

**2008 Western Section Meeting
Rapid City, South Dakota
Charlie Trout Code Breakfast**

1. Several circuits are run in Schedule 40 PVC. There are four 3/0 AWG copper Type THHN conductors, six size 10AWG copper THHW and one size 6 AWG bare copper equipment grounding conductor.

What is the minimum size Schedule 40 PVC conduit permitted for these conductors?

Answer: The total cross sectional area of the conductors is permitted to be up to 40% of the cross-sectional area of the raceway. *Tables 5 & 8*

4- size 3/0 AWG THHN	.2679 Sq. in. X 4=	1.0716 Sq. in.
6-size 10 AWG THHW	.0333 sq in. X 6=	0.1458 Sq. in.
1- size 6 AWG bare	.027 sq. in. =	0.027 Sq. in.

Total Cross-sectional Area **1.2444 Sq. In.**
A. From the 40% Column of Table 4(pg. 675) **Minimum Size 2”**

2. A 15 horsepower, 3-phase, 230-volt Design B squirrel-cage induction motor has a service factor of 1.15 and a nameplate full-load current of 39 amperes. If the branch circuit conductors are copper with 75 degree C. insulation and terminations, what is the minimum size circuit conductor?

Answer: 6AWG

430.22(A), Table 430.250, Table 310.16, 430.6(A)(1)

42 Amperes X 1.25= 52.5 amperes. Next standard OC device per 240.4(D) applies

3. What is the category code that "Troffers" are Listed under?

Answer: (IEVV), Fluorescent Recessed Luminaires on page 147. By way of "troffers" located in the Index of UL Product Categories and Industry Terms on page C55.

4. I have a listed circuit breaker in a hotel in Ft Smith. The breaker does not have an interrupting rating marked on the breaker. The inspector accepted it but, my question is what is the interrupting rating of this breaker?

Answer: The rating of the breaker if not marked on the breaker is 5000 amps according to Article 240.83 (C). Also in UL White Book under CCN DIVQ . The electrical inspector does not have much to do in Ft Smith, it is questionable that the entire load for Ft Smith exceeds 5,000 amps.

5. An installation in a single family dwelling has PVC conduit installed between the main breaker and the panel. The owner has installed TC cable in this raceway. Can this be done? Where do I find this in the code?

Answer: Article 336.10 (3) permits TC cable in a raceway.

6. A solar photovoltaic array consists of eight modules connected in parallel. The common connecting point with overcurrent protection and blocking diodes is located on the backside of the array. The photovoltaic output circuit runs from the back of the array to a disconnect switch with overcurrent protection then underground to an adjacent building which houses the charge controller, batteries and inverter. The distance between the array and the separate building is small enough that there is no voltage drop concern. The nameplate rating of the 36 cell modules is: Open circuit voltage= 21.0 volts: short-circuit current= 7.22 amperes: operating voltage= 17.0 volts; operating current=6.74 amperes: and maximum power= 110 watts. The PV output circuit to the adjacent building is run underground and both the conductors and terminations have a 75 degree C rating. What are the minimum size copper conductors allowed by the NEC for this installation?

Answer:

Source circuit current $7.22a \times 1.25 = 9.03$ amperes (Sect. 690.8(A)(1))

Photovoltaic output circuit current 9.03 amperes $\times 8$ circuits = 72.2 amperes

Minimum conductor ampacity $72.2 \times 1.25 = 90.2$ Amperes (Sect. 690.8(B)(1))

ANSWER--- 3 AWG copper (Table 310.16)

7. Give the type number of a neon power supply that is a "Cord connected neon supply with enclosed output terminals or leads."

Answer: Type 8. See the Guide Information for Neon Transformers and Power Supplies (PWIK), page 249 in the White Book.

8. A display case is wired with flexible cord. It is on a 20 amp circuit. Can I use #14 SJ cord for this installation?

Answer: No #14 SJ cord cannot be used for this installation. Article 410.59 (A) requires cords to be hard-service type and have ampacity at least equal to the branch-circuit overcurrent device. Type SO, SE etc cords with at least 12 AWG conductors are required

9. A 3/4 –inch Rigid Metal Conduit passes from a Class 1, Division 1 hazardous location to an unclassified location. A sealing fitting listed for only a 25% fill is installed on the non-hazardous side of the boundary. What is the maximum number of size 10 AWG Type THHN copper conductors permitted in the fitting?

Answer:

Area of #10 AWG Type THHN conductors (Table 5) 0.0211 Sq. In.

Area of 3/4 inch Rigid Metal Conduit (Table 4) .549 Sq. In.

25% of cross-sectional area of the 3/4-inch RMC (.25 X .549 Sq. In.) 0.1373 Sq. In.

0.1373 Sq. In. / .0211 Sq. In. = 6.5 (wires)

10. An industrial machine has a full-load current rating of 42 amperes, 3-phase, 480-volts and the largest motor of the machine is 15 horsepower with a full-load current of 21 amperes. One additional motor has a full-load current rating of 11 amperes. The remainder of the load is 10 amperes of resistance heating. Copper conductors in conduit with overcurrent protection at the supply end of the conductor are properly sized for the machine. All conductor terminations are 75 degree C rated. What is the minimum size Type THWN conductors allowed for this machine?

Answer: Section 670.4(A), Table 430.250 & Table 310.16

Largest motor	21 amperes X 1.25=	26.25 Amperes
Other motors	11 Amperes X 1=	11.00 Amperes
Heater	10 Amperes X 1.25=	<u>12.50 Amperes</u>
Minimum Ampacity		49.75 Amperes

8 AWG Copper minimum

11. Can I use an un-insulated power distribution block in a metallic wireway with a screwed on cover?

Answer: No, the block must be insulated whether or not a cover is installed according to Article 376.56 (B)(4).

12. What is the service factor required to be marked on Fire Pump motors?

Answer: 1.15 or less. See product marking 15 in the Guide Information for Fire Pump Motors (QXZF) located on page 286 of the White Book.

13. I find it necessary to splice a conductor in a cable tray. The splice will extend above the rail of the cable tray. The cable tray is not subject to physical damage. Can I splice this cable as planned?

Answer: Yes, Article 392.8(A) allows such an installation.

14. Is an attachment plug required to have the manufacturer's name or mark on it? Or is it just required on the carton?

Answer: Yes, Article 406.6 requires attachment plugs and cord connectors to be marked with the manufacturer's name or identification.

15. What is the UL category code for products that can be installed to comply with 2008 NEC 708.14(4)?

Answer: (QVRG) Secondary Protectors for Communications Circuits, located on page 286 in the White Book. By way of the Index of product categories correlated to the 2008 NEC on page 430.

16. An inverter is used to convert DC to AC from a photovoltaic system. Is the inverter required to be listed and identified?

Answer: Yes, this is required by Article 690.4(D).

17. A duplex dwelling has separate meters and load centers for each dwelling. A breezeway separates the two dwellings. The breeze way has two luminaires. Can I feed one luminaire from each dwelling?

Answer: Article 210.25(B) stipulates that common area branch circuits cannot be supplied from equipment that supplies an individual dwelling unit.

18. A steel plate is used to protect electrical nonmetallic tubing traversing a stud. The plate is not listed. What is the minimum thickness of this plate?

Answer: Article 300.4(B)(2) requires a minimum of 1/16" thick.

19. What is the category code and page number in the White Book that covers Zip ties?

Answer: (ZODZ) Positioning Devices, page 392. This appears on page C58 of the Index of Product Categories and Industry Terms

20. A recessed luminaire has not metal exposed and is mounted 7' above a hot tub. Does this luminaire require GFCI protection?

Answer: Yes, Article 680.43(B) (1) (c) (1) requires such an installation to be GFCI protected.