

# International Association of Electrical Inspectors

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**The answers to these questions are the opinion of the person that answered the question. They are not the position of the IAEI, IAEI Western Section, NFPA or a code making panel.**

- 1) The contractor stubs up multiple spare  $\frac{3}{4}$ " EMT conduits out of the top of the panel to above the lay in tile ceiling. Is it required to seal these spare conduits? If so is fire caulk ok?

**Answer:** Unless the spare raceways are subjected to different temperatures, sealing will not be required. Once these are utilized, then sealing may be required using an approved material. Generally, raceways must be mechanically continuous however 300.12 Exception No.1 permits using short sections to support or protection of cable assemblies from physical damage. Sealing would be required per 300.7 if the raceway is subjected to different temperatures but the space above a lay in ceiling is typically used for environmental air so this section will likely not apply. In the future when the spare raceways will be used, the requirements in 312.5(C) Exception item (4) for cables may apply and require sealing but this would not apply to spare raceways.

- 2) We have a laundry room that has a dedicated 20a receptacle as required. The contractor installs an additional 20a receptacle but this receptacle circuit leaves the room for additional receptacles. Is this a violation?

**Answer:** The question is not clear. NEC 210.11(C)(2) requires that the “laundry” circuit be 20 amperes and serve only the laundry receptacles. The question alludes to a receptacle, not a circuit. Section 210.52(F) requires for laundry areas in dwelling units that at least one receptacle outlet shall be installed in areas designated for the installation of laundry equipment. If the contractor added an additional circuit to the area and then left the area without modifying the original “Laundry” circuit, i.e., serving the laundry equipment, there is no violation of the Code.

3) Is it a violation to have a switch box with a 12-3 MC cable black, red & white and re-identify the black & red to 277v colors and leave the white for the neutral?

**Answer:** Depends

No. If you only have one system voltage present in a building or structure.

Yes. If you have two system voltages in a building, and the 277 volt system is identified gray.

Also, assuming the 277 volt system is identified gray, if you have two different voltages (systems) in a raceway, cable or box, then the identification of the grounded (neutral) conductors must distinguish each system.

References: NEC 200.6 and 210.5(C)

4) Is it legal to come off a 277v light pole branch circuit set a small step-down transformer 277/120v for a 120v receptacle?

**Answer:** This proposed installation seems odd but I am not aware of anything that would prohibit it, with the following concerns addressed: 240.21(C) allows the transformer primary overcurrent device to serve as protection for the secondary conductors when only a single voltage is derived. And if the primary side overcurrent device is not more than 125% of the maximum rated input current of the transformer. The transformer must have a disconnecting means insight of the transformer or be marked with the location of the remote disconnecting means and the overcurrent device must be capable of being locked in the open position. 430.14.

If the secondary conductors terminate at a panelboard then feed the receptacle the 408.36 rules apply. Yes, as long as other code requirements are complied with.

5) We are seeing UL listed air conditioner disconnects with a 20a receptacle. Is it a violation to have a 15a circuit supplying this?

**Answer:** Yes, if the receptacle is rated at 20 amperes, then the circuit supplying this 20 ampere receptacle must be rated at 20 amps. Code Ref: NEC 210.21(B)(3) & Table 210.21(B)(3)

6) We have many multifamily buildings with garages on the lower level (slab on grade) is their 0” depth since its under a building or 24” since its under a parking lot that’s under the building?

**Answer:** A parking lot as defined in Wikipedia is “A parking lot or car park, also known as a car lot, is a cleared area that is intended for parking vehicles. Usually, the term refers to a dedicated area

that has been provided with a durable or semi-durable surface” Also, there is rarely any type of structure above a parking “lot”, - with a structure above, it would be considered as a “parking garage” which can be a stand-alone structure, or as a part of a building (offices above, parking below). The NEC relies on common usage of terms when a term is not defined. Therefore, the space under the multifamily units would not be considered as a parking lot, rather It would be considered as part of the building.

If the wiring is in a slab, it is not buried, and Table 300.5 would not apply.

Assuming the wiring method is buried below the slab, the next question is what type of wiring method is being used?

A direct buried cable is not allowed under a building unless it is installed in a raceway or is type MI or MC cable suitable for direct burial. Using any other wiring method, the “burial depth” is 0, because they are “under the building” regardless of the size of the slab.

The 6” rule for RMC and IMC would apply to those areas under 2” of concrete but not under the building, ie sidewalks, patios, and similar, the 4” rule would apply for IMC and RMC where the concrete is 4” thick.

7) Is it required to install an electrode for a buck boost transformer, 208v to 240v?

**Answer:** No, Buck- Boost transformers are wired as an auto transformer which will have a connection from the primary winding to the secondary winding, not meeting the definition of a separately derived system which 250.30 would require a grounding electrode

8) Does NEC 695 apply to “ fire pumps “ in assisted living facility where there is only 20 people?

**Answer:** Yes, Article 695 applies to any fire pump installation even if the facility is not required to install a fire pump but chooses to include one. Note that Article 695 fire pump systems commonly are supplied by a utility service and On-site standby generator to comply with the reliability provisions. This wording “standby generator” is intentional to not imply that all fire pump systems are legally required or emergency standby systems.

9) A 100a X-ray machine is wired with 1 1/4” metallic sealtight does this raceway meet the requirements of 517.13?

**Answer:** No. NEC 250.118(6) LFMC is limited to 60A when used as an equipment grounding conductor without flexibility required.

10) J-boxes over 6’ in any dimension require racking the wire. Can Unistrut and tie wraps be used? Is there any direction on how to do it?

**Answer:** Yes and No.

In pull boxes or junction boxes having any dimension over 1.8 m (6 ft), all conductors shall be cabled or racked up in an approved manner.

Unistrut and cable ties would be allowed if installed in an “approved manner”. It appears that nothing prevents the use of cable ties to secure conductors under the manufacturer's certification, so the use of cable ties would be acceptable.

Other options would include the use of a composite (dielectric) strut material with listed supports identified for the purpose or an insulated cable block using an approved dielectric to secure the conductors.

\*\*At the end of the day, the AHJ has final approval for each unique installation.

Reference: NEC 314.28(B)

- 11) Can you legally install a 20 amp circuit with #12 wire feeding a detached garage and install the 30amp disconnect that's required?

**Answer:** The first part of the question is easy can you install a 20 amp branch circuit using 12 AWG to feed a detached garage. Yes, of course. The rest of the question had me wondering what the real question is. Is it, can a 30 disconnect be used? Or does it require a 30 amp disconnect? The disconnect requirement is in Section 225.31, the location of the disconnect in Section 225.32 and the rating of the disconnect in Section 225.39.

225.39(A) One-Circuit Installation. For installations to supply only limited loads of a single branch circuit, the branch circuit disconnecting means shall have a rating of not less than 15 amperes.

Yes, it is legal to install a 20 amp branch circuit using 12 AWG conductors to feed a detached garage and have a 30 amp disconnect. Sections 225.39(A).

- 12) We have a nursing care building with 50 rooms that each need 1-24v light. There is only 277v in the ceiling, We installed a small 500w step down transformer 277v – 24v, the inspector is requiring an electrode at each transformer. Is he on the medical marijuana?

**Answer:** Typically the answer will be NO. See explanation below.

Grounding of this transformer is not required if this lighting system is covered by Article 411. 411.6(A) states that the secondary of the low voltage lighting shall not be grounded. 411.6(B) requires an isolating type transformer be used for this installation. If low voltage lighting is not covered by 411, then NEC 250.20(A)(1) requires the secondary side of this transformer is required to be grounded based on the fact the primary voltage exceeds 150 volts to ground. NEC 250.30(A)(5) would not require the transformer to be connected to a grounding electrode conductor if the secondary system supplies a Class 1, 2, 3 circuit, and is 1000 va or less.

- 13) What are the types of approved solutions in connecting CU to AL wires

**Answer:** There are many different types of listed wire pressure connectors or twistors on the market today that are suitable for connecting CU and AL. A simple google search brings up splicers such as:

Amp Copalum compression connectors, Ideal purple twistors, WEGO, KING,

Split bolts with the spacers between the conductors  
Butt connectors with the holes on both ends (so that the wires do not touch)  
Check to make sure they are listed and suitable for copper and aluminum

14) Can a PVC floor junction box be used in a patient care circuit?

**Answer:** No, if it is a branch circuit. NEC 517.13 (A) Requires a metal raceway system that qualifies as an equipment grounding conductor and (B) which requires an insulated EGC to be bonded to a "metal enclosure". 517.31 also states that PVC cannot be used for branch circuits that supply patient care areas. Yes, if it is a feeder.

15) In NEC 110.9, what is an example of "other than fault levels"?

**Answer:** The second paragraph was added in the 1978 edition of the NEC with the following supporting comment. SUPPORTING COMMENT: The concept of "at fault levels" removes from this consideration simple disconnect switches which may break charging or magnetizing current. "System" voltage may be different from "employed." "Available current" is a more adequate definition than "that must be interrupted." The difference between a fault interrupter and a simple disconnect switch needs bringing out in this section.

One example would be a disconnect that does not include overcurrent protection such as an isolation switch, molded case switch, or non-fused safety switch.

16) Is a fused disconnect on an Air conditioner unit considered "supplementary overcurrent"?

**Answer:** NEC. Art. 100 definition of Branch Circuit- The circuit conductors between the final overcurrent device protecting the circuit and the outlets.

No. If the fuse is a Listed fuse, it is the final overcurrent device making it a branch circuit from that point to the equipment. If the fuse is a recognized component fuse with a backwards UR symbol, then it is supplemental over current device, not a branch circuit. Recognized component fuses are not suitable for branch circuit protection.

17) As I understand it stainless steel raceways may only be used with stainless steel fittings, boxes enclosures etc. Does this mean that stainless steel NEMA 4 enclosures may also only be used with stainless steel raceways?

**Answer:** Depends.

Based on the answer from last year's WS questions (#6) the answer would be yes and by the literal reading of the 2017 NEC, one could assume that would be the case. However, FR7986 (2020 NEC) and the CMP comment, clarifies that it would only be required where they are subject to severe corrosive influences.

References: NEC 342.14, 344.14 and 358.14

18) Meeting rooms, we have 3 receptacles in the ceiling for projectors, can these count as the required amount of receptacles required for wall space?

**Answer:** The 2017 edition added a new section for meeting room receptacle requirements in Section 210.71.

The answer is no Sections 210.71(B) and 210.52(4)

210.71 Meeting Rooms.

(A) General. Each meeting room of not more than 93 m<sup>2</sup> (1000 ft<sup>2</sup>) in other than dwelling units shall have outlets for nonlocking-type, 125-volt, 15- or 20-ampere receptacles. The outlets shall be installed in accordance with 210.71(B). Where a room or space is provided with movable partition(s), each room size shall be determined with the partition in the position that results in the smallest size meeting room.

(B) Receptacle Outlets Required. The total number of receptacle outlets, including floor outlets and receptacle outlets in fixed furniture, shall not be less than as determined in (1) and (2). These receptacle outlets shall be permitted to be located as determined by the designer or building owner.

(1) Receptacle Outlets in Fixed Walls. Receptacle outlets shall be installed in accordance with 210.52(A)(1) through (A)(4).

(2) Floor Receptacle Outlets. A meeting room that is at least 3.7 m (12 ft) wide and that has a floor area of at least 20 m<sup>2</sup> (215 ft<sup>2</sup>) shall have at least one receptacle outlet located in the floor at a distance not less than 1.8 m (6 ft) from any fixed wall for each 20 m<sup>2</sup> (215 ft<sup>2</sup>) or major portion of floor space.

A receptacle located above 5 1/2' feet above the floor would not be counted from 210.52(4).

19) In NEC 406.12, Tamper-Resistant Receptacles now require that all 250-volt non-locking-type of receptacles in 7 types of occupancies be listed as tamper-resistant. It is my understanding that there are no manufactures making them. How are we as inspectors going to enforce this code requirement?

**Answer:** Typically if the product is not available or not yet being Manufactured, then the AHJ will typically not require until the product is available. After checking with 3 major device Manufacturers, it appears this product is not yet being manufactured.

20) A water pump is also being used for fire mitigation. Is it required to install a breaker remote from the main panel?

**Answer:** Both 225.34(A) and 230.71(A) exception use the term "shall be permitted" to allow the breaker to be remote but it is not required to be remote when it is one of the 6 disconnects allowed. (max of 6). If it is an additional disconnecting means (making the count more than 6) it must be remote and be for 695, 700, 701. Or 702 systems per 225.34(B) or 230.72(B)

21) Is it required to have a bonding bushing in a 208v disconnect when a reducing washer is used and all of the rings were not removed? If so what if MC is the wiring method

**Answer:** Yes, a bonding bushing would be required, metal reducing washers are suitable for grounding for both 120/208v & 277/480v on the load side of the service equipment. However, UI 514(A) does require that all concentric rings be removed to meet the standard. Using MC should require a fitting with a locknut for a bonding bushing

22) Do 50a 3 phase receptacles in a commercial building repair garage require GFCI protection even though they are not listed as required in article 511

**Answer:** Based on the NEC organization where Chapters 1 – 4 apply unless modified by Chapters 5 -7, the requirements in 210.8(B)(8) would require GFCI for this installation.

23) Is it required to install a grounding electrode in a operating rooms isolated transformer or the 120v panel?

**Answer:** No. NEC 517.61 and 517.160(A)(2) prohibit the system grounding of an isolated power system transformer in the stated application as well as in NEC 250.22(2). The only grounding electrode application may be a direct connection to a reference grounding terminal bar located in the operating room, but generally all grounding of equipment is accomplished by the equipment grounding conductors and added bonding conductors provided in the general Code requirements and supplemented in Article 517.

24) In a hospital, is it required to bond the 277v panel for the lighting with a #10 to the panels that supply the 120v power for the head wall receptacles

**Answer:** Yes.

**517.14 Panelboard Bonding.** The equipment grounding terminal buses of the normal and essential branch-circuit panelboards serving the same individual patient care vicinity shall be connected together with an insulated continuous copper conductor not smaller than 10 AWG..... 517.18 & 517.19 (Category 1 and 2 areas) Requires two branch circuits to be supplied from both the critical and normal systems.

References: 514.2 (Definition of Patient Care Vicinity) and 514.14

25) Lashing wires to upgrade the SCCR to 65k in a buss gutter, is there any requirement on what type of rope to use and how to wrap the rope?

**Answer:** In the 2017 National Electrical Code lashing only appears once in Article 396, Messenger-Supported Wiring in the definition in 396.2. This would be to wrap wiring around a messenger wire. The question is regarding lashing in a buss gutter due to an increase in SCCR. Lashing does

not have a specific code section requirement. The installation instructions would make it a requirement from 110.3(B).

Eaton has a nice paper on lashing.

Q: Why is cable lashing required?

A: During a fault, the high magnitude of current in each phase creates strong magnetic fields that result in rapid attraction and repulsion of the conductors. The magnetic forces cause the cables to whip back and forth, which can damage the switchgear and the cables. Cable lashing is used to stabilize phase cables during a fault to reduce cable movement and prevent damage to the switchgear and cables.

Q: When is cable lashing required?

A: The lashing of cables is required for the following conditions:

- All 800 A frame breakers
- All breaker frames with short-circuit ratings above 65 kA
- When lugs described below are not used

Lashing can be completed with rope, lashing devices and cleats to stabilize the conductors during a fault condition.

The requirement for the installation of lashing for a bus gutter would apply if required in the installation instructions. 110.3(B)

26) Does the 240 receptacle outlet on the Electric Range need to be GFCI protected if it is within 6 foot of a sink?

**Answer:** NO, if located within a dwelling unit, NEC 210.8(A)(6) would be applicable in this installation if located within a dwelling unit and only 125 volt, 15 and 20 amp receptacles are required to be GFCI protected. The answer will be yes if located within a kitchen in other than a dwelling unit. NEC 210.8(B) & 210.8(B)(2) requires all single phase receptacles rated 150 to ground or less, 50 amperes or less be GFCI protected, therefore this 240 volt receptacle will need to be GFCI protected if located in a commercial kitchen.

27) I understand that the 2017 NEC is going to allow type TC cable for interior wiring. We have seen people try to use this cable as they would NM cable for mini splits and things like that. Will this be a straight up substitution for NM in the 2017 code?

**Answer:** It is permitted if it is marked JP in one and two-family dwellings. It is then treated as if it is Type NM cable for all the uses permitted, not permitted, installation rules and applying the adjustment and correction factors required in 334.80. (meaning use the 60 degree ampacity, & if run through holes of wood framing without spacing and that is sealed (caulk, foam, insulation and no allowance for the 10'/10% exception) it needs to have the corrections and adjustment factors applied. There is an exception for wiring from a generator that has 75-degree rated terminals that says the provisions of 334.80 do not apply.



28) When using current limiting fuses to reduce fault current below the SCCR of a industrial control panel, can the engineer use RMS values or is it required to use Peak-let through values which is 2.3 times RMS?

**Answer:** The NEC has an informational note in 409.1 & 409.110 (industrial Controllers) that references UL 508A (SB4) that does use “peak Let-through values or the Up & Over method versus RMS or Up, over & down method. This is often problematic in trying to get the AIC below the standard 5ksccr on most HVAC equipment

29) NEC 410.117 requires the j-box for the fixture whip be a minimum of 1' from a 2'X4" light fixture. If we change the fixture whip to #12 MC cable is this now compliant?

30) I understand that I may use an arc-fault type of receptacle with not more than 75' of 12awg nm cable to the AFCI receptacle to provide the protection required by section 210.12. It appears that a special breaker is required for this application. What is this breaker? Also, may I pass through switches etc on the way to the receptacle as long as I am under 75' on the cable run?

**Answer:** Limiting the conductor length is only applicable to the protection methods in 210.12(A)(3) and (A)(4). You cannot pass the conductors through switches etc. (A)(3) limits 12 AWG to 70 ft. as well as requiring the use of a Listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a Listed outlet branch circuit type AFCI that is installed at the first outlet box. There are no Listed supplemental arc protection circuit breakers. (A)(4) addresses a Listed outlet branch circuit AFCI (receptacle) installed at the first outlet on the branch circuit, it requires it to be continuous and a maximum of 70 feet 12AWG to that first outlet when the Listed branch circuit over current device and the Listed outlet branch circuit AFCI (receptacle) are identified as Listed system combination. System combination AFCI's are Listed under the product category System Combination Type Arc Fault Circuit Protection (AWDT). They are required to be identified as system combination devices and are required to be packaged together, so that you get the circuit breaker and the outlet branch circuit receptacle in the same package. You can find the UL guide information and Listings for this product category on UL Product Spec by going to [www.ul.com/productspec](http://www.ul.com/productspec) and enter AWDT at the category code search.

31) A Utility metered/breaker pedestal has (2)-200A breakers installed in it. Two sets of 250URD + 1/0Al EGC 's to the building where the two sets terminate into a single 400A main breaker. Seems like an atypical installation, but is it compliant?

**Answer:** No.

**225.30 Number of Supplies.** A building or other structure that is served by a branch circuit or feeder on the load side of a service disconnecting means shall be supplied by only one feeder or branch circuit unless permitted in 225.30(A) through (E). For the purpose of this section, a multi-wire branch circuit shall be considered a single circuit.

Reference: 225.30

32) Is it a NEC violation to have MC sheath touching copper tubing?

**Answer:** Article 330 for MC Cable has no prohibition on MC Cable sheath touching a copper tubing. The 3xx.14 sections of the Chapter Three wiring method articles addresses dissimilar metals, and the .14 section is not addressed in Article 330. 330.12 addresses uses not permitted and it is not addressed there either. Is it a good idea for those two metal not to touch? yes. Is it a code violation for MC Cable sheath touching copper tubing, No.

33) Does Low-Voltage power over Ethernet lighting system in a suspended ceiling have to be installed by an electrician? There is emergency lighting in this system.

**Answer:** Depends!!!! Check with your local AHJ or State licensing requirements. In Wisconsin, State Statue 101.862(4) licensed persons are not required when installing wiring which is 100 volts or less. Other States or Municipalities will have different requirements based on their Ordinances or State Laws.

34) Can the receptacle on the front porch that has 3 steps of a single family dwelling also be the receptacle for the front of the house

**Answer:** 210.52(E)(1) requires that there must be at least one receptacle outlet that is readily accessible from grade, and not more than 6'6" above grade level and installed in the front and back of the dwelling 210.52(E)(3) requires at least one receptacle to be readily accessible from the porch, balcony or deck, and not more than 6'6" above the walking surface. Those are not mutually exclusive, in other words one receptacle might fulfill both requirements depending on where grade is, and where the receptacle is placed.

In some cases, the porch may be low enough that a receptacle on the porch is less than 6'6" above grade, but in other cases it may end up being higher than 6'6" above grade. In the first case a receptacle that is mounted just to the left or right of the porch would be less than the max height allowed AND be readily accessible from the porch.

(E) Outdoor Outlets. Outdoor receptacle outlets shall be installed in accordance with 210.52(E)(1) through (E)(3).

Informational Note: See 210.8(A)(3).

(1) One-Family and Two-Family Dwellings. For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet readily accessible from grade and not more than 2.0 m (6 1/2 ft) above grade level shall be installed at the front and back of the dwelling.

(2) Multifamily Dwellings. For each dwelling unit of a multifamily dwelling where the dwelling unit is located at grade level and provided with individual exterior entrance/egress, at least one receptacle outlet readily accessible from grade and not more than 2.0 m (6 1/2 ft) above grade level shall be installed.

(3) Balconies, Decks, and Porches. Balconies, decks, and porches that are attached to the dwelling unit and are accessible from inside the dwelling unit shall have at least one receptacle outlet accessible from the balcony, deck, or porch. The receptacle outlet shall not be located more than 2.0 m (6 1/2 ft) above the balcony, deck, or porch walking surface.

35) Can the 10v dimming wire be installed in the same raceway as line voltage for the light?

**Answer:** Yes, only if NEC 725.130(A) ex #2 is followed which allows a class 2 circuit to be reclassified to a class 1 circuit if all the class 2 markings are eliminated.

36) Residential generators for a dwelling are considered optional, should the generator backed up sub panel be installed remote from the normal power panel?

**Answer:** 702.5 refers to article 705.

704.31 Overcurrent protection for electric power production source conductors connected to the supply side of the service disconnecting means in accordance with 705.12(A). shall be located within 3M (10 ft) of the point where the electric power production source conductors are connected to the service.

37) I have seen installers cut some of the grates at the bottom of the transformer and stub up PVC conduits in this area, is this legal?

**Answer: No.** NEC 450.9 and Manufacturer's Instructions

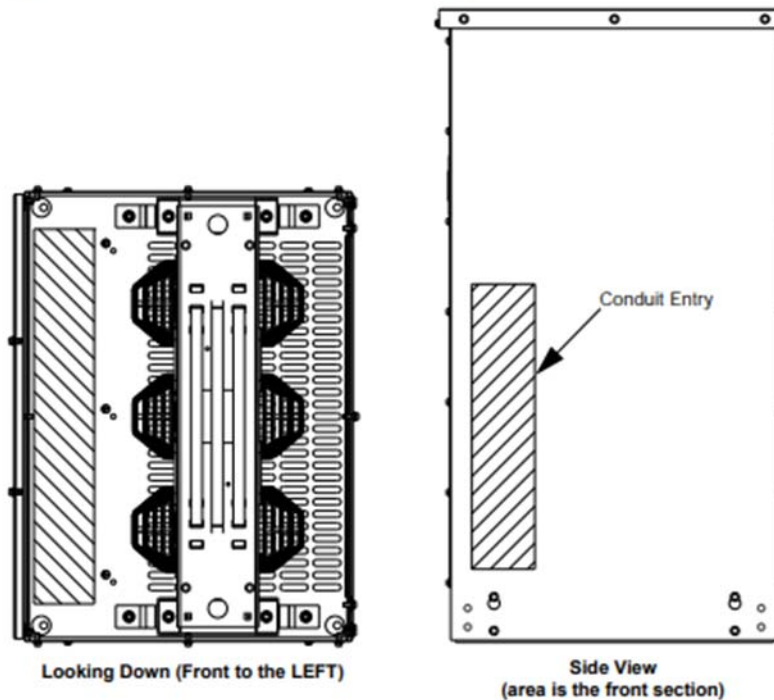
Most transformers require that the raceways be brought into the transformer case within a certain area. This is usually the lower half of the transformer case. Look for manufactures information instructions for the transformer that alert the installer to the proper wiring method locations into the transformer enclosure. Schneider Electric (Dry Type Transformers- 1000 Volts and Below, Section 4- Installation) has language that informs the installer to ensure adequate ventilation since it is essential to properly cool ventilated transformers. Refer to NEC 450.9. Obstructing the grates intended for cooling purposes with stubbed up PVC raceways seems to be interfering with the cooling of the transformer.

Schneider Electric (Dry Type Transformers- Making Electrical Connections) instructs the installer to ensure that raceways, conduits and connectors enter the enclosure only in an area

shown on the drawing for that particular transformer. Access points for each enclosure style are listed below:

- Enclosure Style D: (See Figure 28)
- Front section of the transformer
- Side and bottom access

**Figure 28: Access Point: Enclosure Styles D, E, H and K**



38) Is it NEC compliant to use SO cord in a gymnasium (place of assembly) to wire the collapsing bleachers?

**Answer:** Maybe. I would start by looking at the installation instructions. For a listed assembly, which hopefully we're talking about, these instructions provide valuable guidance for the installer. If the flexible cord is provided with the unit, follow the installation instructions explicitly. If not, NEC Section 400.10(9) permits the use of flexible cord for connecting moving parts. But remember 400.12(1); the cord cannot be used in lieu of permanent wiring. This would not be a suitable method for providing power to the controller but could possibly be utilized for connecting moveable parts.

39) Separate structures require a grounding electrode. Since this conductor does not go to the grounded conductor is it legal to simply install a lug in the panel and use the panel as a conductor to the ground bar?

**Answer:** NEC 250.8(A) 1 thru 8. NEC 250.32

Yes, We start at Article 250.8 where it states the permitted methods of connecting grounding electrode conductors, equipment grounding conductors and bonding jumpers, and in A5 & 6 it allows machine thread screws that engage at least 2 threads to the enclosure and machine screw-type with 2 threads or use a nut. So using the correct machine thread type with a listed lug would be allowed.

40) We have concrete walls within 5' of a hot tub, is it required to somehow bond these walls?

**Answer:** References: 680.42(B) or 680.43 Exception No. 2 and 680.26(B)(2). The bonding requirements as referenced these sections apply to "perimeter surfaces" perimeter surfaces typically apply to paved and unpaved surfaces, such as a lawn surrounding a permanently installed pool.

41) Utility company specifies at least 12' of flexible raceway with a minimum of #6 wire for a all in one construction meter. Is the raceway and conductors in the 12' flexible raceway under the purview of the AHJ?

**Answer:** It depends on where the electric utility sets the service point. The term "Service Point" is defined in the NEC Article 100 as,

"Service Point. The point of connection between the facilities of the serving utility and the premises wiring. (CMP-4)

Informational Note: The service point can be described as the point of demarcation between where the serving utility ends and the premises wiring begins. The serving utility generally specifies the location of the service point based on the conditions of service."

Often, the electric utility will provide specifications and drawings that regulate various conditions that must be met for the installations of a service. Sometimes the utility will supply some or all the temporary construction service. In other locations, the utility specifies raceway, equipment or conductors.

Comply! Theirs is the only game in town!

42) Is it also required to identify the switch leg the same color as the hot when there is 2 voltages in a building?

**Answer:** Yes, NEC Section 210.5(C)(1)

**Branch Circuits Supplied from More than One Nominal Voltage System.** Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit shall be identified by phase or line and system at all termination, connection, and splice points in compliance with 210.5(C)(1)(a) and (b)

- (a) *Means of Identification.* The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means.
- (b) *Posting of Identification Means.* The method utilized for conductors originating within each branch circuit panelboard or similar branch circuit distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each branch circuit panelboard or similar branch circuit distribution equipment. The label shall be of sufficient durability to withstand the environment involved and shall not be handwritten.
- 43) Dimming switches have both line voltage and 10v dimming wire. Is separation required in these boxes as required by NEC 725?

**Answer:** 725.136 (B) Class 2 and 3 circuits shall be permitted to be installed together with the conductors of electric light, power, class 1, non-power-limited fire alarm and medium power network-powered broadband communication circuits where they are separated by a barrier.

- 44) CRAC units on stands for future raised floor now make the disconnect and controller at 7'4" is a platform required or is it now the same as a heater above a ceiling?

**Answer:** Original Question: CRAC units on stands for future raised floor now make the disconnect and controller at 7'4" is a platform required or is it now the same as a heater above a ceiling?

Answer: No (AHJ determination)

Article 100- Accessible (Readily), Article 100- Authority Having Jurisdiction, NEC 240.24, NEC 404.8(A) Exception No. 2, NEC 440.14, NEC 645.10

Here is an example of using terminology and assuming others know what you know. I took the liberty to rewrite this question so that it makes sense to the attendee. A computer room air conditioning (CRAC) unit is a device that monitors and maintains the temperature, air distribution and humidity in a network room or data center. CRAC units are replacing air-conditioning units that were used in the past to cool data centers.

Looking at the various NEC references it appears that 404.8(A) Exception 2 will allow the disconnect switch to be located at a height higher than 2.0 m (6 ft 7 in.) and to be accessible by portable means. Switches and circuit breakers installed adjacent to motors, appliances, or other equipment that they supply shall be permitted to be located higher than 2.0 m (6 ft 7 in.) and to be accessible by portable means.

If we assume this is an Information Technology Room, the NEC language at 645.10 Disconnecting Means tells us that an approved means shall be provided to disconnect power to all dedicated HVAC systems serving the room or designated zones. Who does approving? The authority having jurisdiction (AHJ). See Article 100 for definition of the AHJ. It is best to contact the local authority having jurisdiction (AHJ) for their input.

- 45) I recently inspected a barn type horse stable, are the receptacles in the tack room and all other receptacles required to be GFCI protected?

**Answer:** Not necessarily in the tack room, unless on residential property and your “barn” qualifies (associated with a dwelling unit on residential property) as a residential accessory building covered by 210.8(A)(2). In that case, all receptacles must be protected. However, if Article 547 is applicable, per the scope in 547.1(A) or (B), the only the areas specified in 547.5(G)1-4 would need GFCI protection.

46) A hot tub is installed on a concrete slab adjacent to a wood privacy fence with metal support poles. Are the poles required to be bonded?

**Answer:** NEC 680.42 & 680.26(B)7

Depends, Part IV Spas & Hot Tubs reference at 680.42 Outdoor to use Part I & II, and in 680.26(B)(7) it requires fixed metal parts such as fences be bonded, but if separated by a permanent barrier that prevents contact, or over 5' horizontal from inside walls, or over 12' vertically from the water line, bonding is **not** required. NEC 680.42 & 680.26(B)7

47) 240.87 requires arc flash reduction, the installer had them retrofitted and installed them at the top of the gear at 8' is this a violation

**Answer:** References: 240.87, 240.24(A). There are (7) seven options to satisfy the requirements of 240.87. If one of those methods used incorporated a breaker, compliance of 240.24(A), max. 6'7" would need to be complied with therefore a violation. Although the question seems to only be related to height requirements there may be additional concerns such as 110.3 in regard to retrofitting.

48) Is it compliant with 110.26 to have 4-4" 480v power conduits 3' above a 208v sub panel.

**Answer:** Yes, because it is not considered “other equipment foreign to the electrical installation.” Section 110.26(E)(1)(a) reads,

(a) Dedicated Electrical Space. The space equal to the width and depth of the equipment and extending from the floor to a height of 1.8 m (6 ft) above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this In NEC Section 240.15(B)(2) it states:

“In grounded systems, individual single-pole circuit breakers rated 120/240 volts ac, with identified handle ties, shall be permitted as the protection for each ungrounded conductor for line-to-line connected loads for single-phase circuits.”

So provided that the manufacturer of a 120/240 volts ac rated 4-pole circuit breaker identifies a handle tie, you could connect the outer poles with an identified handle tie to protect 240 volt line-to-line loads. Additionally;

(a) UL 489 also covers 4 pole circuit breakers for use with 3-phase circuits where a switched neutral is required. The fourth pole in these types of circuit breakers is intended to provide a

switched neutral connection and are marked as such. These types of circuit breakers are not suitable for connecting a 240 volt line-to-line load on the outside two poles.

(b) Lastly, UL 489 also covers 4 pole circuit breakers intended for DC applications where one or more poles are intended to be connected in series. These types of circuit breakers are provided with specific instructions and/or connection diagrams detailing their use, and are not suitable for connecting a 240 volt line-to-line load on the outside two poles.

49) Can two outside breakers of adjacent four pole, common trip, breakers be utilized as a common trip breaker, for 240 volt loads, if they are tied with an approved handle tie?

**Answer:** The answer is dependent on the type of 4 pole circuit breaker.

UL 489 The Standard for Safety for Molded-Case Circuit Breakers permits separately operable single pole breakers to be built with a common housing. When so constructed each pole shall be treated as individual circuit breakers.

50) Can a wall below a heating unit in a suspended ceiling space be located in the lower (below ceiling) working clearances per 110.26(A)(4)?

**Answer:** I would say yes. As long that there is an opening no smaller than 22 X 22 inches. The code does not specify that the opening is below the heater. If the heater has hinged doors or panels it shall be capable of opening a minimum of 90 degrees.

51) Standard MC Cable with stab in connectors at 277v in a 8" x 8" jbox with concentric knockouts. Is it required to replace the fitting with threads and install bonding bushings? Even though the sheathing is not considered a EGC

**Answer:** Original questions: Standard MC cable with stab in connectors at 277v in a 8" x 8" jbox with concentric knockouts. Is it required to replace the fitting with threads and install bonding bushings? Even though the sheathing is not considered a EGC

Answer: No. UL Metal-Clad Cable Connectors, Type MC (PJOX), UL 514B, NEC 250.97 and 250.92(B)

52) Article 517.19.c says hospital surgical rooms need 36 receptacles how many circuits are needed?

**Answer:** At minimum, two circuits are required. At least 12 shall be connected to the normal system branch circuit, with as many as 24 being permissible. The remainder shall be connected to the Critical Branch supplied from a different transfer switch than that supplying the normal system. As indicated in the 2017 NEC Handbook commentary following 517.19, the minimum two circuits required may also be supplied solely from the Critical Branch, provided they are supplied from two different transfer switches.



Remember, “receptacle” as used here, is referring to a single contact device, therefore 36 “receptacles” is the equivalent of 18 duplex devices. Of that number, at least one third, or six duplexes, must be connected to each branch circuit. I believe a prudent design would include more circuits supplied from both systems, such as 2 normal and 2 critical. The intent is to minimize any possibility of a simultaneous outage.

53) Why is it not a shock hazard if we have a metallic rigid 90 that goes back to PVC that has 2” of concrete above it? But it’s required to be 18” below earth? Is concrete and perhaps wet concrete a new type of insulation?

**Answer:** NEC 250.80 Exception & 250.86 Exception 3

The Answer can be found in Article 250 Bonding/Grounding where in 250.80 for ‘Services’ and 250.86 for ‘Other Than Service’, which allows a metal elbow [components] in a run of underground non-metallic raceway to **not** be bonded if isolated from possible contact by cover of at least 18”. ‘Other Than Service’ also allows **not** bonding if encased in 2” of concrete. Note that the concrete encasement isolates the contact enough to satisfy the code in Non-service only, and that measurement for both installations is 18” to the closest metal portion of the metal elbow [component], so the actual burial depth of the raceway will be more than 18”.

54) Table 230.51(C): Required support intervals for Individual Open Service Conductors. What is the difference between the first two rows? Both are under 1000V, but support requirements are very different.

**Answer:** Reference: Table 230.51(C). The difference is based on the permitted “Maximum Distance Between Supports” either 9 ft. or 15 ft. The distance between supports naturally effects the sag in conductors, the longer the span the more sag. Therefore, the minimum clearance “Between Conductors” changes accordingly.

55) Does a 480 Volt 3 phase ungrounded delta electrical service require bonding of service conduits?

**Answer:** Yes. The requirements for bonding raceways that contain service conductors in 250.92(A) do not include any exception for ungrounded services. Here’s the reason. The first ground-fault on an ungrounded system simply grounds the system. If a second ground-fault on a different phase occurs before the first ground-fault is cleared, this will result in a phase-to-phase fault. Fault-current will flow through all interconnected metal raceways until, hopefully, the fuse on the line side of the utility transformer opens!

56) What size NM cable is required for a stove circuit in a new home where the stove’s nameplate rating is 12 KW?

**Answer:** #8 NM Cable

NEC Table 220.55 Note 4. It shall be permissible to calculate the branch-circuit load for one range in accordance with Table 220.55. Column C for 1 Range with a rating not over 12kW has a

maximum demand of 8 kW. Divide 8 kW by 240 volts and the minimum ampacity is 33.33333. NEC Section 210.19(A)(3) States for ranges of 8 ¾ kW or more rating, the minimum branch-circuit rating shall be 40 amperes.

Table 310.15(B)(16) 60 degree Column for copper #8 has an ampacity of 40 amperes. 334.80 limits the allowable ampacity of NM cable to that of a 60 degree C rated conductor.

**The answers to these questions are the opinion of the person that answered the question. They are not the position of the IAEL, IAEL Western Section, NFPA or a code making panel.**

## Monday Code Panel

1:00 pm – Code Panel Forum

Don Iverson – NEMA - Moderator – CMP-1

Chad Kennedy – Columbia, SC

Schneider Electric - CMP-13

Tom Lichtenstein – Northbrook, IL

UL – CMP-7

Dean Hunter – Menahga, MN

Assistant Chief - MN Department  
of Labor and Industry – CMP-7

Dave Williams – Lansing, MI

Correlating Committee and CMP-10

Robert Fahey - Janesville, WI

City of Janesville - CMP-11

Christine Porter – Seattle, WA

Intertek - Correlating Committee and CMP-5

Jim Dorsey – Monument, CO

Douglas County Inspector - CMP-10

### Code Panel Question Assignments

Chad Kennedy	1, 8, 15, 22, 29
Tom Lichtenstein	2, 9, 16, 23, 30
Dean Hunter	3, 10, 17, 24, 31
Dave Williams	4, 11, 18, 25, 32
Bob Fahey	5, 12, 19, 26, 33
Christine Porter	6, 13, 20, 27, 34
Jim Dorsey	7, 14, 21, 28, 35

## Wednesday Code Panel

9:45 am – **Inspector Code Panel**

Tim McClintock – NFPA - Moderator

Borgia Noel – Laramie, WY

State of WY Fire Marshal's Office - CMP-6

Jody Wages – Richardson, TX

IAEI - CMP-2

Grant Hammett – Montrose, CO

Colorado State Electrical Board – CMP-8

Steven F. Froemming – Franklin, WI

City of Franklin Inspector, CMP-13

Tom Moore – Akron, OH

City of Beachwood - Chair CMP-16

Phil Simmons – Olympia, WA

Simmons Electrical – CMP-5

Chris Jenson – Logan, UT

UL – Formerly CMP-10

### Code Panel Question Assignments

Borgia Noel	36, 43, 50
Jody Wages	37, 44, 51
Grant Hammett	38, 45, 52
Steven Froemming	39, 46, 53
Tom Moore	40, 47, 54
Phil Simmons	41, 48, 55
Chris Jenson	42, 49, 56