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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. A detached garage at a dwelling unit is supplied by a multi-wire 20 ampere branch circuit. The disconnecting means is a single 20 ampere double pole switch, one phase supplies the lights, and the other phase supplies the receptacles. Am I required to install a grounding electrode system at the garage?

Reference: NEC 250.32(a)

Answer: No

As long as there is a Grounding conductor for grounding. The exception reads "A grounding electrode shall not be required where only a single branch circuit, including a multi branch circuit, supplies the building or structure and the branch circuit includes an equipment grounding conductor for grounding the normally non-current-carrying metal parts of equipment"

2. Are receptacle outlets required to be installed above a built-in desk located in the living room of a dwelling unit?

Reference: 210.52(A)

Answer: Maybe

A recent revision in the 2017 NEC edition for Fixed cabinets "that do not have countertops or similar work surfaces" was added as an item that constitutes a break in a wall space for receptacle spacing reasons in dwelling units

3. An existing ceiling fan is being replaced, and the new ceiling fan is mounted by a means that is now considered a receptacle by Article 100. Would this be considered a modification of the circuit, and would it now be required to have AFCI protection?

Reference: 314.27(E), 210.12(D) and Exception

Answer: Yes, No, Maybe

Ceiling fan permitted to supported by listed locking support and mounting receptacles [314.27(E)]. The exception to 210.12(D) would exempt this replaced ceiling fan from requiring AFCI protection (if it were not already AFCI protected). However, by the definition of “receptacle,” it would be adding a new “device” to this existing “outlet.” Technically, I suppose this would call for AFCI protection per 210.12(D). This was never the intent of this section.

The manufacturer of these listed locking support and mounting receptacles got an exception for their product from GFCI protection at 210.8(A). Maybe they missed this one for AFCI protection?

4. Is it necessary for the AC disconnect of a PV system to be grouped with the service disconnect?

Answer: No. The PV disconnect is not required to be grouped with the other service disconnects.

References: Article 100, definitions of premise wiring, service, service conductors, service entrance conductors and service equipment. Also, NEC sections: 230.2, 230.40, 230.71, 230.72, and 230.82.

5. Is a Construction Meter/ Temp. Construction Service subjected to the same Grounding & Bonding requirements in Art.250 as a Permanent Service? i.e., Supply Side Bonding Jumper, Main Bonding Jumper, Grounding Electrode Conductor, from electrodes connected to the Grounded (Neutral) Conductor.

Reference; 590.2(A)

Answer Yes,

Except as specifically modified in this article, all other requirements of this Code for permanent wiring shall apply to temporary wiring installations.

There are no amendments to the requirements of Article 250 as it relates to the grounding & bonding of service equipment within Article 590

Neither article distinguishes between residential, commercial, or industrial.

6. Mandatory 2018 IRC N1104.1 (page 487) states that not less than 90% of the permanently installed lighting fixtures contain only high-efficacy lamps. What are high efficacy lamps? Are LED lights high efficacy? What is luminaire efficacy?

Reference: 2018 IRC N1104.1

Answer:The definition for high-efficacy lamps and the requirement for a certain percentage of high-efficacy lamps in permanent lighting fixtures first appeared in the 2009 IRC. Lamps have traditionally been referred to as light bulbs. By definition, high-efficacy is determined by the lumens (light emitted) per watts (W) of power to produce the light. The acceptable ratio of lumens to watts depends on the wattage of the lamps. For example, a 60-watt or greater lamp must produce at least 60 lumens/W to be considered high efficacy. Examples of high-efficacy lamps are compact fluorescent lamps (CFLs), T-8 linear fluorescent lamps and LED lamps.

7. A contractor installs a direct-buried feeder to a detached structure. In addition to the required feeder conductors, he installs a green insulated, type THHN/THWN copper in the trench as an equipment grounding conductor for the feeder. Is this a violation?

Reference: NEC 310.10 (F)

Answer: Yes THHN is not rated for direct burial applications. Conductors that are suitable for Direct Burial Applications will have a direct burial rating.

8. Is surge protection now required on the service of every one- and two-family dwelling unit?

Reference: 230.67, FR: 8546 PI4118 & 2696, SR: 7898 **Answer:** That and More 230.67(A) All services supplying dwelling units shall be provided with a surge-protective device (SPD).

Substantiation: This revision was intended to address the recognized need for surge protection to protect the sensitive electronics and systems found in most modern appliances, safety devices (such as AFCI, GFCI and smoke alarms) and equipment used in dwellings.

9. We have a 277/480 V. system that is being converted to a 120/208 V. system. Can we re-use the existing 600 V. rated distribution equipment on the 208 V. system, assuming all fault current ratings are adequate?

Reference: 110.3(B), 408.58, UL 67 (Panelboards), UL 891 (Switchboards)

Answer: Yes (Maybe)

You would need to check the product standards for the equipment involved (such as the product standard for panelboards, switchboards, etc.) You would also need to check the specific manufacturer's spec sheets and ensure that there are not any prohibitions (other components in the equipment that may be impacted, metering equipment etc.) That would be compatible with 110.3(B). Section 408.58 only addresses panelboard marking and the voltage for which the panelboard is designed.

10. I have installed a 1000A, 480/277 service with GFPE. Can you help me understand the testing requirements referenced in the code?

Answer: Section 230.95 in the National Electrical Code (NEC) addresses systems that are required to have Ground Fault Protection of Equipment (GFPE). Although the requirement for GFPE protection for service disconnects, feeders, and branch circuits over 1000 amps, and over 150 volts to ground, has been in the NEC for many code cycles, changes were made in the 2017 NEC regarding the performance testing. In the 2017 NEC, in section 230.95(C), "primary injection testing" was mandated and a copy of the test is required to be provided to the electrical inspector.

Primary injection testing, as opposed to the secondary injection test, is the only way to prove correct installation and operation of the whole protection chain, as the test involves the entire circuit: current transformer primary and secondary windings, relays, trip and alarm circuits, circuit breakers, and all wiring. Primary injection testing is performed during the commissioning and maintenance process, or after any modification, as a functional test of the entire system.

11. The 2020 NEC, section 690.45, permits you to connect the bonding conductor to the equipment grounding conductor. Are you required to increase the size of the equipment grounding conductor to match the size of the bonding jumper when doing so?

Answer: No

There is no need to increase the size of the EGC for voltage drop concerns as stated in 695.45.

“690.45 Size of EGC. EGCs in PV system circuit shall be sized in accordance with 250.122. Where no OCD is used in the circuit, an assumed OCD rated in accordance with 690.9(B) shall be used when applying Table 250.122.

Increases in EGC size to address voltage drop considerations shall not be required.”

12. Is a Shower Steam unit equipped with a power cord (intended to be plugged into a receptacle) installed from the manufacturer (240V, 60A) legal to be installed? Or should it be hard wired with a rated disconnect switch?

Reference: UL Category Code KQBZ

Answer: Yes with conditions

If UL Certified (Listed) as Steam Bath Equipment, it should be legal to be installed in accordance with the installation instructions.

UL Certifies (Lists) these under Steam Bath Equipment (KQBZ). See UL Product iQ (www.ul.com/piq), enter KQBZ at the search field.

To be cord connected must have:

- Max. 6 ft SJ or better cord with strain relief and grounded plug.
- Fastening, water and steam mechanical connections that facilitate frequent interchange- No sweated connections.

13. For line side connections of alternate energy systems, does the main AC disconnect have to be installed like a service disconnect with a main bonding jumper, grounded conductor, and grounding electrode conductor to that enclosure?

Reference: NEC 250.25

Answer: Yes

According to 250.25 of the 2020 NEC says the AC disconnect needs to be treated the same as the service disconnect. And requires all 3: a main bonding jumper, a grounded conductor and a an grounding electrode conductor to the enclosure.

14. We have a contractor that places his Walker boxes and EMT conduit on top of vapor barrier for the slab on grade pour. He states this installation is not in contact with the earth and therefore is not defined as a wet location or corrosive area, do you concur?

Reference: 358.10(A)(1), 358.10(B) & (D) UL Category FJMX **Answer:** Maybe

358.10(A)(1) permits EMT to be installed in **concrete**, in direct contact with the earth or in areas subject to severe corrosive influences where installed in accordance with 358.10(B).

The question did not state the type of EMT (Galvanized steel, Stainless Steel or aluminum).

358.10(B)(1) Permits Galvanized Steel and Stainless Steel EMT, Elbows, and Fittings installed in concrete in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and approved as suitable for the condition.

15. Are Tamper-Resistant Receptacles required in a barn located as an accessory building to a dwelling unit?

Reference: 406.12(1)

Answer: Yes

Tamper resistant receptacles are required in dwelling units, including attached and detached garages and **accessory buildings to dwelling units**, and common areas of multifamily dwellings specified in 210.52 and 550.13

16. I have a large commercial building needing a 2000 Amp service. Can I get a switchboard with two sections each with 3 – 400 Amp main breakers in each section?

Reference: NEC Sections 230.2 and 230.71(B)

Answer: No.

Section 230.71(B) allows only one disconnect in each of vertical section of a switchboard and where barriers are separating each vertical section.

17. In a separately derived system, are you permitted, by code, to bond the neutral and ground at the first overcurrent device beyond the transformer? If so, are you required to isolate the metallic conduit from the service to the transformer to prevent a path to ground to the service? (there is a ground fault equipment protection device in the service).

Reference: 250.30

Answer: Nothing in 250.30(A)(1)(2)(3)(4)(5)(6), (B), or (C) requires isolation of conduit when GFPE is present.

18. Are all 600 Volt and less permanently installed generators required to be listed?

Reference: UL Category Code FTSR

Answer: Yes

2020 NEC 445.6 Requires Listing for stationary generators 600 volts or less shall be Listed. The exception permits a field evaluation by a FEB if one of a kind or a custom manufactured generator.

UL Certifies (Lists) stationary generators under the product category Stationary Engine Generators (FTSR) located on UL Product iQ at UL.com/piq and enter FTSR at the search field.

19. A 100a feeder is installed with EMT however both ends transition to flex or sealtight for flexibility, would it be required to install an exterior bonding jumper sized based on the 100-Amp OCPD?

Reference: NEC 250.118 (5)(b) and (6)(b)(c)

Answer: Yes

A bonding jumper would be required under the specified conditions. And because the OCPD exceeds the maximum allowable value for the flex or sealtight to be considered an EGC, a bonding jumper of some sort will need to be installed in order to insure the EMT is connected to an equipment grounding conductor. The bonding jumper can be installed anywhere in the EMT run; only one is required. 250.86 and 250.118(4), (5), (6).

20. Is it permissible to install LFNC underground for a feeder raceway from one structure to another such as a house to a detached garage?

Reference: 356.10 (4)

Answer: Yes

Article 356 covers Liquidtight Flexible Nonmetallic Conduit. Under 356.10(4) "Uses Permitted" it is permitted to install underground where the LFNC is listed and marked for the purpose. The burial depth requirements are found in column 3 of Table 300.5. If all the requirements found in Article 356 are followed LFNC would be a permitted wiring method.

21. Do all dwelling units now require the main breaker to be installed outside like with a meter-main combination panelboard?

Reference: 230.85

Answer: No, Three options permitted

For one- and two-family dwelling units, all service conductors shall terminate in disconnecting means having a short-circuit current rating equal to or greater than the available fault current, installed in a readily accessible outdoor location.

- New requirement added requiring an emergency disconnect at a readily accessible outdoor location for dwelling units
- New outdoor emergency disconnecting requirement primarily based upon providing first responders an outdoor accessible emergency or service disconnecting means during an emergency situation such as a fire, gas leak, structural damage, flooding, etc.
- Access service disconnecting means for first responders is very challenging when the service disconnect is installed in an indoor location of a dwelling unit area such as a basement
- Requiring first responders to enter a potentially hazardous environment (such as a burning building) to find and then activate the service disconnect(s) is not a safe practice

22. I have installed a 1200A, 480/277 feeder to a main breaker in a panel. Can you help me understand the conductor sizing requirements as compared to an 800A feeder, so I don't undersize my conductors? If the conductors were undersized from using the conductor sizing rules incorrectly, are there any other solutions besides changing the conductors?

References: NEC 240.4(B), 240.4(C) and 240.6

Answer: Generally, the NEC always requires that conductors be sized for the load. NEC section 240.4(B) states that the next higher standard overcurrent device rating above the ampacity of the conductors being protected shall be permitted to be used when the conditions of 1 through 3 are met. Where the overcurrent device is rated over 800 amps, NEC 240.4(C) states that the ampacity of the conductors it protects shall be equal to or greater than the rating of the overcurrent device protecting those conductors per section 240.6.

23. Where the GEC is installed for a separately derived system transformer and the conductor enters through a knock-out in the metal enclosure is a bonding type connector in the wall of the transformer required?

Answer: No

250.64(E) (1) is about the protection of the GEC, the bonding of the protective raceway or enclosure (like a wireway) is to ensure the GEC and the protective raceway or enclosure are in parallel with the GEC to alleviate the choking effect when trying to dissipate the overvoltages.

The NEC is minimum, you can ALWAYS exceed requirements. There are multiple options available to make this connection.

24. Do signs have new marking requirements?

Reference: NEC 600.4 (D) and UL Category UXYT 600.4(D) visibility state

Answer: Yes

The markings required in 600.4(A) and listing labels shall be visible after installation and shall be permanently applied in a location visible prior to servicing. The marking shall be permitted to be installed in a location not viewed by the public.

In addition Jan. 1 2019, signs manufactured after that date are required to use a holographic Enhanced UL Certification Mark. Manufacturers of UL Certified signs can no longer use a legacy UL Listing mark on their signs.

UL Certifies (Lists) signs under the product category Signs (UXYT) is the category code. To view the Guide Information and Certifications, go to UL Product iQ at ul.com/pig and enter UXYT at the search field

25. Does the metal skin of a stick framed structure need to be bonded to the GEC or ECG at the service?

Answer: Yes

If is structural metal it needs to be bonded to GEC or ECG at the service. But if it non structural metal then it does not need to be bonded to GEC or ECG

26. Can Service Entrance Conductors and Feeder Conductors be installed in a common auxiliary gutter mounted at the Service location?

Reference: 230.7 Other Conductors in Raceway or Cable

Answer: No

So where do we begin? As we know the NEC rightfully so needs to be all about proper terms and definitions. I think most of us would use the term trough many times but is not defined in the NEC.

Although the construction of an auxiliary gutter is no different from that of a wireway, the field application of this equipment differentiates an auxiliary gutter from a wireway. A wireway is a raceway in accordance with the definition of raceway in Article 100. Its important we verify the listing mark which could be either or and sometimes both. Auxiliary gutters supplement enclosure wiring spaces and are not encompassed by the definition of raceway. therefore, NEC® requirements that apply only to raceways do not apply to auxiliary gutters. An example of such a requirement is 230.7, which prohibits service conductors from being installed in a raceway with conductors that are not service conductors. This rule applies to wireways installed in accordance with Articles 376 and 378. However, an auxiliary gutter installed to supplement the wiring space of a service equipment enclosure is not a wireway and, therefore, is not subject to 230.7.

27. Is there a Code compliant way to connect EMT to a weatherproof junction box with threaded hubs?

Reference: 358.6, 358.42, 314.15

Answer: Yes (Maybe)

Threaded hubs are only intended for use with threaded conduit, such as rigid metal conduit (RMC) or intermediate metal conduit (IMC). The hubs are designed with a tapered thread to match the tapered thread requirement of RMC or IMC of a 1-in-16 taper (inch per foot taper) as covered in 342.28 for IMC and in 344.28 for rigid metal conduit.

Connection to threaded hubs using other than rigid metal conduit or IMC results in two issues that must be addressed. The first issue deals with connections in a wet location, the second deals with proper grounding paths.

28. Is a “bow” in a run of PVC raceway considered a “bend”? To get to the garage from the house, I had to get around a few trees in an arc. The inspector cited us for having a run of conduit that exceeded 360 degrees of bends.

Answer: NEC section 352.26 allows only 360o bends or bows in a single run of conduit between pull points.

The difference between bend and bow is that bend is (nautical) any of the various knots which join the ends of two lines while bow is to play music on (a stringed instrument) using a bow or a bow can be to bend oneself as a gesture of respect or deference.

As nouns... the difference between bend and bow is that bend is a curve, while a bow is a weapon made of a curved piece of wood or other flexible material whose ends are connected by a string, used for shooting arrows or bow can be a gesture, usually showing respect, made by inclining the head or bending forward at the waist or bow can be (nautical) the front of a boat or ship.

29. We have a spread footer that has multiple short pieces of rebar tied together that does = 20' in a 2'x2' concrete pad that is in contact with the earth. Does this installation meet the intent and therefore is a compliant installation for a concrete encased electrode?

Answer: No

The intent is exactly what the section 250.52(A)(3) (in part) says: “installed in one continuous 20' length, or if in multiple pieces connected together by the usual steel tie wires, exothermic welding, welding, or other effective means to create a 20' or greater length” Pieces of rebar tied together in a star pattern, criss-cross pattern, or other non-single linear length pattern does not qualify as a required grounding electrode. The panel would welcome a study that shows these variations would be acceptable, but until then we do not know if they are equivalent.

30. Can I install reconditioned molded case circuit breakers? They are much less expensive than buying new ones.

Answer: 2020 NEC 240.88(A)(1) specifically prohibits molded case circuit breakers from being reconditioned.

31. A separate structure has a 3 phase 50-amp feeder, and a single phase 15-amp branch circuit going to it as allowed by 225.30 (D). What grounding electrode system would be required and how would it connect to the feeder and branch circuit?

Reference: NEC 250.66

Answer: You can use any combination of the following: Connections to a Rod, Pipe or Plate Electrode; Connection to Concrete-Encased Electrodes or connections to ground Rings.
NEC 250.66 (A)(B)(C).

32. What is the maximum extra length of NMB cable I can have outside the box so there is extra to pull in when the drywallers mangle the conductors in the box?

Reference: 334.30 FR 8049 – SR 7728

Answer: 18” from last support.

There is a revision in Section 334.30 of the 2020 NEC that adds language limiting the amount of cable between cable entry and the closest support. The previous requirements permitted unlimited lengths of cable to be unsecured from the last point of attachment. Substantiation for this revision points out that the NM cable was required to be supported within 12’ of the box but did not limit the amount of cable between the last support and the box. The extra length will provide conductor length for repair.

33. In ~~Art.~~ Section 230.7 Exception #2 Does this include Type TC Tray Cable?

Reference: 230.7, Ex. No. 2, 336.10(1)

Answer: Yes

Section 230.7 prohibits “other” conductors from being installed in the same raceway or cable as service conductors (with two exceptions).

Exception No. 2 to 230.7 allows load management control conductors having overcurrent protection to be installed within service raceways

Based on 336.10(1), Type TC cable is permitted to be used for power, lighting, control, and signal circuits.

34. Does the NEC require hospital grade receptacles be installed in the patient rooms of a dental clinic?

References: 517.2 (Definitions of Dental Office, Patient Care Space (Category 3 Space), 517.18, 517.19 and 110.3.

Answer: No. A dental office would be considered a Category 3 location, and would not require “Hospital Grade” receptacles per NEC sections 517.18 and 517.19. However, the listing instructions and maybe even manufactures instructions may require the dental chair to be supplied from a “Hospital Grade” receptacle. NEC section 110.3 would require those instruction be followed.

35. When must I use the table value instead of motor nameplate current rating?

References: 430.6(A)(1) & (A)(2)

Answer: 430.6(A)(1) states that the Table values are to be used for general motor applications of other than low speed (less than 1200 RPM) or high torques and multispeed motors.

The Table values are used to determine ampacity of conductors, ampere rating of switches, BC/SC protection instead of values on nameplate.

There are 3 exceptions to this requirement that include shaded-pole motors, permanent-split capacitor type fan or blower motors or listed motor operated appliances (such as a disposal, wet shop vac, etc.)

430.6(A)(2) states that where the overload protection is separate, the nameplate shall be used for sizing the overloads. See 430.32 (everything you ever wanted to know about OLs)

36. Is GFCI protection required for snow melting cables?

Answer: No by Article 426. Sometimes by NEC 110.3(B)

NEC 426.28 Ground-Fault Protection of Equipment. requires Ground-fault protection of equipment shall be provided for fixed outdoor electric deicing and snow-melting equipment. GFPE is not the same as a GFCI. GFPE trips at higher levels of leakage current to protect equipment. GFCI's trip in the 4-6 mA range to protect personnel.

Some manufacturers may require the cables to be protected with GFCI protection in their installation instructions in accordance with NEC 110.3(B) and that is fine. The NEC is a minimum requirement, the manufacturer can go over minimum requirements.

Bottom Line: Don't assume, read the installation instructions with the cables.

UL Certifies (Lists) these cables under De-icing and Snow-melting Equipment (KOBQ). See UL Product iQ at UL.com/piq and enter KOBQ at the search field.

37. Underground wiring within 5 ft. horizontally from the inside wall of the pool shall be permitted. What wiring methods are not considered suitable in this environment?

Reference: NEC 680.11(A)

Answer: Its not Suitable if the wiring method is not listed in 680.11(A)(1-7) or has a special listing for that application.

- (1) Rigid Metal Conduit
- (2) Intermediate Metal Conduit
- (3) Rigid Polyvinyl Chloride Conduit
- (4) Reinforced Thermosetting Resin Conduit
- (5) Jacketed type MC Cable that is listed for Burial
- (6) Liquidtight Flexible Non-Metallic Conduit listed for Direct Burial
- (7) Liquidtight Flexible metal Conduit listed for Direct Burial

38. Are the utility requirements for PV systems enforceable in the NEC?

Reference: 90.2(B)(5) Article 100 "Service Point" **Answer:** No

Let's start by recognizing Installations under the exclusive control of an electrical utility by virtue of 90.2(B)(5) are exempt from the NEC rules. Although the specific question seems to be the utility has requirements and are they enforceable. Most all utilities have specific regulations that may overlap. The key point is determining where the "service point" located. That per say demarcation will always be determined by the utility. Any installation past the service point must

comply with the NEC and not so much tariff regulations. However, there are many times in that overlap situation you may have utility regulations and NEC that are in conflict.

We have had utility's that would not permit to nipple out of the rear of a meter socket although permitted in 312.6(B)(2) Exception No. 2. Another common issue that is not so easy coordinate is in 250.142(B) Exception No. 2 where the typical bonding jumper to wire is needed for meter reading purposes is present and the meter enclosure may not be located immediately adjacent to the service disconnecting means, possibly in amter room on another floor. In these cases, coordination between the utility, installer and AHJ needs to happen.

- 39.** In convenience stores there are many countertop appliances (hot dog machines, sandwich, and pizza warmers) that are cord connected. Could this area be considered a "commercial kitchen"? Any receptacles within 6' of the sink are required to be GFCI protected. What about the others?

Reference: Article 100: Kitchen, 210.8(B)(2)

Answer: Could this area be considered a "commercial kitchen"? No (unless the area meets the definition of a "Kitchen").

Because of a Code change for the 2020 NEC at 210.8(B)(2), these receptacles serving hot dog machines, etc. could require GFCI protection without meeting the definition of a "kitchen."

If the area serving the pizza warmers, etc. has a sink and permanent provisions for either food preparation or cooking, GFCI protection would be required for the receptacles in that area.

Kitchen: An area with a sink and permanent provisions for food preparation and cooking.

Additional language was added to clarify that areas not defined as a kitchen with a sink and permanent provisions for either food preparation or cooking have the same potential for shock hazards as a kitchen

This would include areas such as:

- Ice cream parlors
- Coffee shops
- Smoothie stores

These areas typically have stainless steel countertop and/or stainless-steel appliances but no "permanent provisions for cooking" These facilities have at least the same potential for shock hazards as a kitchen

- 40.** Furniture feeds: this system has a LFMC whip with a wire type equipment grounding conductor. Is it legal to terminate into a plastic 4 square blank cover? Or is it required to use a metal cover to maintain the electrical continuity?

References: NEC 250.4, 250.86, 250.96, 250.109, 250.134, 300.10, and 350.60

Answer: Although NEC Section 250.86 allows short sections of metal raceways not to be connected to an equipment grounding conductor; section 250.96 requires the bonding to ensure electrical continuity and the capacity to conduct safely any fault current likely to be imposed. Bonding would ensure an effective ground fault path and help facilitate the operation of the OCPD during a fault condition. A plastic 4 square blank cover could be used as long as another means to bond the LFMC is used.

41. How do properly calculate the bus rating of a 125A sub panel with 30 Amps of back fed PV current available? Feeder OCPD is 100 Amps.

Answer:

- 705.12 Load Side Source Connections. For the purposes of this example, assuming there is not a PCS – power control system being used.
- 705.12 (A) requires a dedicated Circuit Breaker or fusible disconnecting means.
- 705.12 (B) requires the power source output to be taken at 125% ($30A \times 125\% = 37.5A$)

705.12 (B)(1) Feeders. Assuming this is NOT within a Service Panelboard. Ampacity of the Feeder must be not less than 125% of the power source output current (if this was a feeder, the feeder conductor ampacities would have to be greater than 37.5A)

If the OCD for the PV is located at the opposite end from the feeder main no other calculation is needed.

If the OCD for the PV is not at the opposite end, then the feeder conductor ampacities would have to be not less than the Feeder ampacity plus the PV output ($100A + 37.5A$) and the OCD on the load side of the power source connection point must not be greater than the ampacity of the feeder.

705.12(A)(3) Busbars. This requires that one of the following methods is to be used to determine the ampacity of the bus bars

(1) sum of PV output (37.5A) plus rating of the OCD (100A) cannot exceed the ampacity of the bus bar (125A) In this case the sum does exceed the ampacity of the bus

(2) If located at opposite ends, the sum of the power source output (37.5A) plus rating of the OCD ($100+37.5 = 137.5$) cannot exceed 120% of the bus bar rating ($100 \times 120\% = 120A$)

(3) the sum of all OCDs (loads and power source) cannot exceed the ampacity of the bus bar (add up all the CBs, cannot exceed 125A)

42. I have been told that when I install a go-from (EMT to Type MC Cable) that the fitting must be accessible or listed to be hidden, is that accurate? If so, why? What are the listing requirements to allow concealment for items such as EMT connectors or rigid couplings?

Reference: NEC 300.15 (F)

Answer: A “go from” for EMT to MC is a field combination of an EMT fitting, rigid coupling and an MC fitting. All the fittings may be Listed for specific wiring methods but not Listed as a single complete transition fitting. Rigid couplings have been Listed as part of Rigid metal conduit. If it has a Listing mark on the coupling then it has been Listed for use with Listed rigid metal conduit. UL Lists RMC and couplings under the product category Rigid Ferrous Metal Conduit (DYIX). Male threaded fittings have only been Listed for use with a lock nut unless the smallest shipping carton identifies it as Listed for securement to a threaded hub.

Section 300.15 Boxes, Conduit Bodies, or Fittings — Where Required.

Fittings and connectors shall be used only with the specific wiring methods for which they are designed and listed. Where the wiring method is conduit, tubing, Type AC cable, Type MC cable, Type MI cable, nonmetallic-sheathed cable, or other cables, a box or conduit body shall be installed at each conductor splice point, outlet point, switch point, junction point, termination point, or pull point, unless otherwise permitted in 300.15(A) through (L).

F) Fitting.

A fitting identified for the use shall be permitted in lieu of a box or conduit body where conductors are not spliced or terminated within the fitting. The fitting shall be accessible after installation, unless listed for concealed installation.

In order for the fitting to be Listed for concealed installation, the complete fitting would have to be a Listed transition fitting under the UL Product category Conduit Fittings (DWTT) or EMT Fittings (FKAV) or MC Cable Fittings (PJOX). You can find the guide information and Certifications/Listings for these product categories on UL Product iQ at UL.com/piq and enter DIYX, DWTT, FKAV or PJOX at the keyword search

- 43.** During a residential remodel project when replacing receptacles (devices only): Is an AFCI Receptacle, if installed in the 1st outlet acceptable? Or is it also required to protect the Homerun with an AFCI circuit breaker? Note: Older homes maybe wired with 3 wire (shared Neutral) branch circuits.

Reference: NEC 210.12(A)(2)

Answer: Yes

(2) A listed branch/feeder-type AFCI installed at the origin of the branch-circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

- 44.** In a large box-type store, like a Sam's Club or Costco, is it allowable to drop Type SO cord down from the ceiling and terminate it in a suspended outlet box containing a receptacle or cord cap-type receptacle? Can I hardwire it to an island end cap or display case?

Reference: UL Category QCRV

Answer: Yes

Metal reducing washers, only after all the concentric and eccentric rings have been removed. However, those enclosures containing concentric and eccentric knockouts that have been are considered suitable for grounding for use in circuits over and under 250V and where installed in accordance with ANSI/NFPA 70, "National Electrical Code," for raceways containing other than service conductors. Reducing washers are intended for use with metal enclosures having a minimum thickness of 0.053 in. Reducing washers may be installed in enclosures provided with concentric or eccentric knockouts certified for bonding purposes may be used with reducing washers without all knockouts being removed.

Use of reducing washers for grounding is only acceptable where all the rings of concentric or eccentric knockouts are removed.

It does not seem to make a difference whether the EGC is metal sheathed cable, metal armor cable or raceway type wiring method.

- 45.** I am feeding a job trailer from my temporary service. The trailer is fed with a 50-amp Plug. Does the 50-amp receptacle need GFCI protection?

Reference: 590.6(A) and (B), 545.28

Answer: Yes (or an assured equipment grounding conductor program in place).

Also, take a look at Part II of Article 545 (Relocatable Structures). This job trailer would quite possibly qualify as a “relocatable structure.” Section 545.28 would call for GFCI protection for this 50 ampere receptacle if it is installed in compartments accessible from outside the relocatable structure.

46. I recently inspected a gymnasium with retractable stands and retractable basketball nets that were field wired with SO cord, which appeared to be a good installation. The NEC prohibits the use of cords in a place of assembly. The alternative seems like a substandard installation to meet the letter of the code. Is this article on solid ground or is this being interpreted incorrectly?

References: 400.10, 400.12 and 518.4

Answer: NEC 518.4 wiring methods in places of assembly addresses fixed wiring methods. In this case, this installation is not considered a “fixed” wiring methods because of the movement of the bleacher equipment. In my opinion, the flexible cords would be allowed for wiring this specific equipment per 410.10(A)(9) for connection of moveable parts if they follow 400.12.

47. In healthcare facilities, are the calculated loads for electrical sub panels required to be rated for continuous duty? Porter 1-42

Answer: There is nothing within Article 220 that requires this any load to be treated as a continuous load. (the article is about when you can be LESS than nameplate). To determine if a panelboard needs to be rated “continuous duty” is dependent on the loads served. Do they operate for more than 3 hours? Are you trying to load up the panelboard to 100% of its rating? If so, it would need to be rated for 100% of the calculated loads. There is nothing within Art 517 to modify sizing Feeders (in 215, or services in 230, or even the branch circuits in 210). Those are the locations where the continuous duty comes into play for sizing conductors and overcurrent devices.

48. What is Type P cable used for? How is this listed?

Answer: Type P cable is similar to marine shipboard cable, however, they are not the same. It is intended to be used on land-based oil and gas well drilling where units are often transported between drilling sites. Type P cable is Listed under the UL product category Cable for Use in Mobile Installations (CYLD). The UL Guide Information states that Cable marked Type P is a cross-linked polyolefin insulated, single or multi conductor cable, with an equipment grounding conductor, overall nonmetallic jacket and may be armored and sheathed or unarmored.

Type P cable can be used on mobile installations such as land drilling rigs, or other similar equipment and for industrial installations under engineering supervision.

Type P cable is investigated for compliance with the UL 1309A, the Outline of Investigation for Cable for Use in Mobile Installations.

The UL guide information and Certifications (Listings) for Type P cable can be viewed on UL Product iQ at UL.com/piq; enter CYLD at the search field.

49. My question is on 110.26 & 110.33 about the egress door being over 25 feet away. Does this mean if it's beyond that it doesn't need panic hardware & need to open outward?

Reference: 110.26(C)(3)

Answer: Yes.

110.26(C)(3) Personnel Doors.

Where equipment rated 800 amperes or more that contains overcurrent devices, switching devices, or control devices is installed and there is a personnel door(s) intended for entrance to and egress from the working space **less than 7.6 m (25 ft) from the nearest edge of the working space**, the door(s) shall open in the direction of egress and be equipped with listed panic hardware or listed fire exit hardware.

50. If a NM-B support is used as listed, such as a Gardner Bender Multicable Staple Snapshot, is there a need to derate for bundling? For example, the packaging says each support can be used for (8) 12-2/G NM-B cables.

Answer: I do believe this is a good question for our friends at UL. Looking at the product it has spacing between the cables that no derating is necessary.

51. In Art. 702.10 does the term "general wiring" include Service Entrance Conductors?

Reference: 702.10, 300.1(A), 230.7

Answer: No

230.7 Other Conductors in Raceway or Cable: Conductors other than service conductors shall not be installed in the same service raceway or service cable in which the service conductors are installed.

52. Air-conditioners typically have the maximum rating of the branch-circuit short-circuit and ground-fault protective device on the nameplate. Can you use a breaker rated less than the maximum rating and how would I determine if it would work?

Reference: 2020 NEC Commentary

Answer: Appropriate Tables at end of Motor and Motor Controller Chapter

NEC 440.41(A) A motor-compressor controller shall have both a continuous-duty full-load current rating and a locked-rotor current rating not less than the name-plate rated-load current or branch-circuit selection current, whichever is greater . . .

(B) A controller serving more than one motor-compressor or motor-compressor and other loads shall have a continuous-duty full-load current rating and locked-rotor current rating not less than the combined load as determined in accordance with 440.12(B)

53. Can I use the 110.24-required available short-circuit current making to determine my arc-flash PPE? Some experts have told me yes and other experts have told me no.

Reference: NEC 110.24(A) IN #1, 110.16(B) IN #1

Answer: Maybe

As noted in NEC 110.24(A) Information Note #1, the marked **AFC** value per NEC 110.24 is used for the proper selection of short-circuit current ratings and interrupting ratings of equipment. This value may be much larger than the actual value where the utility provides

worst-case fault current values. This is because, the utility recognizes it may make changes to the service that could increase the available fault current, such as replacing a transformer with a larger kVA or lower impedance.

For determining the arc-flash PPE, we need to look to NFPA 70E, which would recommend the use of the actual available fault current or a range of fault currents when selecting PPE. This is because lower values of fault current may result in longer opening times of the overcurrent devices resulting in higher incident energy.

Published Utility Secondary Fault Current – 3 Phase Pad Mount Transformer

TR	TR	TR	TR	Fault Current	
kVA	%R	%X	%Z	120/208 V Secondary	277/480 V Secondary
75	1	1.25	1.6	13,000	5,600
150	1	1.25	1.6	26,000	11,200
300	1	1.25	1.6	52,000	22,500
500	1	1.5	1.8	77,100	33,400
750	1	5.22	5.32	39,100	16,900
1000	0.86	5.25	5.32	52,100	22,600
1500	0.86	5.25	5.32	78,200	33,900
2000	0.86	5.25	5.32	--	45,200
2500	0.65	5.28	5.32	--	56,500

- Actual transformer supplied by Utility may be smaller than expected based on service size which results in lower value of fault current.
- When doing Arc Flash Study for selecting PPE, need to calculate available fault current based on installed transformer.

54. With an in-use cover in a residential application, why do I need to install a heavy-duty type instead of the regular use by my rose bush?

Reference: NEC 406.9(B)(1).

Answer: Code The actual text in the NEC indicates this in use cover shall be identified as “extra duty”, so the heavy duty cover would not be required. 406.9(B)(1) does require all 125 and 250 volt, 15 and 20 ampere receptacles located in wet locations shall be of the “extra duty” type. If the AHJ decides the rose bush provides enough cover, similar to a rook or canopy as indicated in 406.9(A) and classifies the location as a damp location, the the extra duty cover is no longer needed. Also see requirements in 406.9(B)(2) for receptacles other than 125 and 250 volt, 15 and 20 ampere, installed in wet locations.

55. Are the minimum cover requirements in table 300.5 to be measured from the top of the conduit to grade, or from the bottom of the trench to grade?

Reference: 300.5 Table Notes:

Answer: Yes, you would measure from a point of the top surface of a raceway or direct buried rated cable to the surface on grade.

Note #1. Cover is defined as the shortest distance in mm (in.) measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.

56. What is tri-plex and 4-plex bundled conductors now called?

Answer: The only thing I can find is a Multiconductor cable, see 250.119(B)

57. Is a DC disconnecting means required for a battery system under 50-volts?

Reference 480.7

Answer: No

480.7(A) Disconnecting Means.

A disconnecting means shall be provided for all ungrounded conductors derived from a stationary battery system with a voltage over 60 volts dc. A disconnecting means shall be readily accessible and located within sight of the battery system

58. What is the maximum allowable setting for an adjustable, instantaneous trip circuit breaker where it will not carry the 3-phase starting current of a Design B energy-efficient motor?

Reference: 2020 NEC Commentary
NEC 430.52(C)

Answer: 1700 percent

Exception No. 1: Where the setting specified in Table 430.52 is not sufficient for the starting current of the motor, the setting of an instantaneous trip circuit breaker shall be permitted to be increased but shall in no case exceed 1300 percent of the motor full-load current for other than Design B energy-efficient motors and no more than **1700 percent of motor full-load current for Design B energy-efficient motors**. Trip settings above 800 percent for other than Design B energy-efficient motors and above 1100 percent for Design B energy-efficient motors shall be permitted where the need has been demonstrated by engineering evaluation. In such cases, it shall not be necessary to first apply an instantaneous-trip circuit breaker at 800 percent or 1100 percent.

59. Is it code compliant to apply 240.4(B) and round up to the next standard size over-current device in this situation: Can 15 feet of 500 kcmil, Type THHN/THWN copper conductors be tapped from a 1200 ampere feeder and terminate in a 400-ampere main breaker for a subpanel? 2

Reference: Article 100, NEC 240.21(B) & (B)(2) and Table 310.16 **Answer:** No

Definition of Tap Conductor: A conductor, other than a service conductor, that has overcurrent protection ahead of its point of supply that exceeds the value permitted for similar conductors that are protected as described elsewhere in 240.4.

The situation described would be a feeder tap requiring compliance with NEC 240.21(B): Conductors shall be permitted to be tapped, without overcurrent protection at the tap, to a feeder as specified in 240.21(B)(1) through (B)(5). The tap shall be permitted at any point on

the load side of the feeder overcurrent protective device. Section 240.4(B) shall not be permitted for tap conductors.

- 60.** Section 410.36(B) requires luminaires installed in suspended ceilings to be attached to the ceiling members. Some jurisdictions require independent support wires instead. Are the wires allowed and/or required? What is the definition of "Dormitory Unit" include?

Reference: NEC 410.36(B ANS: Code).

Answer: This Code section does require the luminaires to be securely fastened to the ceiling framing members (T-bars in most cases) by mechanical means, such as bolts, screws, or rivets. The NEC does not require the independent support wires, although as mentioned in the question, States or local Municipalities may by Ordinance require additional supports be added. In earthquake prone areas of the US, this is something that might be required.

The definition of "Dormitory Unit" is new in the 2020 NEC in Article 100. Dormitories have been in the NEC under 210.60. for receptacle placement requirements. The definition of dormitory is something that is often required.

The definition of "Dormitory Unit" is new in the 2020 NEC in Article 100. Dormitories have previously been included within the NEC under section 210.60 for receptacle placement requirements. "The definition of dormitory is a building or space in a building in which group sleeping are provided for more than 16 people not from the same family in one room or a series of closely associated rooms, without individual cooking facilities".

Note: see NEC for definition with exact language.

Same definition as in NFPA 5000. IBC definition does not have the qualifier with the 16 people.

- 61.** Are there any new load calculation requirements (Derating Factors) that maybe applied to the Table 220.12 values for Dwelling LED lighting? The exceptions seem to apply to commercial installations only.

Answer: Yes. The 2020 NEC completely reconstructed the table using data from (ASHRAE) and the International Energy Conservation Code (IECC) and, dwellings and multi-family dwellings were moved out of the table altogether and now only referenced in new Section 220.14(J).

- 62.** Can the 120V air handler for a gas furnace in a dwelling unit that's part of a split system be cord-and-plug connected per the NEC? Can a 240V air-handler with heat strips that's part of a split system heat pump be cord-and-plug at 240V in a dwelling unit?

Answer: 424 .4 (A) address the branch circuit requirements and 424.4(B) addresses the branch circuit sizing. 424.6 requires the equipment to be listed. If the equipment in the question is listed to be cord-and plug connected and specifies the type of cord to be used then the answer is no.

- 63.** We have a mixed occupancy building (part surgery center and part business) that shares the life safety panel for emergency lighting. Is it required to hard pipe the lights in areas that serve the B occupancy emergency lights?

Reference 517.10(B), 517.1, 517.31(C), 517.31(C)3f **Answer:** No, but why ?

As a 'Business' portion part II is not applicable, but if part III applies, it would say not needed in 517.31(C)(3)(f) Luminaires installed in ceiling structures.

But, 517.29(A) seems to not allow this type of non-health care 'business' to use the Life Safety branch transfer switch/panel in the first place.

- 64.** What is the minimum size copper THWN conductor required to supply an air conditioner condensing unit with a minimum circuit ampere requirement of 23 Amperes? All terminals are rated 75° C.

Reference: 2020 NEC Table 310.16

Answer: #10 AWG

- 65.** The main disconnect switch for a 277/480-volt MDP is rated at 1200 amperes. The calculated load would allow installation of 900 ampere fuses. Would ground-fault protection of equipment be required since the fuses are less than 1000 amperes?

Reference: NEC 230.95

Answer: Yes

Assuming this is the service disconnect per NEC 230.95, the rating is the largest fuse that can be installed.

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 1000 volts phase-to-phase for each service disconnect rated 1000 amperes or more...

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

- 66.** Banks normally have windows throughout the building for security, they typically hang non-electrified signs. Does 210.62 apply and should the contractor install receptacles throughout? This is a tough one to enforce as an inspector.

Answer: NEC 210.62 specifies that at least one 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed within 18 inches of the top of a show window for each 12 linear ft. or major fraction thereof of show window area measured horizontally at its maximum width.

Based on the intent and reason for this requirement, to eliminate extension cords for illuminated signs or other items the retail business may be trying to display, a retail occupancy would definitely need these receptacles installed. A bank, office building or similar occupancy would not typically be displaying items for sale and typically do not have signs in windows, therefore in my interpretation, I would say no show window receptacles would be required.

- 67.** Can a Construction Meter be attached to a Residential Single-Family Dwelling (SFD) under construction? No info found in Art. 230, Art. 590, or the IRC is this an insurance or Utility requirement?

Answer: There is nothing in NEC that would prohibit installing a construction (temp service) on a residential dwelling. However, if the local utility has other requirements, then those would have to be followed.

68. Where did all the requirements for wiring methods and ampacities for medium voltage conductors go?

Answer: A new article 311 is now in the 2020 NEC that address medium voltage conductors and cable.

69. A LG Energy Storage System (ESS) has a built in ON/OFF switch located behind a removable (2 latches) cover for access. Is a separate external disconnect required adjacent to the unit? Or would Labeling/ Placarding be required to indicate the location of the internal switch for 1st Responders?

Reference: 706.15

Answer: No to extra switch and label

It can be integral to the equipment, inside a cover if readily accessible and would only need the labeling if not within sight.

70. A lockable fire pump controller is located in an adjacent room from a 125 HP fire pump. Since the fire pump is out of sight, is another disconnect switch located to be within site of the pump required since the controller can be locked off?

Reference: 2020 NEC Commentary

Answer: Yes

NEC 695.4(B) Connection Through Disconnecting Means and Overcurrent Device. Permits, but does not require, the installation of a disconnecting means and associated overcurrent protection between a power source and the fire pump control devices described in 695.54(B)(1). While not always possible, the best method to provide continuity of power is the direct connection of the source to the fire pump control equipment in accordance with 695.4(A). The permitted additional disconnect facilitates the creation of an electrically safe work condition as required by NFPA 70E while maintenance of the fire pump controller is being performed.

71. What are the placarding requirements when PV equipment i.e., Inverter, Production Meter, ESS etc.... cannot be installed in the same location as the utility service/ Main service Disconnect?

Reference: NEC 690.56(B) and 705.10

Answer: See Below

Per NEC 690.56(B), plaques or directories of facilities with Utility Services and Photovoltaic Systems are required to be installed in accordance with 705.10 and 712.10, as required.

NEC 705.10 requires a permanent plaque or directory installed at each service equipment location, or at an approved readily visible location. The plaque or directory is required to denote the location of each power source disconnecting means for the building or structure and be grouped with other plaques or directories for other on-site sources. The plaque or directory shall be marked with: "CAUTION: MULTIPLE SOURCES OF POWER." Any posted diagrams shall be correctly oriented with respect to the diagram's location.

72. Is it a violation to hang a 10' stick of rigid conduit to a 4" square box that an exit sign is attached to without supporting the box at the exit sign?

Answer: Maybe a Code violation, although this may be an acceptable method if you follow all of the requirements in NEC 314.23(H)(2) for pendant boxes. If the 4" square box does not have hubs, which I am assuming it does not have threaded hubs, to the rigid or intermediate metal conduit wrenchtight into the threaded hub, then this would be a problem. Other conditions in 314.23(H)(2) are to have a listed swivel hangers, the threaded conduit have a set screw or other effective means to keep the conduit from loosening, the exit sign must be a minimum of eight above the floor, the luminaire cannot exceed 12" in any horizontal direction from the conduit entry.

73. Are the branch circuit conductors feeding an EV Charger, rated 80 Amps on the Nameplate, required to be full sized? Even though the installer/ owner can internally select a lesser ampacity charging output based on the vehicle charging requirements.

Reference: Article 625.42

Answer: Adjustable settings shall be permitted on fixed-in-place equipment only. If adjustments have an impact on the rating label, those changes shall be in accordance with manufacturer's instructions, and the adjusted rating shall appear with sufficient durability to withstand the environment involved on the rating label. Electric vehicle supply equipment with restricted access to an ampere adjusting means shall be permitted to have ampere ratings that are equal to the adjusted current setting.

Sizing the service and feeder to match the adjusting means shall be permitted. Restricted access shall prevent the user from gaining access to the adjusting means. Restricted access shall be accomplished by at least one of the following:

- (1) A cover or door that requires the use of a tool to open
- (2) Locked doors accessible only to qualified personnel
- (3) Password protected commissioning software accessible only to qualified personnel

74. Do the requirements of 400.8(5) apply to factory-supplied cord and plug connected equipment, such as condensate pumps for air handlers, security cameras, and wireless routers install above suspended ceilings?

Answer: I am having trouble finding 400.8(5) I even looked in the 2017 NEC so I will do my best to answer the question. If the listed equipment and cord is factory supplied, rated for the ampacity of the equipment, and used to the manufacture specifications this is acceptable. Any equipment above a suspended ceiling must be rated for that environment and the ambient temperature must be factored for the equipment.

75. When installing a PV system via a Line Side Tap: your 1st AC disconnect switch constitutes a new "Service Disconnect". Are there any exceptions in the installation of the MJB and GEC terminations at the Grounded (Neutral) conductor terminal to avoid a parallel path with the original service (Utility) Grounded Conductor?

Reference: 690.47, 250 part III

Answer: No

PV systems reference 250 and I do not see anything in this question the way I understand it that would alter normal grounding

76. How is an electronically protected motor identified?

Reference: 2020 NEC

Answer: Yes

NEC 430.7 Marking on Motors and Multimotor Equipment.

(A) Usual Motor Applications.

(16) Motors that are electronically protected from overloads in accordance with 430.22(A)(2) and (B)(2) shall be marked “electronically protected” or “E.P.”

77. The 2020 NEC, section 242, requires surge protection to be installed. Do these surge protection devices require overcurrent protection for a code compliant installation?

Reference: NEC 242.12, 242.14, 242.16, 230.82 and 110.3(B)

Answer: Depends

NEC Article 242 does not require surge protection, just requirements for installation.

Per NEC 242.12 and 230.82(4), Type 1 SPDs are permitted to be installed on the supply side of the service disconnect without overcurrent protection.

Per NEC 242.14 and 230.82(8), Type 2 SPDs are permitted to be installed ahead of the supply side of the service disconnect where overcurrent protection and disconnecting means are provided or on the load side of the first overcurrent device.

Per NEC 242.16, Type 3 SPDs are required to be installed on the load side of the branch-circuit overcurrent device and at least 30 feet from the service or separately derived system disconnect.

If the SPD installation instructions indicate overcurrent protection is required, NEC 110.3(B) would require it to be provided.

78. Does an under counter (Wet Bar) water chiller or Insta-Hot require GFCI protection per Art. 422.5 (A)(2)? See definition in 2015 IPC for Water Cooler & Water Dispenser.

Answer: **422.5(A) General.**

Appliances identified in 422.5(A)(1) through (A)(7) rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase, shall be provided with Class A GFCI protection for personnel. Multiple Class A GFCI protective devices shall be permitted but shall not be required for the following appliances:

- Automotive vacuum machines,
- Drinking water coolers and bottle fill stations,
- Cord-and-plug-connected high-pressure spray washing machines,
- Tire inflation machines,
- Vending machines,
- Sump pumps and,
- Dishwashers.

After reading the list of appliances required to be GFCI protected, it does not appear the water chiller will need GFCI protection, nor will the Insta Hot will not need GFCI protection. Also check the installations instructions as the Manufacturer may require GFCI protection.

NOTE – 2015 IPC Definitions of:

Water Cooler – A drinking fountain which incorporates a means of reducing the temperature of the water supplied to it from the potable water distribution system.

Water Dispenser – A plumbing fixture which is manually controlled by the user for the purpose of dispensing potable drinking water into a receptacle such as a cup, glass or bottle. Such fixture is connected to the potable water distribution water system of the premises. This definition also includes a freestanding apparatus for the same purposes that is not connected to the potable water distribution system and that is supplied with potable water from a container, bottle or reservoir.

Drinking Fountain – A plumbing fixture which is connected to the potable water distribution system and drainage system. The fixture allows the user to obtain a drink directly from a stream of flowing water without the use of any accessories.

79. Is it necessary to connect all the 125 Volt receptacles in a dwelling unit garage to the 210.11(C)(4) required 20-amp branch circuit or can we have additional, individual branch circuit-supplied receptacles for specific appliances, i.e.: central vac or freezer? Can there be other receptacle branch circuits rated 15 amps?

Answer: Yes

You can install additional circuits. See 210.11(C)(4) Garage Branch Circuits.

In addition to the number of branch circuits required by other parts of this section, at least one 120-volt, 20-ampere branch circuit shall be installed to supply receptacle outlets required by 210.52(G)(1) for attached garages and in detached garages with electric power. This circuit shall have no other outlets. However, the required 20amp circuit must be located in each vehicle bay as stated in 210.52(G)(1).

80. We have several jurisdictions in our State that only allow (2) NM-B cables to be installed through a single hole in a wood framing member, no matter how large the hole. Even if the hole is sealed with sealing foam and requires derating for the number of current-carrying conductors where there are more than two cables, the number of cables does not appear to be limited by the NEC. Especially with TGIs, it seems like overkill to limit a hole to (2) cables. Is this a Building Code requirement or a local jurisdiction interpretation?

Answer: The building code does not limit the number of cables in any framing member.

310.14(C)(1) if conductors are installed without maintaining spacing for a continuous length longer than 24 inches will then need to be de-rated to the table 310.15(C)(1) the local jurisdiction may have their own interpretation.

81. I have 6 equipment grounding conductors coming into my device box. How do I calculate the box fill with that many conductors?

Reference: 314.16(B)5

Answer: $\frac{1}{2}$

6 conductors = Count 1 for the first 4,

Then $\frac{1}{4}$ for each of the rest, 2 in this case $\times \frac{1}{4} = \frac{1}{2}$

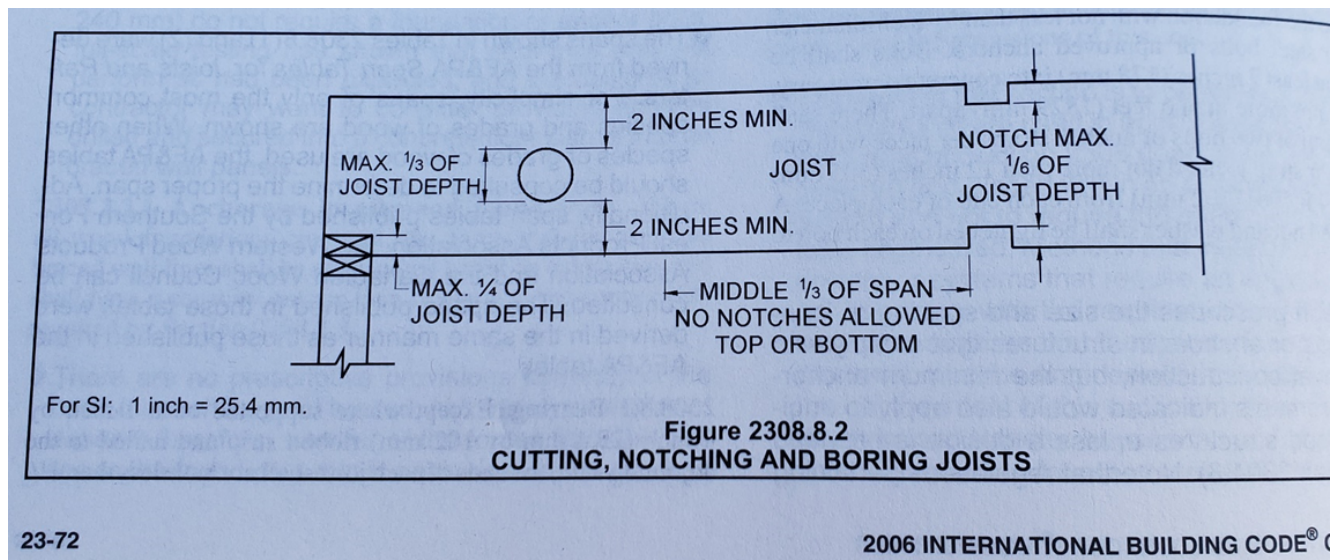
So $4 + \frac{1}{2} = 4 \frac{1}{2}$ cu based on the largest conductor

82. Some jurisdictions require that holes drilled in floor joists for the installation of wiring must be drilled in the center third of the joist and in the outside third of the joist span – no holes in the middle third of the span. Is this an actual Building Code requirement that everyone should be following?

Reference: 2018 IBC

Answer: Yes

2308.8.2 Framing details. . . . Holes bored in joists shall not be within 2 inches (51mm) of the top or bottom of the joist, and the diameter of any such hole shall not exceed one-third the depth of the joist. Earlier editions of the IBC have required that the drilling of holes be restricted in the center third and be kept near areas of support.



83. Does the round-up rule of Article 240.4 (B) allow two parallel runs of 2/0 AWG, Type THWN aluminum conductors to be protected at 300 amperes?

Reference: NEC 240.4(B) and 240.6

Answer: Yes

Per NEC Table 310.16, assuming 75 deg C terminations, 2/0 AWG, Type THWN aluminum conductors an ampacity rating of 135A. If we have parallel runs, the ampacity rating is 270A.

Per NEC 240.6, the standard ampere ratings for fuses and circuit breakers are 250A and 300A. Since our overcurrent device is not larger than 800A and the ampacity rating of the conductors is 270A, the next higher standard overcurrent device rating is permitted per NEC 240.4(B), therefore a 300A overcurrent device is permitted.

84. When installing multiple sources of power, (wind, solar, battery backup, and/ or generator) to the grid, does the NEC require the opening of the neutral conductor as well as the current carrying conductors at the utility disconnect?

Answer: The NEC does not require the neutral (grounded) conductor be opened as is required for the ungrounded conductors. Many transfer switches will not have the neutral disconnected (switched). Section 694.20 in fact prohibits opening of the grounded conductor within disconnecting means with wind turbine systems.

If the other system is classified as a separately derived system, such as generators are in some cases, then the neutral may be required to be opened along with the ungrounded conductors in the transfer switch.

85. We have town houses that have fire rated demising walls between them but share a common foundation. There is a meter stack with 100-amp breakers attached at one end of the building. Does each unit require a grounding electrode and a main for the homeowner's panel for separate structure or does the meter stack breakers and Grounding electrode at the end of the building suffice?

Answer: Yes – Possibly

See the following NEC articles. 250.24/250.121. Regarding the main, 230.71(B) in the 2020 NEC does complicate the installation since now you would be required to have a main disconnect ahead of the meter pack because not being able to have multiple disconnects in the same enclosure.

86. I have an installation that an inspector requires me to install a wall space required receptacle put in an island. I'm sure that if a top is installed on this island, I do not need to install it. What does the code say?

Answer:

210.52(C)(2) Island and peninsular countertops and work surfaces

210.52(C)(3) Receptacle outlet location

87. What are the four new protection techniques allowed for Hazardous (Classified) Locations?

Reference 500.7 **Answer:** L, M, N, O,

- (L) Inherently Safe Optical Radiation "op is."
- (M) Protected Optical Radiation "op pr."
- (N) Optical System With Interlock "op sh."
- (O) Protection by Skin Effect Trace Heating "IEEE 844.1"

88. Are all the conduits, boxes, panels, receptacles, etc. on the essential electrical system in Hospitals required to be identified, such as by color?

Reference: 2020 NEC

Answer: Yes

NEC 517.31(C)(1)(a) Raceways, cables, or enclosures of the life safety and critical branch [essential electrical system] shall be readily identified as a component of the essential electrical system (EES).

89. Does the 6'7" maximum height requirement for "Readily Accessible" found in Art. 240.24 (A) apply to the disconnect switch contained in PV Inverters?

Reference: NEC 240.24(A) and 670.13(A)

Answer: Yes

NEC 240.24(A) applies generally through out the Code unless modified by requirements in Chapters 1 through 7. There are no provisions in this section that would allow the PV system disconnect to exceed this height.

NEC 690.13(A) requires the PV system disconnect to be installed in a readily accessible location.

Readily Accessible is defined as: Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to take actions such as to use tools (other than keys), to climb over or under, to remove obstacles, or to resort to portable ladders, and so forth.

90. With new elevator systems that have all the solid-state controls in the door, does the area around that door have to comply with 620.23? Fahey P2-75

Answer: The heading for 620.23 reads as " Machine room or Control Room/Machinery Space or Control Space Lighting and Receptacles".

In the case of the elevator with the controls located within the door frame, these requirements would be applicable, as the door frame is not a room or space which is dedicated to the elevator equipment.

Review the definitions located in 620.2 for "Machine room and "Machinery space" and the definition of Machinery Space would be the space around the door frame if the controls were located in the frame.

91. I installed a 1 1/4" fitting for my AC installation. The inspector wants a plastic bushing installed. Why did he not ask for a ground bushing, and for what reason does he require a bushing anyway? Iverson P2-79

Answer: The question didn't provide enough information to understand why the inspector made the request. However, I suspect there was a connector installed where the conductor was #4AWG or larger which triggered the requirement in 300.4(G). I would also add referencing 250.92, 250.97 & 250.100 to address "why didn't he ask for a ground bushing" as well.

92. Section 210.8 (A)(1) GFCI protection for outlets in bathrooms. Once you have met the required 20-amp circuit can you add an additional 15-amp circuit to the bathroom if the receptacles are GFCI protected? Noel P2-83

Answer:No

210.11(C)(3) one or more 120 volt 20 ampere branch circuit shall be provided to supply bathroom receptacle outlet required by 210.52(D) and any countertop and similar work surface receptacle outlets. Such circuits shall have no other outlets.

93. We have a 45 KVA transformer installed above a lay in tile ceiling, is a light required?
Froemming P2-85

Reference 450, 300, 210.70(C), 110.26(D)

Answer: No

It is not required by any of these, so everybody knows if you can't find it must be ok.

94. Is an individual branch circuit required for cord-connected range hood? Jamison P2-86

Reference: 2020 NEC

Answer: Yes

NEC 420.16(B)(4) Range Hoods and Microwave Oven/Range Hood Combinations. Range hoods and over-the-range microwave ovens with integral range hoods shall be permitted to be cord-and-plug-connected with a flexible cord identified as suitable for use on range hoods in the installation instructions of the appliance manufacturer, where all of the following conditions are met:

3) The receptacle is supplied by an individual branch circuit.

95. Do commercial bathrooms wall mounted 1000w hand dryers require a disconnect?

Reference: NEC 422.30 and 422.31(B)

Answer: Not likely

A hand dryer in a commercial bathroom would need to comply with the requirements of NEC Article 422 for appliances.

NEC 422.30 requires a disconnecting means.

NEC 422.31(B) permits the branch-circuit switch or circuit breaker to serve as the disconnecting means where the switch or circuit breaker is within sight from the appliance or be capable of being locked in the open position in compliance with 110.25.

The branch-circuit switch or circuit breaker is likely not within sight of the commercial hand dryer, but if permanent locking provisions are provided for the switch or circuit breaker, an additional disconnect is not required.

Code panel 1

Day 1 9/20 – 1:00PM

Ray Horner 1,7,13,19,25,31,37,43

Tom Moore 2,8,14,20,26,32,38,44

Keith Lofland 3,9,15,21,27,33,39,45

Dean Hunter 4,10,16,22,28,34,40,46,85,91

Christine Porter 5,11,17,23,19,35,41,47

Tom Lichtenstein 6,12,18,24,30,36,42,48

Code Panel 2

Day 3 9/22 – 100:00AM

Don Iverson 49,55,61,67,73,79,85,91,

Borgia Noel 50,56,62,68,74,80,86,92

Steve Froemming 51,57,63,69,75,81,87,93

Jack Jamison 52,58,64,70,76,82,88,94

Dan Neeser 53,59,65,71,77,83,89,95

Robert Fahey 54,60,66,72,78,84,90