

**Michigan Chapter IAEI
2014 Annual Meeting in Frankenmuth, Michigan
Code Panel Answers December 4th**

1. Article 810.58 refers to a 'protective' bonding conductor and an 'operating' bonding conductor?. What are they and what is the difference.

Answer: If we look at 810.58, it covers the requirements for Bonding and Grounding Electrode Conductors for Amateur and Citizen Band Transmitting and Receiving Stations. 810.58(A) requires compliance with 810.21 (A) – (K).

While the NEC does not define a protective or operating bonding conductor, if we look at the requirements in 810.58(B) and (C), we'll find that the sizing requirements for the protective bonding conductor to be more restrictive than for the operating bonding conductor. The protective bonding conductor must be sized at least as large as the lead in conductor, but not smaller than #10. Whereas the operating bonding conductor can be sized #14 or equivalent. Furthermore, equivalent could be a braid or strap.

The protective bonding conductor is what is run from the antenna to the grounding electrode connection. The operating bonding conductor is what is run between equipment. The difference between the two would be similar to the difference between a grounding electrode conductor and equipment bonding jumper in a power grounding system.

810.21(I) permits a single bonding conductor or grounding electrode conductor shall be permitted for both protective and operating purposes.

2. Is it allowed to use the grounding grid of a swimming pool's patio to be used as the grounding electrode system for a separate structure's pool equipment room?

Answer: No - 680.26 is establishing an equipotential bonding plane not grounding electrode system. The conductor min size in 680 is #8 Cu which is too small. NEC 250 grounding electrode systems have different requirements than 680.26

3. Is it permissible to use 240.4(b) and round up to the next standard size over current device on a feeder tap? Example; Can 23 feet of 500 kcmil, Type THHN/THWN copper conductors be tapped off of a 1200 ampere feeder and terminated on a 400 amperes main breaker in a subpanel?

Answer: No, see NEC 240.4(E)(3) which refers you to NEC 240.21 and 240.21(B) for feeder taps which states that "The provisions of 240.4(B) shall not be permitted for tap conductors."

4. In a small aircraft hangar where the aircraft has its fuel tanks in the wings, is it allowed to have electrical outlets on the side walls by the wings for servicing the aircraft?

Answer: Articles; 513.3 (C)(1), 513.4 (A), 513.10 (D), 501.140 (A) & (B), 501.145 (A) & (B). No. The 5' clearance requirements and the restrictions on the use of equipment in and around the Aircraft make installation of outlets highly unlikely.

5. Can PVC conduit be installed under the floor of a Commercial Garage (NEC 511) and if so are there any restrictions?

Answer: Yes, PVC Conduit are permitted to be installed under the floor of a commercial garage.

Article 511 went through some changes in the 2008 NEC that separated the commercial garages into two classifications. Major Repair Garage and a Minor Repair Garage. 511.2

Major Repair Garage. A building or portions of a building where major repairs, such as engine overhauls, painting, body and fender work, and repairs that require draining of the motor vehicle fuel tank are performed on motor vehicles, including associated floor space used for offices, parking, or showrooms. [30A: 3.3.12.1]

Minor Repair Garage. A building or portions of a building used for lubrication, inspection, and minor automotive maintenance work, such as engine tune-ups, replacement of parts, fluid changes (e.g., oil, antifreeze, transmission fluid, brake fluid, air-conditioning refrigerants), brake system repairs, tire rotation, and similar routine maintenance work, including associated floor space used for offices, parking, or showrooms. [30A: 3.3.12.2]

The main requirements will depend on the classification of the building. If it is a Class I location will need to comply with the requirements of Article 501. The question did not provide information necessary to provide a clear answer.

6. Can I bond the water line to a sub panel ground bar and not at the main panel if the incoming waterline is plastic and the house waterline is copper? If so, what size wire do I need to bond it with if I've fed the house with 4/0 aluminum?

Answer: NO per 250.104 Bonding of piping systems and exposed structural steel

Metal water piping shall be bonded as required in (A)(1), (A)(2) or (A)(3)

(A)(1) General

Metal water piping systems installed in or attached to a building shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size or to one or more grounding electrodes used. The Bonding jumper shall be size per Table 250.66

Per 250.66 the required bonding jumper would be #4 Cu or #2 AL

7. There is a residence that has a library 16' x 20' with book cases floor to ceiling along all 4 of the walls. Do I have to install floor boxes to meet wall space receptacle requirement of 210.52 or are no receptacles required?

2008 NEC: 210.52(A)(2) Wall Space. As used in this section, a wall space shall include the following:

(1) Any space 600 mm (2 ft) or more in width (including space measured around corners) and unbroken along the floor line by doorways, fireplaces, and similar openings

(2) The space occupied by fixed panels in exterior walls, excluding sliding panels

(3) The space afforded by fixed room dividers such as free-standing bar-type counters or railings

2011 NEC: 210.52(A)(2) list item (1) Any space 600 mm (2 ft) or more in width (including space measured around corners) and unbroken along the floor line by doorways **and similar openings**, fireplaces, and **fixed cabinets**

2014 – no changes.

Any wall space that is unbroken along the floor line by doorways, fireplaces, archways, and similar openings must be included in the measurement. The wall space may include two or more walls of a room (around corners).

Fixed room dividers, such as bar-type counters and railings, are required to be included in the 6-foot

measurement. Fixed glass panels in exterior walls are counted as wall space, and a floor-type receptacle close to the wall can be used to meet the required spacing. Isolated, individual wall spaces 2 feet or more in width, which are often used for small pieces of furniture on which a lamp or an appliance may be placed, are required to have a receptacle outlet to preclude the use of an extension cord to supply equipment in such an isolated space.

The word usable does not appear at all in 210.52(A)(2) as a condition for determining compliance with the receptacle-spacing requirements. As an example, to correctly determine the dimension of the wall line in a room, the wall space behind the swing of a door is included in the measurement. This does not mean that the receptacle outlet has to be located in that space, only that the space is included in the wall-line measurement.

The substantiation for the change to (A)(2)(1) is to deal with kitchen cabinets. Obviously, the Code doesn't expect a receptacle installed in front of lower kitchen cabinets to satisfy the wall space receptacles of this section. While this makes sense — and seems to be a clarification that's worth making — it also brings with it technical changes as well. For example, built-in bookcases often consume entire walls in dwelling unit libraries, studies, offices, and similar rooms. With this change, it seems receptacles are no longer required in such bookcases.

8. I have two islands in my house, one is for the kitchen and one is for my wet bar in another room. They both have a receptacle within 6' of the sink installed on the back side of the island. The inspector is requiring that the one for the wet bar be GFCI protected and not requiring that for the kitchen. Is that a proper interpretation of the 2011 NEC?

Answer: Yes - 210.8(A)

(6) Kitchens— where the receptacles are installed to serve the countertop surfaces

(7) Sinks — located in areas other than kitchens where receptacles are installed within 1.8 m (6 ft) of the outside edge of the sink

9. Conduits and their end fittings are installed at the bottom of an open-bottom switchboard. How far into the switchboard can these raceways extend?

Answer: See NEC 408.5 on Clearance for Conductor Entering Bus Enclosures which states that “The conduit or raceways, including their end fittings, shall not rise more than 3 inches above the bottom of the enclosure.

10. I am looking at a an assembly building that requires fire suppression. The water source is a well. Does the pump supplying the suppression system have to be listed and meet the requirements of Art 695?

Answer: Yes. **695.10 Listed Equipment.** Diesel engine fire pump controllers, electric fire pump controllers, electric motors, fire pump power transfer switches, foam pump controllers, and limited service controllers shall be listed for fire pump service.

NFPA 13: 24.2.1(2): A connection including a fire pump in accordance with [24.2.3](#)

24.2.3: A single automatically controlled fire pump installed in accordance with [NFPA 20](#) shall be an acceptable water supply source.

695.10...listing req. extracted directly from NFPA 20-13 Handbook:

Section [24.2](#) describes those sources of water that are acceptable for use as the permanent, automatic supply for the sprinkler system.

FAQ What are some additional types of water supplies?

Although not specifically mentioned, suction tanks (see [Exhibit 24.1](#)), embankment supported tanks, wells, and ponds could also be considered as water supply sources for automatic sprinkler systems. Along with the other water supply sources identified, the sources must be reliable and have enough

capacity to meet the sprinkler system demand at all times.

When water supplies other than circulating public waterworks systems are used, the proper installation of system components, such as piping, pumps, or tanks, should be verified. Even though private systems are designed to provide adequate water capacity, flow, and pressure, the reliability of these systems needs to be monitored through the implementation of a periodic inspection, testing, and maintenance program and through the proper supervision of certain system components. Public systems are tested and supervised continually by the daily demands placed on them. Private systems can remain idle for longer periods of time.

FAQ Can a fire pump be used to increase the capacity of a water supply?

It is important to understand that fire pumps cannot create water. Fire pumps can increase the pressure and resultant flow from an existing supply of water such as a waterworks system.

Listed fire pumps installed in accordance with [NFPA 20](#) and connected to a sufficient supply of water are an acceptable water supply source.

11. The interior of a panelboard got a little overspray from the drywall installation. How do we determine what to do with the panel interior?

Answer: The AHJ, Authority Having Jurisdiction will need to make that determination. It could involve replacing the equipment, Cleaning the equipment with appropriate cleaning agents. There may be applications where the manufacturer may need to be brought in to determine the possible damage.

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

Informational Note No. 1: See 300.6 for protection against corrosion.

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

110.12 (B) Integrity of Electrical Equipment and Connections. Internal parts of electrical equipment, including busbars, wiring terminals, insulators, and other surfaces, shall not be damaged or contaminated by foreign materials such as paint, plaster, cleaners, abrasives, or corrosive residues. There shall be no damaged parts that may adversely affect safe operation or mechanical strength of the equipment such as parts that are broken; bent; cut; or deteriorated by corrosion, chemical action, or overheating.

12. Should the lightning protection system ground terminals be bonded to the electrical grounding electrode system of a building?

Answer: Yes - 250.106 Lightning Protection Systems. The lightning protection system ground terminals shall be bonded to the building or structure grounding electrode system.

13. Can a grounding electrode conductor be run through the small ¼ inch hole in a service panel without being clamped?

Answer: Yes – 110.3(B) Furthermore, checking with some manufacturers, this ¼ hole is designed for this purpose.

14. If I have a installation that is 120v or 208v and use a reducing washer in a panelboard but do not remove all the rings. Am I now required to install a bonding bushing?

Alans Answer: Yes, you need a bonding bushing. This is a NEC 110.3(B) issue. Reducing washers are

Certified under Outlet Bushings and Fittings (QCRV), located on page 391 and 392 in the 2014 UL White Book. The Guide Information for QCRV under the Grounding heading, states Metal reducing washers are considered suitable for grounding for use in circuits over and under 250 V and where installed in accordance with ANSI/NFPA 70, "National Electrical Code." Reducing washers are intended for use with metal enclosures having a minimum thickness of 0.053 in. for non-service conductors only. Reducing washers may be installed in enclosures provided with concentric or eccentric knockouts, only after all of the concentric and eccentric rings have been removed. However, those enclosures containing concentric and eccentric knockouts that have been certified for bonding purposes may be used with reducing washers without all knockouts being removed.

15. Is it a violation to have open wire nuts in a non-plenum ceiling for class 2 & 3 wiring methods for signs & occupancy sensors.

Answer: I would say if the Class 2 or 3 wiring methods comply with NEC 725.130 and are fed from Class 2 or 3 power sources that comply with NEC 725.121, then per 725.3 it would not be a violation to have open wire nuts.

16. An overhead service is using the conduit as the support for the service drop from the utility. Where in the code are the requirements for the conduit to be a rigid metal conduit?

Answer: The Utility provider will have the requirements listed in their service installation information to address the use of 2" RMC that is mentioned in the question.

230.28 Service Masts as Supports. Where a service mast is used for the support of service-drop conductors, it shall be of adequate strength or be supported by braces or guys to withstand safely the strain imposed by the service drop.

Where raceway-type service masts are used, all raceway fittings shall be identified for use with service masts. Only power service-drop conductors shall be permitted to be attached to a service mast.

17. Can I leave two inches of NM sheathing inside a switch box ? If so where do I start measuring my six inches of free conductors from?

Answer: Previous codes have had the requirement of having six inches of free conductors in boxes to make splices, taps, and connections to devices, for a number of decades, in fact I found that it was in the 1947 NEC. The 1999 edition of the NEC was the first edition to spell out how to measure the six inches of free conductor.

Can I leave 2" of sheath in the box, yes, there is nothing that prohibits it. Still need 6" free conductor. Where do I measure the free conductor from? As it emerges from the sheath.

300.14 Length of Free Conductors at Outlets, Junctions, and Switch Points. At least 150 mm (6 in.) of free conductor, measured from the point in the box where it emerges from its raceway or cable sheath, shall be left at each outlet, junction, and switch point for splices or the connection of luminaires or devices. Where the opening to an outlet, junction, or switch point is less than 200 mm (8 in.) in any dimension, each conductor shall be long enough to extend at least 75 mm (3 in.) outside the opening.

18. When are fire pump supply conductors required to be protected by 2 inches of concrete ? Are there any alternatives?

Answer: See NFPA 780 695.6(A)(1) service conductors and on-site power production facilities, must be installed per 230.6 and 230.9

230.6 Conductors considered outside the building

1) where installed under not less than 2" of concrete

2) Encased in not less than 2" concrete

3) Installed in a vault

4) In conduit and buried not less than 18' of earth BENEATH a building or other structure
Where installed in outside service masts on the outside of the building

19. Can a single conductor be used to carry the neutral loads from an old panel (now gutted and used as a junction box) back to the originating panelboard ?

Answer: No **Article 100 Branch Circuit, Multiwire**. A branch circuit that consists of two or more ungrounded conductors that have a voltage between them, and a grounded conductor that has equal voltage between it and each ungrounded conductor of the circuit and that is connected to the neutral or grounded conductor of the system. See **210.4, 240.15(B)(1), and 300.13(B)** for specific information about multi-wire branch circuits.

20. The sprinkler code (NFPA 13) seems to prohibit using the underground fire suppression piping as a grounding electrode while the Electrical code seems to require it. Which rule do I follow?

Questions from the floor

Is it permissible to install optical fiber in the same raceway as power and light conductors?

Answer: Art 770 .133(A) Installation of Optical Fibers and Electrical Conductors

Where optical fibers are installed within the same composite cable, they shall be permitted to be installed only where the functions of the optical fibers and the electrical conductors are associated. Nonconductive optical fiber cables shall be permitted to occupy the same cable tray or raceway with conductors for electric light, power, Class 1 non-power limited fire alarm type ITC, or medium power network powered broadband circuits at 600 volts or less.

Conductive optical fiber shall not be permitted in the same application

Article 77 defines "conductive" and non-conductive" optical fiber. Conductive fibers have some metallic elements (shield, supports, etc.)

The Code Panel Questions and Answers will be posted on the
Chapter Website when available following the meeting.

<http://IAEI-Michigan.org>