosion-proof heater listed for a Class 1 Division 1 location and installed in a Class 1 Division 2 location. Is a conduit seal installation allowed, before the LFMC, if it is still within 18" of the heater?**
LFMC is permitted in a class I div 2 location, 501.10(B)(2) (3), however, per 510.15(B)(1) does not. 501.135 requires The heater to be identified for Class I, Division 1 locations.

So the wiring must be according to 501.10A and listed for the location I don't believe LFMC is listed for a class I div 2 location but if it is

(B) Conduit Seals, Class I, Division 2. In Class I, Division 2 locations, conduit seals shall be located in accordance with 501.15(B)(1) and (B)(2).

(1) Entering Enclosures. For connections to enclosures that are required to be explosionproof, a conduit seal shall be provided in accordance with 501.15(A)(1)(1) and (A)(3). All portions of the conduit run or nipple between the seal and such enclosure shall comply with 501.10(A).

501.135(B) Class I, Division 2. In Class I, Division 2 locations, all utilization equipment shall comply with 501.135(B)(1) through (B)(3).

(1) Heaters. Electrically heated utilization equipment shall conform with either item (1) or item (2):

(1) The heater shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved on any surface that is exposed to the gas or vapor when continuously energized at the maximum rated ambient temperature. If a temperature controller is not provided, these conditions shall apply when the heater is operated at 120 percent of rated voltage.

Exception No. 1: For motor-mounted anticondensation space heaters, see 501.125.

Exception No. 2: Where a current-limiting device is applied to the circuit serving the heater to limit the current in the heater to a value less than that required to raise the heater surface temperature to 80 percent of the ignition temperature.

(2) The heater shall be identified for Class I, Division 1 locations.

60. The restrooms in a commercial building have 277 volt lighting and 120 volt exhaust fans. Can one 2-pole switch control both loads?

Yes, if the switch is rated for the highest line-to-line voltage being applied, in this case 480 volts, or if the snap switch is listed and identified for this application. The listing guide card information for general use snap switches can be found under Category Code WJQR, Snap Switches on page 399 of the 2010 White Book and the following text is part of this guide information. "Multi-pole, general-use snap switches have not been investigated for more than single-circuit operation unless marked "2-circuit" or "3-circuit."

404.8(C) Multipole Snap Switches. A multipole, general-use snap switch shall not be permitted to be fed from more than a single circuit unless it is listed and marked as a two-circuit or three-circuit switch, or unless its voltage rating is not less than the nominal line-to-line voltage of the system supplying the circuits.

61. Does a structural steel beam, located in the basement of a residence, require grounding?

No. 250.52(A)(2) If the steel beam is not connected to earth as referenced in the code section then it would not be required to be used as a grounding electrode.

The metal beam does not constitute

250.104(C) Structural Metal. Exposed structural metal that is interconnected to form a metal building frame and is not intentionally grounded and is likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with Table 250.66 and installed in accordance with 250.64(A), (B), and (E). The points of attachment of the bonding jumper(s) shall be accessible.

62. If a fire pump is fed from the utility power and also has a generator backup, can the conductors from the generator to the transfer switch be run through the building without any type of encasement?

Yes, the conductors can run through the building without encasement from the generator. Protection would be required as follows.

700.9(C) Wiring Design and Location. Emergency wiring circuits shall be designed and located so as to minimize the hazards that might cause failure due to flooding, fire, icing, vandalism, and other adverse conditions.

(D) Fire Protection. Emergency systems shall meet the additional requirements in 700.9(D)(1) and (D)(2) in assembly occupancies for not less than 1000 persons or in buildings above 23 m (75 ft) in height with any of the following occupancy classes: assembly, educational, residential, detention and correctional, business, and mercantile.

(1) Feeder-Circuit Wiring. Feeder-circuit wiring shall meet one of the following conditions:

(1) Be installed in spaces or areas that are fully protected by an approved automatic fire suppression system

(2) Be a listed electrical circuit protective system with a minimum 1-hour fire rating

FPN: UL guide information for electrical circuit protection systems (FHIT) contains information on proper installation requirements to maintain the fire rating.

(3) Be protected by a listed thermal barrier system for electrical system components

(4) Be protected by a listed fire-rated assembly that has a minimum fire rating of 1-hour and contains only emergency wiring circuits.

This section was revised for the 2008 Code to clarify the requirement for installation in a fire-rated assembly. Where installed in a fire-rated assembly, only emergency system wiring is permitted. If a fire-rated assembly is needed for normal circuits, it must be a separate fire-rated assembly from the one used for the emergency system.

(5) Be embedded in not less than 50 mm (2 in.) of concrete

(6) Be a cable listed to maintain circuit integrity for not less than 1 hour when installed in accordance with the listing requirements

63. Can a 75 KVA transformer be installed in the space above a grid ceiling not used as a return air plenum?

No NEC 450.13(B) –

(B) Hollow Space Installations. Dry-type transformers 600 volts, nominal, or less and not exceeding 50 kVA shall be permitted in hollow spaces of buildings not permanently closed in by structure,….

64. Is it compliant to use table 310.15(B)(6) for the feeder size to a sub-panel in a residential basement?

Reference: 310.15(B)(6), 215.2(A)(3), Table 310.16

The 2008 NEC is not very clear on feeders used with sub-panels. My understanding is 215.2(A)(3) refers to 310.15(B)(6) which references Table 310.15(B)(6) to determine the size of the feeder that severs as the "Main Power Feeder" for each dwelling units. Any other feeders after the "Main Power Feeder" that would supply sub-panels would have to be sized per 310.15 and Table 310.16. Several proposals and comments were received to modify this section for the 2011 NEC. However, consensus could not be reached and any proposed text that revised 310.15(B)(6) to remove the language "Main Power Feeder" was reverted back to the 2008 NEC language.

65. Is it OK to install a receptacle in a wall over an electric baseboard heater?
Although, the NEC does not specifically prohibit the installation of a receptacle over an electric baseboard heater, the listing of the electric baseboard heater may specifically prohibit it's installation below a receptacle. Attention is drawn to this issue by the FPN to 210.52.

66. How could the calculations of the selective coordination, required by NEC 700.27, be verified by the electrical plan review?
The plan reviewer must examine the one-line drawing included in the plan review package. The one-line drawing must have the fault current listed for each O/C device as well as trip setting. The plan reviewer should have enough data to determine which device will interrupt a fault for each feeder circuit. He also has the right to ask for additional data. Many good engineers provide calculations and manufacturers time/base curves to evaluate protective device performance. A stamped dated performance certificate from the engineering firm should be kept on file for each project.

67. What is the intended usage for a required receptacle located between six and ten feet of a spa or pool?
Response; Blender, Boom box,
Chapter 6 Special Equipment :: ARTICLE 680 Swimming Pools, Fountains, and Similar Installations :: II. Permanently Installed Pools
680.22 Lighting, Receptacles, and Equipment.
(A) Receptacles.
(1) Circulation and Sanitation System, Location. Receptacles that provide power for water-pump motors or for other loads directly related to the circulation and sanitation system shall be located at least 3.0 m (10 ft) from the inside walls of the pool, or not less than 1.83 m (6 ft) from the inside walls of the pool if they meet all of the following conditions:
(1) Consist of single receptacles
(2) Employ a locking configuration
(3) Are of the grounding type
(4) Have GFCI protection
(2) Other Receptacles, Location. Other receptacles shall be not less than 1.83 m (6 ft) from the inside walls of a pool.
(3) Dwelling Unit(s). Where a permanently installed pool is installed at a dwelling unit(s), no fewer than one 125-volt, 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located not less than 1.83 m (6 ft) from, and not more than 6.0 m (20 ft) from, the inside wall of the pool. This receptacle shall be located not more than 2.0 m (6 ft 6 in.) above the floor, platform, or grade level serving the pool.

68. Article 334.116(B) defines NMC as moisture-resistant but yet it can't be used in conduits installed outside of buildings. Please define moisture-resistant and its applications.
Actually, 334.116(A) and (B) define the outer sheath of both NM and NMC cable as being flame retardant and moisture resistant. The difference with NMC are additional requirements that the sheath be fungus resistant and corrosion resistant. Section 334.10(B) for NMC cable permits it to be installed "For both exposed and concealed work in dry, moist, damp, or corrosive locations….". A dry location, as defined in Article 100 allows for temporary dampness or wetness such as when a

building is under construction. The definition of a damp location indicates exposure to moisture but not immersion or saturation in liquids. Type NMC can also be installed in outside masonry or block walls and shallow chases in masonry, concrete or adobe construction, where type NM and NMS are prohibited in these locations. All of these allowed uses subject the sheath to some moisture, but not to point of immersion as in a wet location. 300.9 defines the interior of conduit installed outdoors as a wet location and NMC cable does not have the rating to be immersed as could be the case for this type wet location inside an outdoor conduit.
334.116 Sheath.
The outer sheath of nonmetallic-sheathed cable shall comply with 334.116(A), (B), and (C).
(A) Type NM. The overall covering shall be flame retardant and moisture resistant.
(B) Type NMC. The overall covering shall be flame retardant, moisture resistant, fungus resistant, and corrosion resistant.
334.10(B) Type NMC. Type NMC cable shall be permitted as follows:
(1) For both exposed and concealed work in dry, moist, damp, or corrosive locations, except as prohibited by 334.10(3)
(2) In outside and inside walls of masonry block or tile
(3) In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a steel plate at least 1.59 mm (in.) thick and covered with plaster, adobe, or similar finish
Location, Dry. A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction.

69. Are freezers located in garages and basements required to be GFCI protected?
210.8(A)(2) and 8(A)(5) Yes there are no exceptions in the 2008 NEC for outlets in those areas.

70. A facility that has only two power outages a year is considered to have a reliable power source and would only require a connection ahead of the main for power to a fire pump per NEC 695.3(A)(1). Please explain the rationale for this seemingly relaxed requirement.
695.3 Power Source(s) for Electric Motor-Driven Fire Pumps.
Electric motor-driven fire pumps shall have a reliable source of power.
The power source for an electric motor-driven fire pump must be reliable and have adequate capacity to carry the locked-rotor currents of the fire pump motor and accessory equipment. These two main requirements ensure that the fire pump will operate in the event of a fire without being accidentally disconnected and that the fire pump will continue to operate until the fire is extinguished, the fire pump is purposely shut down, or the pump itself is destroyed.
Reliable in Webster's dictionary stated (dependable). The question is the power source in general dependable? This is a question for the AHJ and the Design Professional. Yes, with only two outages a year I would say that the source is reliable.
In St. Louis there are 2 different types of systems.
1. Downtown has an underground loop system where the power can flow from a different set of transformers if power fails from one. There has been one power failure in10 years. I feel it is very reliable.
2. Overhead lines are used in the outer areas not on the loop that are subject to storms, winter weather, vehicle accidents, etc. that may and do take down the power distribution system. A generator would be required.

71. What is meant by "isolation of the fuses" on circuits of over 600 volts?

NEC 490.21(B)(7) High-Voltage Fuses. Metal-enclosed switchgear and substations that utilize high-voltage fuses shall be provided with a gang-operated disconnecting switch. Isolation of the fuses from the circuit shall be provided by either connecting a switch between the source and the fuses or providing roll-out switch and fuse-type construction. The switch shall be of the load-interrupter type, unless mechanically or electrically interlocked with a load-interrupting device arranged to reduce the load to the interrupting capability of the switch.

72. Can I tap a #14 conductor off a 20-amp branch circuit?

Reference: 210.19(A)(4) Exception No. 1 and Table 210.24
Per 210.19(A)(4) Exception No. 1 a #14 conductor can be used as a tap on a 20 amp branch circuit as long as it is not supplying a load specified in 210.2 and are used to supply the loads described in item (a) through (e) in Exception No. 1 in 210.19(A)(4).
Table 210.24 indicates that #14 conductors can be used as a tap for a 20 amp branch circuit.

73. Are reduced-sized neutrals allowed for manufactured home service conductors?

That will depend on the manufacturer's requirements and any local or state requirements for manufactured homes I could not fine anything in the NEC that would prohibit reducing the size of a grounded service conductor for manufactured homes. In fact, 550.18(C) permits the optional method for calculating lighting and appliance load shown in 220.82.
220.82(A) states that feeder and service-entrance conductors whose calculated load is determined by this optional calculation shall be permitted to have the neutral load determined by 220.61.
220.61(A) states that the feeder or service neutral load shall be the maximum unbalance of the load determined by this article and finally, 250.24(C)(1) states that the grounded conductor brought to service equipment shall be routed with the phase conductors and shall not be smaller than the required grounding electrode conductor specified but shall not be required to be larger than the largest ungrounded service-entrance phase conductor.

74. What is the difference between an Emergency System and a Legally Required Standby System?

700.1 Scope. Emergency systems are those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction. These systems are intended to automatically supply illumination, power, or both, to designated areas and equipment in the event of failure of the normal supply or in the event of accident to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life.
701.1 Scope. The provisions of this article apply to the electrical safety of the installation, operation, and maintenance of legally required standby systems consisting of circuits and equipment intended to supply, distribute, and control electricity to required facilities for illumination or power, or both, when the normal electrical supply or system is interrupted.
Although both are very similar, the key difference is that emergency systems are intended to control power and illumination that is essential for safety to human life, such as emergency lighting for means of egress and operating room and life-support equipment in hospitals.
Whereas, legally required standby systems are intended to provide electric power to aid in fire fighting, rescue operations, and similar operations.
While similar in many ways to an emergency system, there are some subtle differences like wiring for legally required standby systems may occupy the same raceways, cables, boxes, and

cabinets as other general wiring, whereas wiring for emergency systems must be kept entirely independent of other wiring. Legally required standby systems take second priority to emergency systems if they are involved in sharing an alternate supply and/or load shedding or peak shaving schemes.

75. Is a receptacle required in a single-family detached garage? What about a multi-family garage? What is the difference?

A. At least one general purpose receptacle is required in a single-family garage only if provided with electric power. Reference 210.52(G)

B. Unlike 210.52(E)(2) for outdoor receptacle requirements a multi-family detached garage is not required to have a receptacle.

C. Researching previous ROP's it does not seem that any proposals to mandate a receptacle in a multifamily detached garage. I would assume the requirement would be the fact the same use would be less for a multifamily.

76. What size conductors would I need for a 100 amp load that is run in EMT across a roof-top? The conduit is supported on treated 2 by 4 blocks.

There is not enough information in the question to give an accurate answer, but as it stands, the best answer is "Bigger that you might think."

I will assume a 100-amp, three-phase load with 4 THWN-2 conductors in a metal raceway mounted on blocks so the conduit is located 1.5 inches above a roof deck on a building located in Minneapolis.

NEC Article 310.10 states "In no case shall conductors be associated together in such a way…that the limiting temperature of any conductor is exceeded." We can assume that the temperature of the conductor is affected by the air around it.

310.15(B)(2)(c) Conduits Exposed to Sunlight on Rooftops. Where conductors or cables are installed in conduits exposed to direct sunlight on or above rooftops, the adjustments shown in Table 310.15(B)(2)(c) shall be added to the outdoor temperature to determine the applicable ambient temperature for application of the correction factors in Table 310.16 and Table 310.18.

1. Use the ASHRAE temperature charts for Minneapolis and you'll see that the 2% Design Temperature is 90ºF. The American Society of Heating, Refrigerating and Air-Conditioning Engineers has compiled 30 years of temperature data based on average June, July and August 2% dry bulb design temperatures.

2. You can also go to www.copper.org and look at the temperature charts and see that for Minneapolis the ASHRAE 2% Design Temperature is 90ºF

Table 310.15(B)(2)(c) specifies the number of degrees be added to the ambient temperature correction factors from the bottom of Table 310.16. So, we start with Minneapolis' 90ºF and add 40ºF to that for a total temperature of 130ºF.

The correction factor for 130 ºF for a 90ºC conductor like THWN-2 is .71.

Look at Table 310.16 – soon to be 310.15(B)(16) and multiply the ampacity of a #2 copper conductor, 130 amps by the correction factor (.71) to determine the new ampacity of the conductor.

130 x .71 = 92.3 amps.

So #2 is not big enough. Per 310.16 a #1 Copper THWN should be used for this 100-amp load.

77. For electrical safety, what is the limited approach boundary in exposed fixed circuit parts that are energized at 480 volts?

The answer to this question is found in NFPA 70E, Electrical Safety in the Workplace. Limited Approach Boundaries are for protection against electric shock. This is the outermost of three boundaries. Restricted approach and prohibited approach are the other shock protection boundaries. The definition is found in Article 100 and reads, "Boundary, Limited Approach. An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists." See Section 130.2(B) which refers to Table 130.2(B). The Limited Approach Boundary in Table 130.2(B) for electrical systems with a phase-to-phase voltage of 480 for fixed circuit parts is 3 ft 6 in.
A lot of information and requirements in NFPA 70E Article 130.

78. I was told that I had to pigtail the neutral connection to receptacles to prevent an open neutral if one of the receptacles was removed. Is this true?
NEC 300.13(B) requires that in multiwire circuits the continuity of the grounded (neutral) conductor shall not depend on receptacle connections where the removal of the receptacle would interrupt the continuity of the grounded (neutral) conductor. Unless the neutral is looped pigtailing is required, that is, the neutral is spliced with a jumper from the splice to connect to the receptacle grounded terminal. This requirement does not apply to 2-wire circuits.

79. Assuming that AFCI and GFCI technologies are compatible as we have been told, why aren't all dwelling receptacles required to have AFCI protection if the aim is to prevent fires? Isn't there the same possibility of an arcing fire in the kitchen or bathroom?
NEC 210.12 pg. 49, I agree with all that has been said and in my opinion the statement is correct. Remember that in the ROP phase of the 2008 NEC cycle whole house protection was discussed and did have support but not enough to get the required votes for passage. The panel was a little concerned with the potential for nuisance tripping problems that were encountered with the start up of the GFCI initiative. So it was decided to start at the present coverage areas and see what potential field problems would arise. Unfortunately the 2011 NEC does not provide any additional relief. It has long been said that the Code is the minimum standard and should one choose to go above and beyond that of the mandatory requirements they certainly can. However that seldom happens and unless it is positive code text it is not going to be done.

80. Where does the equipotential bonding grid need to be installed for a hot tub installed on a wooden deck? Will installing an equipotential bonding grid on a wooden deck serve the purpose?
680.26(B)(2): Revised to require bonding of paved and unpaved perimeter surfaces extending 3 ft horizontally from edge of pool, and provided new means for bonding the perimeter surfaces and required connection points to bonding element of a conductive pool shell.
Creating an electrically safe environment in and around permanently installed swimming pools requires the installation of a bonding system with the sole function of establishing equal electrical potential (voltage) in the vicinity of the swimming pool. A person who is immersed in a pool or who is dripping wet, has a large amount of exposed skin, and is lying or walking on a concrete deck or other conductive perimeter surface is extremely vulnerable to any differences in electrical potential that may be present in the pool area.
But on hot tub installed on a wooden patio deck is impossible.

81. Can you cut the plug end from the cord on a sump pump and wire it directly through the switch so as to not GFCI- protect the sump pump? If this violates the listing on the pump could you get it field approved?

Cutting the plug from the cord would be considered a modification of Listed equipment. In the 2010 UL White Book page 41 it answers the question, "What happens to the Listing if a UL-Listed product is modified in the field?" An authorized use of the UL Mark is the manufacturer's declaration that the product was originally manufactured in accordance with the applicable requirements when it was shipped from the factory. When a UL-Listed product is modified after it leaves the factory, UL has no way to determine if the product continues to comply with the safety requirements used to certify the product without investigating the modified product. UL can neither indicate that such modifications "void" the UL Mark, nor that the product continues to meet UL's safety requirements, unless the field modifications have been specifically investigated by UL. It is the responsibility of the Authority Having Jurisdiction (AHJ) to determine the acceptability of the modification or if the modifications are significant enough to require one of UL's Field Engineering Services staff members to evaluate the modified product. UL can assist the AHJ in making this determination.

An exception for a field modification authorized by UL is when the product has specific replacement markings. For example, a switchboard may have specific grounding kits added in the field. The switchboard is marked with a list of specific kit numbers that have been investigated for use in that particular switchboard. Only grounding kits that are included on the marking on the product have been investigated for use in that product.

This could also be a 110.3(B) violation; one should look at the manufacturers installation instructions since there is some manufacturers that require their products to be connected to a GFCI protected circuit. Additional disconnecting means may also be required to comply with Article 422 Part III and Article 430 Part IX if the plug and receptacle were the intended disconnect.

Sump Pumps are covered in the UL White Book under Category Pumps, Electrically Operated, Liquid (REUZ) located on page 331 in the White Book and tested to UL 778, the Standard for Mortor Operated Water Pumps. A submersible pump is to be tested for leakage current while submersed in a tank filled with water. The top of the pump is to be at least 12 inches below the surface of the water during the test. Allowable current leakage for a cord connected stationary of fixed sump pump is .75 milliamps. GFCI's are tested to trip between 4 to 6 milliamps. This means a listed sump pump would need to have a minimum of 533% more current leakage then the UL standard 778 allows for sump pumps.

As for field approved, I am assuming that you are asking about a UL Field Evaluation, that is possible, however it is sure to cost more then the replacement of the sump pump.

82. Is Ground Fault Protection required for service equipment rated at 1000 amps but fused at 800 amps? The service is a 3-phase, 4-wire, 277/480 volt.

230.95 Ground-Fault Protection of Equipment.

Ground-fault protection of equipment shall be provided for solidly grounded wye electric services of more than 150 volts to ground but not exceeding 600 volts phase-to-phase for each service disconnect rated 1000 amperes or more. The grounded conductor for the solidly grounded wye system shall be connected directly to ground through a grounding electrode system, as specified in 250.50, without inserting any resistor or impedance device.

With respect to the question, the Key is in the second paragraph which states:

The rating of the service disconnect shall be considered to be the rating of the largest fuse that

can be installed or the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted.
Invoking the Ground Fault Protection for service disconnects is triggered by the rating of the disconnect and rating of the largest fuse that can be installed. Therefore, if 1000 amp fuses can be installed, GFP is still required.
Code Section: 230.95

83. Would a GFCI receptacle located in a garage that is within 25ft of the outdoor A/C unit meet the requirements of 210.63?
No. Section 210.63 requires a 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air-conditioning, and refrigeration equipment. Article 100 definition of accessible (as applied to equipment) as Admitting close approach; not guarded by locked doors, elevation, or other effective means. The required receptacle located in a garage would not meet the definition of accessible.

84. There is still some confusion on the requirement for GFCI requirements for lights over hydro-massage tubs and showers. Are these lights required to be GFCI protected?
410.10(D) and 680.72 Other Electrical Equipment
Luminaires located directly over a hydro-massage bathtub or shower stall are addressed in 410.10(D)
Bathtub and Shower Areas. No parts of cord-connected luminaires, chain-, cable-, or cord-suspended luminaires, lighting track, pendants, or ceiling-suspended (paddle) fans shall be located within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or shower stall threshold. This zone is all encompassing and includes the space directly over the tub or shower stall.
There is no GFCI requirement.
Part VII of Article 680 addresses hydromassage bathtubs
680.72 Other Electrical Equipment. Luminaires, switches, receptacles, and other electrical equipment located in the same room, and not directly associated with a hydromassage bathtub, shall be installed in accordance with the requirements of Chapters 1 through 4 in this Code covering the installation of that equipment in bathrooms.
There is no GFCI requirement.
Part IV of Article 680 addresses Spas and Hot Tubs – specifically 680.43(B) and covers indoor installations of luminaires located over or within 5-feet of the outside walls of those tubs.

85. I have a building with 5- 200amp services, each of which is fed with 4-3/0 THWN cu conductors. If I decide to run one main Grounding Electrode Conductor and tap to each 200 amp service, what are the sizes of the GEC and the taps?
I am approaching this question as the building is supplied by one service with 5 disconnecting means in separate enclosures as permitted by 230.71(A). I have re-written the question to read:
I have a building with a service consisting of five 200 amp service disconnecting means in separate enclosures. Each disconnecting means is supplied by four 3/0 THWN cu conductors. If I decide to run one common Grounding Electrode Conductor and tap to each 200 amp service disconnect, what are the sizes of the GEC and the taps?

This is covered in 250.64(D)(1) Grounding Electrode Conductor Taps. Where the service is installed as permitted by 230.40, Exception No. 2, a common grounding electrode conductor and grounding electrode conductor taps shall be installed. The common grounding electrode conductor shall be sized in accordance with 250.66, based on the sum of the circular mil area of the largest ungrounded service-entrance conductor(s). Where the service-entrance conductors connect directly to a service drop or service lateral, the common grounding electrode conductor shall be sized in accordance with Table 250.66, Note 1. A tap conductor shall extend to the inside of each service disconnecting means enclosure. The grounding electrode conductor taps shall be sized in accordance with 250.66 for the largest conductor serving the individual enclosure. The tap conductors shall be connected to the common grounding electrode conductor by exothermic welding or with connectors listed as grounding and bonding equipment in such a manner that the common grounding electrode conductor remains without a splice or joint.
Table 250.66 Note 1. Where multiple sets of service-entrance conductors are used as permitted in 230.40, Exception No. 2, the equivalent size of the largest service-entrance conductor shall be determined by the largest sum of the areas of the corresponding conductors of each set.
Step 1, determine the size of the common grounding electrode conductor. Go to Table 8 of Chapter 9 to determine the circular mil area of the 3/0 service-entrance conductors.

3/0 = 167,800 cm
5 sets of SE conductors x 167,800 = 839,000 cm

To Table 250.66 = Over 600 through 1100 cm = 2/0 AWG
Step 2, determine the size of the grounding electrode conductor taps from the common grounding electrode conductor to each service disconnecting means.
To Table 250.66: 2/0 or 3/0 SE conductors = 4 AWG grounding electrode conductor taps
The tap conductors shall be connected to the common grounding electrode conductor by exothermic welding or with connectors listed as grounding and bonding equipment in such a manner that the common grounding electrode conductor remains without a splice or joint.

86. What type of sealing compound is allowed in the conduit seals at the boundaries of a Class 1 Division 2 location where they are not required to be explosion-proof?
NEC 501.15(B)(2) permits these seals not to be explosionproof but they shall be identified for the purpose of minimizing passage of gases under normal operating conditions. Duct seal is sufficient if approved by the AHJ. Note that the requirement shows only the minimizing of the passage of gases.

87. If the contractor is only changing out receptacles, is he required to replace with the Tamper-Resistant type? Is there any retro-active rule to receptacle replacement?
NEC 406.11, pg. 261, addresses the requirement; and the answer depend on the AHJ of the area you are working in and it would be best to check with him or her as to any local requirements. In 406.3 (D) pg. 259, for replacement receptacles the Tamper Proof is not mentioned so thus it is not required by the NEC.

88. A duplex dwelling has separate meters and load centers for each dwelling. These dwellings are connected via a large carport used by both dwellings. If there are lights under these carports, can they be fed from one of the dwelling units?
NO, Each dwelling shall serve the lights and receptacles in their portion of the carport.

210.25 Branch Circuits in Buildings with More Than One Occupancy.
(A) Dwelling Unit Branch Circuits. Branch circuits in each dwelling unit shall supply only loads within that dwelling unit or loads associated only with that dwelling unit.
240.24 Location in or on Premises. (B) Occupancy. Each occupant shall have ready access to all overcurrent devices protecting the conductors supplying that occupancy, unless otherwise permitted in 240.24(B)(1) and (B)(2).
(1) Service and Feeder Overcurrent Devices. Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the service overcurrent devices and feeder overcurrent devices supplying more than one occupancy shall be permitted to be accessible only to authorized management personnel in the following:
(1) Multiple-occupancy buildings
(2) Guest rooms or guest suites
(2) Branch-Circuit Overcurrent Devices. Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the branch-circuit overcurrent devices supplying any guest rooms or guest suites without permanent provisions for cooking shall be permitted to be accessible only to authorized management personnel.

89. What is the process for a Field Evaluation from U.L. and is the AHJ notified?
A field evaluation is an alternate process to listing or certification that can be applied to some, but not all products. The Field Evaluation process is designed to fill the need for unique, one-of-a-kind, limited production, or used equipment that does not bear a listing mark or where it appears to have been modified from its original certified construction. Field Evaluations are equipment specific and site specific and are not a substitute for certifications where the products are intended to be distributed or installed in many locations. UL Field Evaluation staff apply the labels, manufacturers, contractors, installers, or users of the products do not put on labels. The overall process generally and briefly follows the following steps:
UL receives an inquiry.
The product is determined to be eligible for a Field Evaluation and a quote is issued to the applicant
When the quote is accepted, the full scope of the project is determined and evaluation scheduled. As part of this step the AHJ is notified in writing of the Field Evaluation, who the applicant is, what the product is, and where it is being installed
The qualified FE staff conducts the evaluation looking for compliance with construction of the product and performs applicable nondestructive testing. If issues are found, a Preliminary Findings Report is issued to the applicant and the AHJ.
When issues are resolved, a final evaluation and applicable testing is completed and when all is found in compliance, a FEP label is applied by the FE staff
A final report is prepared and issued to the applicant and the AHJ.
To reiterate on the notification of the AHJ, under UL procedures there is a written notification as soon as the project is secured. There is then a verbal notification when the preliminary and/or final evaluations are scheduled so the AHJ can be present if they desire. The AHJ is also provided copies of the Preliminary and Final engineering reports that support the process completed to achieve the application of the FEP label.

90. Are nail plates required for MC cables run horizontally through 1 ½' metal studs?
330.17 Through or Parallel to Framing Members.
Type MC cable shall be protected in accordance with 300.4(A), (C), and (D) where installed through or parallel to framing members.
300.4(A) not applicable (cables & raceways through wood members)
300.4(C) not applicable-Cables through Spaces Behind Panels Designed to Allow Access.
300.4(D) Cables and Raceways Parallel to Framing Members and Furring Strips. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed parallel to framing members, such as joists, rafters, or studs, or is installed parallel to furring strips, the cable or raceway shall be installed and supported so that the nearest outside surface of the cable or raceway is not less than 32 mm (11/4 in.) from the nearest edge of the framing member or furring strips where nails or screws are likely to penetrate. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by nails or screws by a steel plate, sleeve, or equivalent at least 1.6 mm (1/16 in.) thick.
While you can forgo a grommet as required for NM Cable or ENT per 300.4(B), we are still required to maintain the 1 ¼ inches from the nearest of the framing member. Accordingly, 1 ½ inch metal studs would require nail plates.
Code Section: 330.17 & 300.4(D)

91. I have an A/C condensing unit with a maximum fuse or breaker rating of 35 amps. I don't have a 35-amp breaker. Can I go to the next size breaker of 40 amps?
No 440.22(C) states "the protective device rating shall not exceed the manufacturer's values marked on the equipment."

92. Since most of the new hot tub motors and piping are made of plastic is there still a bonding requirement?
Since we're discussing hot tubs, remember that a hydromassage tub is a fill-and-dump unit, while a spa is a molded acrylic tub where the large quantity of water generally remains from use to use. Technically, a hot tub is just that – a wooden tub with staves that are secured with metal bands. Spas and Hot Tubs are in Section IV of Article 680 and (A) tells us the grounding requirements of Part I apply, and if the "hot tub" is located outdoors, the provisions of Part II for permanently installed pools – including the bonding -also apply. However, there is an allowance for tubs built on a common metal base with direct metal-to-metal mounting, as that can be accepted as the bonding of the motor and controller.
When installed indoors, the bonding requirements for "hot tubs" are found in 680.74
680.74 Bonding. All metal piping systems and all grounded metal parts in contact with the circulating water shall be bonded together using a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG. The bonding jumper shall be connected to the terminal on the circulating pump motor that is intended for this purpose. The bonding jumper shall not be required to be connected to a double insulated circulating pump motor. The 8 AWG or larger solid copper bonding jumper shall be required for equipotential bonding in the area of the hydromassage bathtub and shall not be required to be extended or attached to any remote panelboard, service equipment, or any electrode.
So, if the motor is double insulated and there is no metallic piping system associated with the unit, there is nothing to bond. The 2011 NEC will require that a #8 bonding conductor be made available at the motor location if there is metallic piping system that requires bonding.

93. Is the ground rod installed at a generator required to be bonded to the building electrode system and if so, by what means?

The answer depends upon the location of the generator. If located at the same building or structure as the service, all grounding electrodes are required to be bonded together to create a grounding electrode system. See 250.50 and 250.58. If a separately derived system, the size of the grounding electrode conductor is determined from Table 250.66 based upon the size of the derived conductors. If not a separately derived system, and the ground rod is installed as an auxiliary grounding electrode, no other bonding is required other than the connection to the equipment grounding conductor.

If the generator is a separately derived system and is located remote from the building or structure where the service is located, a grounding electrode and grounding electrode conductor connection is required at the generator location. See 2011 NEC 250.30(C).

If a permanently installed generator, see 250.35(B). It requires.

"If the generator is installed as a non-separately derived system, and overcurrent protection is not integral with the generator assembly, a supply-side bonding jumper shall be installed between the generator equipment grounding terminal and the equipment grounding terminal, bar, or bus of the disconnecting mean(s). It shall be sized in accordance with 250.102(C) based on the size of the conductors supplied by the generator."

94. Would the NEC allow a temporary installation of conductors rated for a wet location to be installed in schedule 80 PVC staked down on top of the ground without being glued together so that it can be re-used at the next temporary event? (Assume that all other factors meet code compliance)

By the use of your term "temporary event", the installation is governed by NEC 590.3(B). According to 590.4(C) Exception, branch circuits specified in 590.3(B) are permitted to be run as single conductors (no raceway required), the wiring shall not be subject to physical damage and the conductors shall be supported on insulators. Any other use or installation shall be governed by the permanent wiring requirements of the Code (590.2). Based on this the PVC must be installed according to Article 352.

95. I am installing an optional emergency generator with 300 ampere OC protection. The facility it will serve has a calculated load of 160 amperes. Is it a violation to install 3/0 THHN cu conductors from the 300-amp breaker to a 200-amp main breaker panelboard or do the conductors need to be rated for 300 amperes?

NEC 445.13, pg. 334 the ampacity of the conductors from the generator terminals to the first distribution device containing OCP shall not be less than 115 percent of the nameplate current rating of the generator., the neutral conductor can be sized per 220.61, pg. 62, Feeder or Service neutral load, which considers the maximum unbalanced for the 120 volt circuits being utilized. So the conductors should be rated for 300 X 1.15 = 345 amps., 400 K-cmil copper Also should the generator enclosure have the room or capability to have a tap box installed then consider 240.21 (B) pg. 86, and follow the Tap rules that would apply. Thus it could be done as proposed.

96. Should the bonding bushing be located in the transformer, in the panel or both for a separately derived system consisting of a 480/208volt, 3-phase, 75 KVA transformer and a 200 amp MB panel?

250.30(A) (6) Bonding. Structural steel and metal piping shall be connected to the grounded conductor of a separately derived system in accordance with 250.104(D).250.30

There no bonding requirements on the secondary side of transformer as there are on service

250.97 Bonding for Over 250 Volts.

For circuits of over 250 volts to ground, the electrical continuity of metal raceways and cables with metal sheaths that contain any conductor other than service conductors shall be ensured by one or more of the methods specified for services in 250.92(B), except for (B)(1).

Exception: Where oversized, concentric, or eccentric knockouts are not encountered, or where a box or enclosure with concentric or eccentric knockouts is listed to provide a reliable bonding connection, the following methods shall be permitted:

(1) Threadless couplings and connectors for cables with metal sheaths

(2) Two locknuts, on rigid metal conduit or intermediate metal conduit, one inside and one outside of boxes and cabinets

(3) Fittings with shoulders that seat firmly against the box or cabinet, such as electrical metallic tubing connectors, flexible metal conduit connectors, and cable connectors, with one locknut on the inside of boxes and cabinets

(4) Listed fittings

250.92 b Bonding jumpers meeting the other requirements of this article shall be used around concentric or eccentric knockouts that are punched or otherwise formed so as to impair the electrical connection to ground. Standard locknuts or bushings shall not be the sole means for the bonding required by this section.

97. Can I shorten the factory- installed neutral on a GFCI breaker to make a neater looking job without violating the listing of the breaker?

Yes, provided there is nothing in the manufacturers installation instructions that prohibit it. 110.3(B)

There is nothing in the NEC, UL White Book category Circuit Breakers and Ground Fault Circuit Interrupters (DKUY) located on page 100 in the 2010 White Book, or UL 943 that would prohibit this application.

98. How deep does the transition fitting need to be when converting from underground PVC to GRC emerging from the earth from a gas pump location to an emergency switch located in a non-classified area?

2 feet-

514.8 Underground Wiring.

Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit. Any portion of electrical wiring that is below the surface of a Class I, Division 1, or a Class I, Division 2, location [as classified in Table 514.3(B)(1) and Table 514.3(B)(2)] shall be sealed within 3.05 m (10 ft) of the point of emergence above grade. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point of emergence above grade. Refer to Table 300.5.

Exception No. 2: Rigid nonmetallic conduit shall be permitted where buried under not less than 600 mm (2 ft) of cover. Where rigid nonmetallic conduit is used, threaded rigid metal conduit or

threaded steel intermediate metal conduit shall be used for the last 600 mm (2 ft) of the underground run to emergence or to the point of connection to the aboveground raceway, and an equipment grounding conductor shall be included to provide electrical continuity of the raceway system and for grounding of non–current-carrying metal parts.
Code Section: 514.8 Exception No. 2

99. What is the common point where are all of the fittings, boxes, enclosures & equipment in a gas dispenser are supposed to be bonded to?
Section 514.16 covers the requirements for grounding and bonding of "Motor Fuel Dispensing Facilities" which includes all the items mentioned in the question. Grounding and bonding in Class I locations shall comply with 501.30. Definition of "Bonded" in Article 100 is "Connected to establish electrical continuity and conductivity." With all these items bonded together the common point would be at the point where the main bonding jumper at the service or system bonding jumper for a separately derived system is made.

100. A 24" length of Liquid-tight Flexible Metal Conduit is utilized for flexibility in a Class 1 Division 2 location and is installed with listed fittings for this location. Is any additional bonding required when a properly sized GEC is installed in conduit?
A "a properly sized GEC is installed" means that this is at a service or SDS – and the GEC is installed in conduit to provide physical protection and in flexible conduit because flexibility is needed?
Yes, additional bonding is required per 210.64(E) "Bonding shall apply at each end…"
The question may actually be asking about an equipment bonding jumper. A change was made to the 2011 Code that makes it clear that an equipment bonding jumper shall be installed with Liquid-tight Flexible Metal Conduit. This is found in 501.30(B) There is an exception to the bonding requirement for lengths of less that 6-feet where the load is not a power utilization load and is less than 10 amps.

101. If a metallic conduit sleeve containing a grounding electrode conductor is run from a panel to the Ground electrode, does the panel end of the sleeve need to have a choke fitting installed in addition to the conduit connector?
Not positive what is meant by a "choke fitting". Positive bonding of the metal conduit to the service enclosure is required to comply with 250.64(E). This includes bonding bushings and grounding/bonding locknuts. The main bonding jumper in the service serves to connect the enclosure to the neutral and the grounding electrode conductor.

102. In a major repair garage where lighter-than-air gaseous vehicles are parked, what is the rating of unventilated ceilings?
NEC 511.3(C)(2)(b) requires that in major repair garages where lighter than air gaseous fueled vehicles, such as vehicles fueled by natural gas or hydrogen, are parked or stored, ceiling areas where ventilation is not provided shall be classified as Class I, Division II

103. Is the laundry room considered a "like" room as compared to the areas that are exempt from AFCI protection?
NEC 210.12 pg. 49, in my opinion the only receptacle exempted from the AFCI requirement is the one that is GFCI protected as required by 210.8 (A) (7), pg. 47. Remember the whole house

requirement concept that the panel started out with and I believe that goal will slowly be achieved in some point of time in the future.

104. I have several molded-case circuit breakers of different amperages that will be mounted in an industrial control panel. I would prefer to terminate the supply conductors on the bottom lugs and the load conductors on the top set of lugs. Would this violate the NEC?
CIRCUIT BREAKERS, MOLDED-CASE AND
CIRCUIT BREAKER ENCLOSURES (DIVQ)
Line and load markings on a circuit breaker are intended to limit connections thereto as marked.

105. Is a power strip that is plugged into another power strip, in order to reach a permanent receptacle, a violation of the listing? Does the NEC regulate power strips?
Yes, the 2010 UL White Book pages 417 & 418 for category XBYS (Relocatable Power Taps) states that Relocatable power taps are intended to be directly connected to a permanently installed branch circuit receptacle. Relocatable power taps are not intended to be series connected (daisy chained) to other relocatable power taps or to extension cords.
Therefore this could be considered a violation of 110.3(B).
210.50(B) Cord Connections. A receptacle outlet shall be installed wherever flexible cords with attachment plugs are used. Where flexible cords are permitted to be permanently connected, receptacles shall be permitted to be omitted for such cords.

106. An inspector gave me a correction for having 12 receptacles on a 15-amp circuit in a residential basement. He said that I needed to calculate each opening at 180 VA and the circuit is limited to 10 receptacles. How many can I put on the circuit? Is the inspector correct?
The inspector is incorrect. There is no maximum number of receptacles permitted.
220.14 Other Loads — All Occupancies.
In all occupancies, the minimum load for each outlet for general-use receptacles and outlets not used for general illumination shall not be less than that calculated in 220.14(A)through (L), the loads shown being based on nominal branch-circuit voltages.
(J) Dwelling Occupancies. In one-family, two-family, and multifamily dwellings and in guest rooms or guest suites of hotels and motels, the outlets specified in (J)(1), (J)(2), and (J)(3) are included in the general lighting load calculations of 220.12. No additional load calculations shall be required for such outlets.

(1) All general-use receptacle outlets of 20-ampere rating or less, including receptacles connected to the circuits in 210.11(C)(3) (bathroom 20-amp circuit)
(2) The receptacle outlets specified in 210.52(E) and (G) (E-outdoor rec) (G-basement/garage)
(3) The lighting outlets specified in 210.70(A) and (B)

(L) Other Outlets. Other outlets not covered in 220.14(A) through (K) shall be calculated based on 180 volt-amperes per outlet.
Code Section: 220.14(J)

107. Is a conduit seal required within18" of an explosion-proof motor, listed for use in a Class 1 Division 1 location and installed in a Class 1 Division 2 location, if the motor leads are factory sealed?
YES but not required
500.8(B)(2) permits equipment that has been identified for a Division 1 location to in a Division 2 location of the same class, group, and temperature class. Requirements for conduit seals located in a Class I Division 2 are covered in Section 501.15(B) and are not required in the location as described in the question.

108. Where should the emergency lighting switch be located in a motion picture theatre?
520.8 refers the user to Article 700. Section 700.21 states "In facilities covered in Articles 518 and 520, a switch for controlling emergency lighting systems shall be located in the lobby or in a place conveniently accessible thereto." And it further states that "In no case shall a control switch for emergency lighting be placed in a motion-picture projection booth or on a stage or platform.

109. A 75 KVA, 3-phase, 480/208volt transformer feeds a 200-amp main breaker panel filled with 20 amp breakers. The bonding is done in the transformer where the equipment bonding jumper and the isolated-ground conductor originates. How is the IG conductor sized?
It is assumed that the insulated equipment grounding conductor is installed for the purpose of reduction of electrical noise in accordance with 250.146(D). Since all the overcurrent devices are rated 20 amperes, the equipment grounding conductor is not required to be larger than 12 AWG according to 250.122.

110. Do soda machine dispensers at service stations and convenience stores need to be GFCI protected?
NEC 422.51 requires that cord-and-plug-connected vending machines manufactured after January 1, 2005 shall include a ground fault circuit-interrupter as an integral part of the attachment plug or be located within 12 in. of the attachment plug. Vending machines manufactured prior to January 1, 2005 must be connected to a GFCI protected outlet.

111. Is type NM-B cable allowed in a barn where animals are housed if it is a dry location?
NEC 547.5 pg. 463, addresses wiring methods allowed and does mention Types UF, NMC cables but not NM-B; so the answer is no. Remember the cables must be terminated with approved fittings and it is normally a dusty environment so NM box connectors do not work, but the compression type would.

112. Does the disconnecting means for an electrical driven irrigation machine need to be within sight if it can be locked-out?
675.8(B) Main Disconnecting Means. The main disconnecting means for the machine shall provide overcurrent protection, shall be at the point of connection of electric power to the machine, or shall be visible and not more than 15 m (50 ft) from the machine, and shall be readily accessible and capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. This disconnecting means shall have a horsepower and current rating not less than required for the main controller.

In accordance with 675.8(B), the main disconnecting means is permitted to be up to 50 ft from the machine but must be readily accessible and capable of being locked in the open position. This eliminates one set of overcurrent protective devices and one disconnecting means where the circuit originates at the motor control panel for the irrigation pump and the panel is located within 50 ft of the center pivot machine. It also alleviates some potential problems wih machines designed to be towed to a second site.

113. Most terminal lugs state stranded minimum size to maximum size. They do not indicate listings for solid conductors. Are the lugs that are terminated with solid wires a violation of the listing?
Most likely, and if so would also violate NEC section 110.3(B). However it may depend on the size of the wire connector and conductor being terminated. 2010 UL White Book category Wire Connectors and Soldering Lugs (ZMVV) located on pages 452 & 453 states under the heading of Product Markings and Ratings; Wire stranding — Unless clearly marked "Solid," "SOL," "Stranded" or "STR" for a given wire size, wire range or wire combination, conductors in the range 30-10 AWG are both solid and stranded, and 8 AWG and larger are for stranded wire only.

114. A residence has a 200-amp MB panel and a calculated load of 171 amps. A PV system is installed and the MB is changed to 175 amps in order to maximize the efficiency and use a back-fed 60-amp breaker. Is it compliant to have a 175-amp MB for the 171 amp calculated load?
Yes, assuming that the load was calculated in accordance with Part III, IV or V of Article 220, taking into account the calculated load already includes the adjustment for 125% of the continuous load.
230.79 states the service disconnect rating can't be less than the load calculated by Article 220, parts III, IV, or V. So, if the load calculated by Article 220 is 171 A then a 175 A MCB would be compliant
Code Section: 230.79

115. A commercial freezer unit requires a disconnect switch for its lights and fan coil units. Does the door heater/defroster also require a disconnect switch?
There are no code requirements that would require a disconnecting means for the door heater/defroster.

116. Are the rules for theatre dressing room receptacles more stringent than for other commercial applications?
Yes and No. Part VI of Article 520 is entitled "Dressing Rooms" but there is no requirement for the receptacles themselves to be different.
520.73 requires that any receptacles adjacent to the mirror and above the dressing table counter(s) installed in dressing rooms be controlled by wall switches inside the dressing room(s). In addition, a pilot light is required to be located outside the dressing room and adjacent to the door to indicate when those receptacles are energized. [The other receptacles within the dressing room are not required to be switched or to have remote indicators

117. Does an unattached garage, which is fed from the house, require a grounding electrode system at the garage?
Only if it is supplied by a feeder or by more than one branch circuit. See 250.32(A). Note the limitation on the number of supplies to a building or structure in 225.30.

118. A kitchen island has a 4' long framed and drywall backside facing the family room. Can the small appliance circuit serving the countertop also serve the receptacle located on this wall?
The backside of the island is a part of the island and the requirements for receptacle outlets located on kitchen islands are applicable.

119. Is a receptacle located behind a refrigerator in a staff lounge required to be GFCI protected when there is another GFCI protected receptacle above the counter between the sink and the refrigerator?
NEC 210.8 (B) (5) pg. 48, yes if it is within (6ft.) of a sink regardless if it is qualified as a kitchen area or not. If the area does qualify as a kitchen area by definition 100, pg.28, the answer is the same.

120. How many feet of USE cable can enter a house to feed a service?
None.
338.12 Uses Not Permitted. (B) Underground Service-Entrance Cable. Underground service-entrance cable (USE) shall not be used under the following conditions or in the following locations:
(1) For interior wiring

121. Will the manufacturers of NMC make a product that can be installed in a wet location since the NEC considers all conduits run outside as a wet location?
This is a question probably better suited to be answered by one of the NM cable manufacturer. However to the best of my knowledge, none of the NM cable manufacturers currently construct an NMC cable. However, if one wanted to install a non-metallic type cable inside of a conduit that is installed in a wet location, they could use a UF type cable or a USE type cable as both are identified for use in wet locations. USE may only be installed outside only unless it is a dual rated cable.
338.12(B)(1)
340.10(3) & 340.116
Additional information may be located in the 2010 UL White Book under Categories Service Entrance Cable TYLZ page 369 and Underground Feeder and Branch Circuit Cable YDUX page 432.

122. Can a PV system be connected into a sub-panel if it is located closer and is more accessible than the main service panel?
Yes, provided disconnecting means meets the provisions of 690.14. See also 690.64, which allows connection on the load side of the service disconnecting means at any distribution equipment on the premises.
690.14:

(A) Disconnecting Means. The disconnecting means shall not be required to be suitable as service equipment and shall comply with 690.17.
(B) Equipment. Equipment such as photovoltaic source circuit isolating switches, overcurrent devices, and blocking diodes shall be permitted on the photovoltaic side of the photovoltaic disconnecting means.
(C) Requirements for Disconnecting Means. Means shall be provided to disconnect all conductors in a building or other structure from the photovoltaic system conductors.
(1) Location. The photovoltaic disconnecting means shall be installed at a readily accessible location either on the outside of a building or structure or inside nearest the point of entrance of the system conductors
690.64:
(B) Load Side. The output of a utility-interactive inverter shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises. Where distribution equipment, including switchboards and panelboards, is fed simultaneously by a primary source(s) of electricity and one or more utility-interactive inverters, and where this distribution equipment is capable of supplying multiple branch circuits or feeders, or both, the interconnecting provisions for the utility-interactive inverter(s) shall comply with (B)(1) through (B)(7).
Code Section: 690.14 & 690.64

123. Can trees be used to support extension cords for Christmas lighting?
Section 590.4(J) Exception permits holiday lighting conductors or cables to be supported to trees with proper strain relief devices, tension take-up devices or other approved means if in accordance with 590.3(B) which limits a time period not to exceed 90 days.

124. Would type NM-B cable be acceptable for wiring a barn with a tack room, hay storage and some stalls? Does the size of the barn dictate the use of article 547? Some private barns are between 10,000-20,000 square feet with riding arenas hay storage, tack rooms and wash areas. Should we use article 547 for these barns?
No, No and Maybe. The scope of 547, as clarified in the 2011 NEC is agricultural buildings or parts of a building that meet the conditions specified in either 547.1(A) or (B).
A is Excessive Dust and Dust with Water and B refers to Corrosive Atmospheres.
There is always a concern for a building where animal feed is stored, as rodents will be present and the wiring methods are subject to damage. Type NM or NMB cable could not be installed in those locations, but Types UF, NMC, copper SE cables, jacketed Type MC cable, rigid nonmetallic conduit, liquid-tight flexible nonmetallic conduit, or other cables or raceways suitable for the location can be used

125. An electric service is utility fed to an owner- supplied disconnect on a pole at the edge of the property. Is a grounding conductor required in with the feeder to the structure service location?
The disconnecting means installed at the pole is the service disconnecting means. The service neutral is required to be connected to a grounding electrode system at this location. See 250.24(A)(1), 230.70 and 230.71. An equipment grounding conductor is required with the feeder conductors to the building or structure if any equipment at the building or structure is required to

be grounded. See 215.6. See 250.110, 112 and 114 for a list of equipment that is required to be grounded.
If required, the size of the equipment grounding conductor is determined from Table 250.122 on the basis of the overcurrent device protecting the feeder or branch circuit.

126. Why does the NEC govern the installation of low voltage wiring systems such as communications, telephone, CATV, lighting, etc., but does not govern the wiring for environmental systems such as t-stat wiring?
NEC 90.1 states the purpose of the Code – The practical safeguarding of persons and property from hazards arising from the use of electricity. It is not intended as a design specification.

127. Do all outdoor accessible balconies, decks, and porches need to have receptacles?
NEC 210.52 (E) (3) Exception pg. 54, (2008) no only those with a floor area of (20 sq. ft) or larger. The 2011 NEC will drop that exception so all spaces will have the requirement, when it is adopted.

128. Is an equipotential plane required for the building where cows are milked for a small farm with six cows?
547.10 Equipotential Planes and Bonding of Equipotential Planes.
The installation and bonding of equipotential planes shall comply with 547.10(A) and (B). For the purposes of this section, the term livestock shall not include poultry.
547.1 Scope.
The provisions of this article shall apply to the following agricultural buildings or that part of a building or adjacent areas of similar or like nature as specified in 547.1(A) and (B).
(A) Excessive Dust and Dust with Water. Agricultural buildings where excessive dust and dust with water may accumulate, including all areas of poultry, livestock, and fish confinement systems, where litter dust or feed dust, including mineral feed particles, may accumulate.
(B) Corrosive Atmosphere. Agricultural buildings where a corrosive atmosphere exists. Such buildings include areas where the following conditions exist:
(1) Poultry and animal excrement may cause corrosive vapors.
(2) Corrosive particles may combine with water.
(3) The area is damp and wet by reason of periodic washing for cleaning and sanitizing with water and cleansing agents.
(4) Similar conditions exist.

129."Protection from physical damage" is a very broad description, and is enforced very differently by various jurisdictions. Is there any way that this can be defined better in the NEC?
Yes, you could submit a proposal.
Currently the term physical damage is not defined in the NEC. This term is subjective, however it allows the AHJ to make a decision of equipment approval based on the site conditions of the actual installation.
The NEC Style Manual states that; In general, Article 100 shall contain definitions of terms that appear in two or more other articles of the NEC. The term physical damage is used 266 times in the 2008 NEC Handbook.
However it also states that in 3.2.5.5 Provisions on Protection Against Physical Damage. If protection against physical damage is to be one of the requirements, this can be standardized by the

use of this terminology instead of using the phrase provided with mechanical protection to mean the same thing. In many cases, one or two acceptable methods of providing the intended protection can be stated as examples for better understanding without restricting the rule to a specification-type requirement. There have been some cases, such as in the instance of grounding electrode conductors, where the means provided by the installer for protection against physical damage has impaired the electrical function of the conductor or equipment. This can be largely avoided by an explanatory note if the intent cannot be otherwise made sufficiently clear.
NEC?

130. Is a general-use cord connector allowed to be used for connecting cords from signaling devices that are listed for use in a Class 1 Division 2 location and are not gas permeable, to a j-box where splices are made?
501.140 covers the permitted uses and installation requirements for flexible cords. Assuming the requirements of 501.140(B) have been met, i.e., extra-hard usage, include an equipment grounding conductor, connected to terminals or to supply conductors in an approved manner and supported properly, there are no specific requirements to address the cord connectors, other than be provided with a "suitable seal." There is, however, a change in the 2011 NEC that will require cord connectors to be listed when installed in a Class I Div 2 location.
Code Section: 501.140(B)

131. Is a stand-alone fuel cell system permitted to supply 120 volts nominal to a 120/240 volt, single-phase electrical service?
Yes
Section 692.10(C) in part states "The inverter output of a stand-alone fuel cell system shall be permitted to supply 120 volts, nominal, to single-phase, 3-wire 120/240-volt service equipment…"

132. What is the main purpose of an isolated grounding conductor in addition to the grounding conductor in a health care facility? Is it for grounding redundancy?
First of all, this is not an isolated grounding conductor nor is it a requirement for all wiring in a health care facility. The requirement is for an insulated equipment grounding conductor and it applies to patient care areas of health care facilities. A patient care area is defined as "any portion of a health care facility wherein patients are intended to be examined or treated."
This insulated equipment grounding conductor is sometimes referred to as the "redundant ground." Redundant means "exceeding what is usual" and that is exactly the purpose – an extra level of safety.
The FPN found in Section 517.11 General Construction Criteria states:
FPN: In a health care facility, it is difficult to prevent the occurrence of a conductive or capacitive path from the patient's body to some grounded object, because that path may be established accidentally or through instrumentation directly connected to the patient. Other electrically conductive surfaces that may make an additional contact with the patient, or instruments that may be connected to the patient, then become possible sources of electric currents that can traverse the patient's body. The hazard is increased as more apparatus is associated with the patient, and, therefore, more intensive precautions are needed. Control of electric shock hazard requires the limitation of electric current that might flow in an electrical circuit involving the patient's body by raising the resistance of the conductive circuit that includes the patient, or by insulating exposed surfaces that might become energized, in addition to reducing the potential difference that can

appear between exposed conductive surfaces in the patient care vicinity, or by combinations of these methods. A special problem is presented by the patient with an externalized direct conductive path to the heart muscle. The patient may be electrocuted at current levels so low that additional protection in the design of appliances, insulation of the catheter, and control of medical practice is required.

133. Does NEC 690.47(D) require an additional GEC for a roof mounted array? The verbiage indicates that NEC 690.47(B)(3) and 690.47(B)(6) do not apply. Please explain why two electrodes are necessary for one array.

Generally, "Yes." Grounding electrodes shall be installed in accordance with 250.52 … as close as practicable to the location of roof-mounted photovoltaic arrays. The electrodes shall be connected directly to the array frame(s) or structure. The dc grounding electrode conductor shall be sized according to 250.166. Additional electrodes are not permitted to be used as a substitute for equipment bonding or equipment grounding conductor requirements.

Roof-mounted photovoltaic arrays shall be permitted to use the metal frame of a building or structure if the requirements of 250.52(A)(2) are met.

Exception No. 2: Additional array grounding electrode(s) shall not be required if located within 6 ft of the premises wiring electrode.

134. Do garage- door opener receptacles on ceilings in garages need to be GFCI protected?

NEC 210.8(A)(2) requires that all 125-volt, single-phase, 15 and 20-ampere receptacles installed in garages shall have ground fault circuit-interrupter protection for personnel. This includes garage door openers.

135. A kitchen counter has a 60" window behind it in lieu of a wall. There is no backsplash high enough to install a receptacle within the 24" rule. Would a receptacle installed at each end of the glass be sufficient?

NEC 210.52 (C) pg. 53, No, , the comment (no backsplash high enough), leads me to believe that there is something there all be it a wood window frame molding , a wire mould strip or possible a dog-house pop-up receptacle can be utilized. The public seems to be trying to find reasons for why not to meet the code, remember it does have to be there but no one mandates that it be used.

136. Can a PV system mounted on a detached garage terminate into the garage sub-panel that is fed from the house by a 50-amp breaker?

690.9 Overcurrent Protection.

(A) Circuits and Equipment. Photovoltaic source circuit, photovoltaic output circuit, inverter output circuit, and storage battery circuit conductors and equipment shall be protected in accordance with the requirements of Article 240. Circuits connected to more than one electrical source shall have overcurrent devices located so as to provide overcurrent protection from all sources.

Exception: An overcurrent device shall not be required for circuit conductors sized in accordance with 690.8(B) and located where one of the following apply:

(a) There are no external sources such as parallel-connected source circuits, batteries, or backfeed from inverters.

(b) The short-circuit currents from all sources do not exceed the ampacity of the conductors.

137. PV system rooftop micro-inverters keep the DC voltages on the roof. Does the A/C wiring from the combiners passing through the attic also need to meet 690.31(E) rules for metallic conduit?

No, 690.31(E) is only applicable to DC circuits.
However keep in mind that the requirements of 690.9, 690.14(C)(1) and 690.14(D) are still applicable for a micro-inverter installation.
690.9 states that the inverter output circuit shall be protected in accordance with the requirements of Article 240.
690.14(C)(1) states that the PV disconnecting means shall be installed at a readily accessible location either on the outside of a building or structure or inside nearest the point of entrance of the system conductors. Note that the exception is for installations that comply with 690.31(E).
690.14(D) permits Utility-interactive inverters to be mounted on roofs or other exterior areas that are not readily accessible. However this installation shall comply with 4 conditions.

Note that micro-inverters and AC Modules are different applications. UL Category QHYZ covers AC Modules on page 303 and UL Category Static Inverters and Converters for use in Independent Power Systems QIKH covers Micro-Inverters on page 307 of the 2010 UL White Book.

138. Is it required to change out non-weather resistant receptacles in a listed assembly, such as a power outlet, to weather resistant type ("WR") if the assembly is listed for use outdoors?

No, it is not required to retrofit existing listed assemblies
Field Modifications
An authorized use of the UL Mark is the manufacturer's declaration that the product was originally manufactured in accordance with the applicable requirements when it was shipped from the factory. When a UL-Listed product is modified after it leaves the factory, UL has no way to determine if the product continues to comply with the safety requirements used to certify the product without investigating the modified product. UL can neither indicate that such modifications ''void'' the UL Mark, nor that the product continues to meet UL's safety requirements, unless the field modifications have been specifically investigated by UL. It is the responsibility of the Authority Having Jurisdiction (AHJ) to determine the acceptability of the modification or if the modifications are significant enough to require one of UL's Field
Engineering Services staff members to evaluate the modified product. UL can assist the AHJ in making this determination.
Code Section 110.3(B)

139. Are there any restrictions on the type of bends in the grounding electrode required from the roof mounted PV system to earth? This could potentially be a path for lightning.

There are no provisions for PV System grounding electrode conductor to run in a straight as possible line, or restrictions to bends. The only required grounding electrode conductor to be run in a straight line as much as practicable is for Chapter 8 communication systems such as in Section 800.100(A)(5).

140. Article 210.12(B) gives a list of outlets and similar rooms that shall be protected by an AFCI circuit but it excludes other areas that require GFCI circuits. Does this exclusion also cover the wet bar GFCI receptacle?

The coincidence that AFCI protection is currently not required for those areas of a dwelling where GFCI protection is required does not mean that AFCI and GFCI technology are incompatible, nor does it mean that AFCI is prohibited on circuits where GFCI is required.
So, is AFCI protection required for the 120-volt, single phase, 15- and 20-ampere branch circuits serving GFCI protected receptacle outlets at a wet bar sink?
Well, where's the wet bar? Living room? Den? Rec room? Bedroom? Here's what the Code tells us:
B Dwelling Units. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, or similar rooms or areas shall be protected by a listed arc-fault circuit interrupter, combination-type, installed to provide protection of the branch circuit.
If the wet bar is located in any of the areas specified in 210.12(B) then, yes – AFCI is required in addition to GFCI.

141. Can flexible cords be used to install a permanent loudspeaker system with open terminations at the speakers?

No. See the following.

400.8 Uses Not Permitted.

Unless specifically permitted in 400.7, flexible cords and cables shall not be used for the following:

(1) As a substitute for the fixed wiring of a structure

(2) Where run through holes in walls, structural ceilings, suspended ceilings, dropped ceilings, or floors

(3) Where run through doorways, windows, or similar openings

(4) Where attached to building surfaces

Exception to (4): Flexible cord and cable shall be permitted to be attached to building surfaces in accordance with the provisions of 368.56(B)

(5) Where concealed by walls, floors, or ceilings or located above suspended or dropped ceilings

(6) Where installed in raceways, except as otherwise permitted in this Code

(7) Where subject to physical damage

725.46 Class 1 Circuit Wiring Methods.

Class 1 circuits shall be installed in accordance with Part I of Article 300 and with the wiring methods from the appropriate articles in Chapter 3.

Exception No. 1: The provisions of 725.48 through 725.51 shall be permitted to apply in installations of Class 1 circuits.

Exception No. 2: Methods permitted or required by other articles of this Code shall apply to installations of Class 1 circuits.

725.130(B) Class 2 and Class 3 Wiring Methods. Conductors on the load side of the power source shall be insulated at not less than the requirements of 725.179 and shall be installed in accordance with 725.133 and 725.154.

725.179 Listing and Marking of Class 2, Class 3, and Type PLTC Cables.

Class 2, Class 3, and Type PLTC cables and nonmetallic signaling raceways installed as wiring methods within buildings shall be listed as being resistant to the spread of fire and other criteria in accordance with 725.179(A) through (K) and shall be marked in accordance with 725.179(L).

142. How far back can a box be in a wood finished wall before a spark ring(box extension) is needed?
NEC 314.20 requires that in walls constructed of wood, boxes shall be flush with the finished surface or project therefrom. If an extension ring is required to accomplish this, the extension ring is required to be flush with the finished surface or project therefrom.

143. A community kitchen in a retirement home has two circuits with two receptacles on each circuit. This kitchen is used for celebrations, potluck dinners and meetings. The calculated load is 180va per receptacle. A coffee pot uses at least 600va and an electric skillet uses 1500va. These loads exceed the calculated load. Is there a NEC reference that is more in line with reality for the receptacle loads?
NEC 220.14 (A), pg 59, states that an outlet for a specific appliance or other load not covered in 220.14 (B) through (L) shall be calculated based on the ampere rating of the appliance or load served. Since the question indicates that the kitchen has two circuits, which should be # 12 AWG 20 ampere circuits and even though they only each have two receptacles on each circuit ; these circuits should be able to handle the occasional loads applied to them. Should the inspector not be satisfied he or she can invoke the requirement for a diagram and total calculated loads, as stated in 215.5. Another consideration would be per 210.23 (A) (2) which states that any one appliance can not exceed 50% per-cent of the branch circuit ampacity level. Thus the electric skillet will draw 12 &1/2 amperes and it is greater than the allowable limit; and it would then take a separate circuit to be installed for that use and purpose.

144. Do the dishwasher and garbage disposal need GFCI protection when located in a commercial break room with a sink?
Yes, If within 6 feet of the sink
210.8 (b)(5) Sinks — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the sink