

SDEC 2017 Questions, Group 2

1. What is the proper termination point for the grounding electrode conductor on a residential service? Is it the meter base or first point of disconnect in the service?

Answer: The connection can be at any accessible point from the service drop to the neutral bar at the service disconnect. NEC 250.24 (A)(1).

20:44:22:28. System grounding connections. All grounding electrode conductors of the system grounding connections must terminate on the neutral bus inside the service equipment unless they are inspected before the service is energized by the power supplier.

2. Can a person install metallic-sheathed cable (such as MC) in PVC conduit in a slab in a medical facility?

Answer: Yes. NEC 330.10 allows MC cable to be installed in any raceway. PVC conduit installed in concrete above grade is not a wet location. If the PVC conduit is buried underground under the concrete then the inside of the PVC is considered wet location, and the MC cable would have to be listed for wet location. NEC 300.5. If the MC is feeding into a patient care area, then the cable would have to be listed as Hospital Grade. NEC 517.13.

3. The main service disconnect switch in a 277/480 volt panel board is rated 1200 amperes. The calculated load would allow 900 amp fuses. Would GFI protection of equipment be required since the fuses are less than 1000 amperes?

Answer: Yes. The GFI protection requirement for over 1000 amperes is based on the rating of the service disconnect not the size of the fuses or breaker. The 1200 ampere rated panel board would require GFI protected. NEC 230.95

4. Can type SO cord be dropped from a bar joist to a display shelf (end cap) and hard-wired to a junction box on that display unit, or does it have to be installed in conduit?

Answer: Type SO cord cannot be hard-wired to the junction box. Cords cannot be used as a substitute for fixed wiring methods. NEC 400.8. The wiring method to the display shelf shall be installed in a conduit.

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

Answer: Yes. NEC 250.106 requires that the lightning protection ground terminals be bonded to the grounding electrode system. 250.60 says that ground rods for strike terminals (lightning rods) can not be used solely for the grounding electrode system.

Informational Note No. 2: Metal raceways, enclosures, frames, and other non-current-carrying metal parts of electrical equipment installed on a building equipped with a lightning protection system may require bonding or spacing from the lightning protection conductors in accordance with NFPA 780-2014, *Standard for the Installation of Lightning Protection Systems*.

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

Answer: No. If the underground metal water pipe is 10 feet or more underground it is required to use that pipe as a grounding electrode. NEC 250.50 and 250.52. The grounding electrode conductor can only be connected to the first 5 feet of copper water pipe from where the pipe enters the building. NEC 250.68(C).

7. Does the NEC require sealing inside raceways from the outside to inside of structures?

Answer: Yes. 300.7 requires sealing raceways from outside to inside. 300.5(G) Sealants shall be identified for use with the cable insulation, conductor insulation, bare conductor, shield, or other components.

8. Do the receptacles in a detached garage require to be tamper-resistant?

Answer: Yes, if the detached garage is part of the dwelling. 210.50 requires receptacles installed in sections 210.52 thru 210.64. 210.52(G) requires a receptacle in a detached garage with electrical power. 406.12 requires that receptacles installed in areas that are specified in 210.52 to be tamper-resistant.

9. Does a structural steel beam located in the basement of a residence require to be grounded?

Answer: No. The structure must have a steel frame work tied together to require bonding to the grounding system. An isolated beam that is covered would not be required to be bonded to the grounding system. NEC 250.104 C.

(C) Structural Metal. Exposed structural metal that is interconnected to form a metal building frame and is not intentionally grounded or bonded and is likely to become energized shall be bonded to any of the following:

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

Answer: No. The maximum size transformer that can be installed in a hollow space is 50 KVA. NEC 450.13(B).

11. Does the NEC have any requirements for smoke alarm locations and if they are required to be hard wired or battery operated for new or remodel work?

Answer: NO. This will be in the local building codes and enforced by the local building inspectors. Article 760 covers fire alarm systems with smoke and heat detectors and control panel. Smoke alarms are self-contained with detector and alarm sound. NFPA 72 covers the installations of smoke alarms in dwellings.

12. Are freezers located in garages and basements require to be GFCI protected?

Answer: Freezers are not required to be GFCI protected. Receptacles installed in garages and unfinished basements in dwelling units are required to be GFCI protected. 210.8 A.

13. Are reduced-sized neutrals allowed for mobile home manufactured home feeder conductors?

Answer: Yes. 550.33 (B) says that conductors are permitted to be sized in accordance with 310.15(B)(7) and this section permit's the neutral to be smaller than the ungrounded conductors.

(7) Single-Phase Dwelling Services and Feeders. For onefamily dwellings and the individual dwelling units of two-family and multifamily dwellings, service and feeder conductors supplied by a single-phase, 120/240-volt system shall be permitted to be sized in accordance with 310.15(B)(7)(1) through (4).

(4) Grounded conductors shall be permitted to be sized smaller than the ungrounded conductors, if the requirements of 220.61 and 230.42 for service conductors or the requirements of 215.2 and 220.61 for feeder conductors are met.

14. Is a receptacle required in a single-family detached garage?

Answer: If the detached garage has electrical power, then yes, at least one receptacle other than those for specific equipment, such as a garage door opener, shall be installed in in each vehicle bay and not more than 7½ feet above the floor in a detached garage. If there is no electrical power in the detached garage, then a receptacle is not required. NEC 210.52(G)(1).

15. I was told that I had to pigtail the neutral connection to receptacles to prevent an open neutral if one of the receptacle was removed. Is this true?

Answer: Yes and No. If the receptacle is part of a multi-wire branch circuit, the neutrals must be spliced with a pigtail going to the receptacle. 300.13(B). If the receptacle is on a single branch circuit then pig-tailing is not necessary.

16. The owner says he has to remove the take out auger on a bin, when the auger plugs up. In this situation, may I use type "SO" cord for permanent wiring?

Answer: No, 400.12, but if you use a receptacle cord cap at one end, then it may be used. 400.10. Cords cannot be used as a substitute for fixed wiring.

17. If a spare ungrounded conductor is installed from a switch location in a dwelling to a ceiling mounted box, but not connected to a switch or light, would the ceiling box be required to suitable for fan support?

Answer: Yes, 314.27(C) Box shall be listed for sole support of a paddle fan.

Where spare, separately switched, ungrounded conductors are provided to a ceiling-mounted outlet box, in a location acceptable for a ceiling-suspended (paddle) fan in one-family, two-family, or multifamily dwellings, the outlet box or outlet box system shall be listed for sole support of a ceiling suspended (paddle) fan.

18. A receptacle is added in a residential bedroom on an existing circuit. Does this existing circuit require to be AFCI protected?

Answer: Yes. 210.12(D) If a circuit is extended or modified then AFCI is required, by either an AFCI breaker or AFCI receptacle on the first receptacle outlet of the circuit.

19. A transformer has the neutral bonded to the frame inside the transformer. Where do I connect the grounding electrode conductor to, the breaker panel or the transformer? Does this need to be a separate conductor to the grounding electrode?

Answer: You make your grounding electrode connection at the transformer, where the neutral is bonded to the frame NEC 250.30(A)(5)

Yes, 250.121 The equipment grounding conductor shall not be used as a grounding electrode conductor.

20. Is a neutral conductor to be installed at all 3 and 4 way switches?

Answer: No 404.2 (C)

404.2 Switch Connections.

(C) Switches Controlling Lighting Loads. The grounded circuit conductor for the controlled lighting circuit shall be installed at the location where switches control lighting loads that are supplied by a grounded general-purpose branch circuit serving bathrooms, hallways, stairways, or rooms suitable for human habitation or occupancy as defined in the applicable building code. **Where multiple switch locations control the same lighting load such that the entire floor area of the room or space is visible from the single or combined switch locations, the grounded circuit conductor shall only be required at one location.**

21. On a single lot you have a 200 amp main breaker single phase meter pedestal located out by the back of the lot of a zoned single family residential neighborhood. The 200 amp main breaker panel is located on the basement wall of a house within 5 feet inside the house. How many conductors are required from the meter to the house? What type of grounding is required at the pedestal and at the house?

Answer: It depends on who owns the pedestal, if the utility owns the pedestal, then we do not consider that as a service. Then all you need is 3 conductors between the pedestal and the panel in the house. If the owner of the property owns the meter-breaker pedestal, then that would be a service to the property, then 4 conductors would be required between the pedestal and the panel in the house.

You still need to establish a grounding electrode system at the pedestal and at the house. The grounding electrode would connect to the neutral terminal at the pedestal.

If you install 3 conductors to the panel in the house, then the house grounding electrode system would connect to the neutral terminal of the service panel.

If you install 4 conductors to the panel in the house, then the grounding electrode system would connect to the equipment ground bar in the service panel. You also must isolate all neutral and grounds in the house service panel. 250.50 and 250.32.

22. A small maintenance building was built on a concrete foundation 500 feet away from the main building. The building has a 150 amp panel fed underground from the main building. This feeder contains a grounded conductor and an equipment grounding conductor. Is it required to connect this panel to the UFER ground? What terminal in the panel do I connect the grounding electrode conductor to? The neutral, or equipment ground?

Answer: Yes, 250.32 Each building shall have a grounding electrode system. The UFER ground is required to connect to the equipment grounding bar in the panel. 250.32(B)(1) The grounded conductor shall not be connected to the grounding electrode when an equipment grounding conductor is installed at the service panel.

23. Can I install a dishwasher and a garbage disposal together on a single phase, 120 volt 20 amp small appliance branch circuit?

Answer: No, Yes, Maybe. Dishwashers and disposals can not be on the appliance branch circuit serving the countertop, 210.52(1) and (2). Can the disposal and dishwasher be on the same circuit? 210.23 Yes depending... that the disposal or dishwasher does not exceed 50% of the branch circuit rating and the total load does not exceed 80% of the branch circuit rating.

24. What fittings on metal raceways are required to be used on exterior of a building, weatherproof or rain tight?

Answer: Raintight 358.42 EMT couplings and connectors where installed in wet locations shall comply with 314.15.

314.15 Damp or Wet Locations. In damp or wet locations, boxes, conduit bodies, outlet box hoods, and fittings shall be placed or equipped so as to prevent moisture from entering or accumulating within the box, conduit body, or fitting. Boxes, conduit bodies, outlet box hoods, and **fittings** installed in wet locations shall be listed for use in wet locations.

25. What is the distance the equipotential bond wire is required to be installed, measuring from the edge of a pool, without a concrete deck?

Answer: 18 to 24 inches and buried 4 to 6 inches. 680.26(B)(2)

(2) Perimeter Surfaces.

(b) *Alternate Means.* Where structural reinforcing steel is not available or is encapsulated in a nonconductive compound, a copper conductor(s) shall be utilized where the following requirements are met:

- (1) At least one minimum 8 AWG bare solid copper conductor shall be provided.
- (2) The conductors shall follow the contour of the perimeter surface.
- (3) Only listed splices shall be permitted.
- (4) The required conductor shall be 450 mm to 600 mm (18 in. to 24 in.) from the inside walls of the pool.
- (5) The required conductor shall be secured within or under the perimeter surface 100 mm to 150 mm (4 in. to 6 in.) below the subgrade.

26. What is the sizing ruling for an equipment grounding conductor in a raceway that contains multiple circuits

Answer: It shall be sized to the largest over current device protecting the conductors in the raceway. 250.122(C) Use table 250.122 to size the equipment ground wire.

27. How close to a bathtub/shower compartment can a light switch be located?

Answer: The switch could be located right next to the shower stall, but not in the shower or bathtub stall. 404.4(C).

If this was a whirlpool tub, and a switch is located within 5 feet of the tub, then the switch would have to be bonded to the motor of the whirlpool tub. NEC 680.74. This is a code change for the 2017 NEC.

680.74 Bonding. (read and explain this code change)

(A) General. The following parts shall be bonded together:

- (1) All metal fittings within or attached to the tub structure that are in contact with the circulating water
- (2) Metal parts of electrical equipment associated with the tub water circulating system, including pump and blower motors.
- (3) Metal-sheathed cables and raceways and metal piping that are within 1.5 m (5 ft) of the inside walls of the tub and not separated from the tub by a permanent barrier
- (4) All exposed metal surfaces that are within 1.5 m (5 ft) of the inside walls of the tub and not separated from the tub area by a permanent barrier
- (5) Electrical devices and controls that are not associated with the hydromassage tubs and that are located within 1.5 m (5 ft) from such units**

28. Can a marking pen be used to “legibly mark” the available fault current on a service disconnect? What if the marking is inside the door of an outdoor disconnect?

Answer: 110.24 requires the available fault current to be legibly marked on the service equipment and be of sufficient durability to withstand the environment involved. How it is marked is up to the AHJ.

29. A PVC service conduit is installed outdoors from the meter socket down into a cement slab under the meter socket. Is an expansion fitting required for this conduit?

Answer: Not really required, but it would be a good idea to allow for movement and settling of the concrete slab. 300.5(J) says we are to allow for ground movement. 300.7(B) using expansion fittings when necessary.

30. Engineers often asked for a ground rod at parking light poles. What conductor should the ground rod be connected to? The neutral (if installed) or the equipment ground wire.

Answer: The ground rod must be connected to the equipment ground wire. 250.54

250.54 Auxiliary Grounding Electrodes. One or more grounding electrodes shall be permitted to be connected to the equipment grounding conductors specified in 250.118 and shall not be required to comply with the electrode bonding requirements of 250.50 or 250.53(C) or the resistance requirements of 250.53(A)(2) Exception, but the earth shall not be used as an effective ground-fault current path as specified in 250.4(A)(5) and 250.4(B)(4).

31. Is it permissible to install SER cable in an underground PVC raceway between a house and a garage?

Answer: No, 338.12, uses not permitted, 338.12(A)(2) not permitted underground with or without a raceway.

32. . My grounding electrode system consists of a water pipe, a UFER, and a ground rod. My service conductors are 500kcmil copper. Can I run a 1/0 CU grounding electrode conductor to the water pipe, then a #4 cu conductor from the water pipe to the UFER, then a #6 cu from the UFER to the ground rod”

Answer: Yes this will work. 250.50 says that all electrodes used at a building must be bonded together. 250.64(F) is the installation of the electrode conductors and the jumpers between them. 250.66 tells the size of

the electrode conductors and jumpers. Use table 250.66 to size the electrode conductor to the water pipe. 250.66(B) #4 copper conductor to the UFER ground. 250.66(A) #6 copper conductor to the ground rod.

33. In a new house, the owner does not want the service panel any place on the main floor, he wants it hidden. The only place to install the service panel is in a 3 foot high crawl space, am I allowed to install the service panel in the crawl space? What if the service panel is located in a 8 foot by 8 foot room with a ceiling height of 7 feet, but the only way to get to the service panel is by crawling 10 feet in a 3 foot crawl space under the house, Will this installation work?

Answer: First question No, no, no. 110.26 spaces about electrical equipment, then go to 110.26(A)(3) height of working space. This requires 6 ½ or more of head room in front of the service panel, this measurement is from the floor.

Second Question: 230.70(A)(1) requires the service panel to be installed in a readily accessible location.

Definition of readily accessible was changed in the 2017 NEC to include crawling under,

Accessible, Readily (Readily Accessible). 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. (CMP-1)

The answer to the second question would be no, the service panel is not readily accessible.

34. Is the receptacle for the garbage disposal located below the kitchen sink required to be GFCI protected?

Answer: Yes, the receptacle under the kitchen sink is required to be GFCI protected, 210.8(7), all receptacle within 6 feet of sinks require to be GFCI protected.

(We as inspectors do not consider a cabinet door as a door or doorway)

35. Can I run NM cable thru PVC conduit under a concrete slab floor in direct contact with the earth in a kitchen to get power to an island?

Answer: No - PVC conduit underground or under a slab is considered a wet location. 300.5(B). Article 334.12 Type NM cables shall not be permitted as follows 334.12(B) Types NM and NMS cables shall not be used under the following conditions or following locations. (4) In wet or damp locations.

36. I just finished wiring a convention center where there were vending machines on each of 5 floors. The inspector told me I had to have GFCI receptacles for the vending machines. This is inside not outside where does the code required that vending machines have GFCI protection?

Answer: Vending machines do require GFCI protection, NEC 422.5(A). This is a change in the 2017 NEC.

422.5 Ground-Fault Circuit-Interrupter (GFCI) Protection for Personnel.

(A) **General.** Appliances identified in 422.5(A)(1) through (5) rated 250 volts or less and 60 amperes or less, single- or 3-phase, shall be provided with GFCI protection for personnel. Multiple GFCI protective devices shall be permitted but shall not be required.

- (1) Automotive vacuum machines provided for public use
- (2) Drinking water coolers
- (3) High-pressure spray washing machines — cord-and-plug connected
- (4) Tire inflation machines provided for public use
- (5) Vending machines

The GFCI protection can either be GFCI breaker, GFCI receptacle, or GFCI in the vending machine cord, NEC 422.5(B). Since a person has no way of knowing if there will be GFCI in the cord, it would be best to use GFCI receptacle or GFCI breaker. Remember the GFCI device must be readily accessible.

37. I recently installed a dry transformer in a building and the transformer was protected by an over current device on the supply side of the transformer that was sized appropriately to protect the secondary conductors that fed a main lug only panel. The inspector told me I need a main in the panelboard. Is that correct?

Answer: Yes of course, the inspector is always correct.

Article 450.3(B) table - allows the protection of the conductors on the secondary side of the transformer under certain conditions, however, Article 408.36 requires that the panelboards have over current protection to protect the panel board. Article 408 applies to all panelboards and has nothing to do with transformers.

408.36 Overcurrent Protection. In addition to the requirement of 408.30, a panelboard shall be protected by an overcurrent protective device having a rating not greater than that of the panelboard. This overcurrent protective device shall be located within or at any point on the supply side of the panelboard.

38. I just installed a 3-phase 480 volt fused service to a larger chiller. The inspector told me I had to carry a grounded conductor to the service even though it will never need a neutral. This is a pure motor load only. Why is that?

Answer: You must have the grounded conductor brought to the service disconnecting means, 250.24(C) AC current must always return to its source, so if a ground fault occurs from a phase conductor to the motor frame for instance, the fault current will flow through the equipment-grounding conductor to the main bonding jumper and over the grounded circuit conductor back to the transformer. The current flow that results will cause the fuse in the faulted circuit conductor to open.

39. If you have a receptacle within 6' of a kitchen sink but is behind the refrigerator does it need to be GFCI protected?

Answer: 210.8(A) requires GFCI protection in the following locations in a dwelling unit. 210.8(A)(7) receptacles that are installed within 6 feet of sinks required GFCI protection. The answer is yes, that receptacle would require GFCI protection. The GFCI device must be readily accessible, so the GFCI receptacle cannot be installed behind a fridge.

40. I am wiring a cattle barn and installing 20 amp 120 volt receptacles about 8 feet above the floor for big cooling fans. Are these receptacles require to be GFCI protected? And can I use GFCI receptacles?

Answer: Yes - 547.5(G) All receptacles in buildings that require an equipotential plane are to be GFCI protected, even receptacles for special equipment. GFCI receptacles must be readily accessible 210.8 so a person could not install them 8 feet above the floor, either use breakers or install GFCI receptacles lower and feed the fan receptacles from the GFCI receptacles.

41. I am installing electric heating cables under ceramic tile in a kitchen floor. Do the heating cables require to be GFCI protected, even though the thermostat has GFI protection in it?

Answer: Yes - 424.44(E) Be careful some thermostats say they have GFI protection in them, which means they do not have GFCI for personal which is required in 424.44(E). Some thermostats are labeled as GFCI Class A which is required by the NEC, if you use that type of thermostat then a GFCI breaker would not be required.

42. Do receptacles that are 5 1/2 feet or higher in a dwellings require to be tamper resistant?

Answer: No - 406.12 ex.1

406.12 Tamper-Resistant Receptacles. All 15- and 20-ampere, 125- and 250-volt nonlocking-type receptacles in the areas specified in 406.12(1) through (7) shall be listed tamper resistant receptacles.

(1) Dwelling units in all areas specified in 210.52 and 550.13

(2) Guest rooms and guest suites of hotels and motels

(3) Child care facilities

(4) Preschools and elementary education facilities

(5) Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities

(6) Subset of assembly occupancies described in 518.2 to include places of waiting transportation, gymnasiums, skating rinks, and auditoriums

(7) Dormitories

Exception to (1), (2), (3), (4), (5), (6), and (7): Receptacles in the following locations shall not be required to be tamper resistant:

(1) Receptacles located more than 1.7 m (5 1/2 ft) above the floor

43. Can NM cable be used in storage buildings of 2-family dwellings?

Answer: Yes - 334.10(1)

334.10 Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following, except as prohibited in 334.12:

(1) One- and two-family dwellings and their attached or detached garages, and their storage buildings.

44. I have a 120 volt duplex receptacle installed for a washer in a laundry area. Is it required to have AFCI protection and GFCI protection?

Answer: Yes to both requirements. 210.12 laundry area is included for AFCI protection. 210.8(A) the laundry area is on the list of receptacles that require to be GFCI protected. Both requirements was added to the 2014 NEC.

45. Is it required to install a ground rod at a dwelling unit in addition to the concrete-encased electrode?

Answer: No, 250.52(3), the concrete encased electrode does not require a supplemental electrode. The only electrodes that require additional electrodes are ground rods, plate, and metal underground water pipe, NEC 250.53.

46. What is the definition of readily accessible in the 2017 NEC?

Answer:

Accessible, Readily (Readily Accessible). 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. (CMP-1)

47. I have installed a new step down transformer from 480 volts to 120/208 volts. Where do I terminate the Grounding electrode conductor? At the transformer or at the branch circuit panel board?

Answer: 250.30(A)(5) It all depends on where you install the main bonding jumper. If you bond the neutral of the transformer to the transformer frame, then the grounding electrode would terminate in the transformer. If you do not bond the neutral to the transformer frame, but install the main bonding screw in the panel board, then the grounding electrode would terminate in the panel board. You can only bond the neutral at one location only, Either at the transformer or the panel board, not both places.

48. I need to change out an non-grounded type receptacle on an old two wire cable without a ground, what can I replace it with?

Answer: 406.4(D)(2)

49. A house has flood damage to a level of two feet, the outlets and wire have to be replaced, do the replacement receptacles have to be tamper resistant?

Answer: Yes - 406.4(D)(5)

(D) Replacements. Replacement of receptacles shall comply with 406.4(D)(1) through (D)(6), as applicable. Arc-fault circuit-interrupter type and ground-fault circuit-interrupter type receptacles shall be installed in a readily accessible location

(5) Tamper-Resistant Receptacles. Listed tamper-resistant receptacles shall be provided where replacements are made at receptacle outlets that are required to be tamper-resistant elsewhere in this *Code*, except where a non-grounding receptacle is replaced with another non-grounding receptacle.

50. . Does the NM cable that is dropping down from the ceiling to the hot water heater require to be in conduit?

Answer: Yes, 334.15, NM cable must follow the surface of the building, and protected from physical damage.

334.15 Exposed Work. In exposed work, except as provided in 300.11(A), cable shall be installed as specified in 334.15(A) through (C).

(A) To Follow Surface. Cable shall closely follow the surface of the building finish or of running boards.

(B) Protection from Physical Damage. Cable shall be protected from physical damage where necessary by rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 PVC conduit, Type RTRC marked with the suffix - XW, or other approved means.

51. I had just finished a new house, and the electrical inspector wrote me up saying the garage door opener receptacles and the sump pump receptacle s are required to be GFCI protected. Why is that since it was OK in the house I wired eight years ago?

Answer: Those receptacles used to be exempt from GFCI protection in our older wiring bulletin. Effective July1, 2011, those exemptions were removed from our wiring bulletin. So now all receptacles in garages and

unfinished basements are required to be GFCI protected as per NEC 210.8(A). The reason is, if we did exempt a receptacle in the garage for a freezer to be GFCI protected and the house get sold, now we have a receptacle in the garage that is not GFCI protected.

52. I am wiring a small office building that is wood constructed with ½ inch sheetrock on the walls. I know I can use type NM cable in the walls. Can I use type NM cable for fixture whips above the suspended ceiling system?

Answer: No - 334.12 - uses not permitted for type NM cable. It says that type NM cable can not be exposed above dropped or suspended ceilings in other than dwellings.

53. When terminating MC cable to a metal box, what type of connectors can be used?

Answer: 330.6 - The fitting or connectors have to be listed and identified for use with MC cable. Most NM cable connectors are not identified to be used with MC cable. This code section was added to the 2017 NEC replacing 330.40.

330.6 Listing Requirements. Type MC cable shall be listed. Fittings used for connecting Type MC cable to boxes, cabinets, or other equipment shall be listed and identified for such use.

54. I am installing a circuit to equipment with a 190 ampere rating. Am I allowed to parallel 2 #2 AWG copper conductors instead of a single 3/0 copper conductor to the equipment?

Answer: No - even though both types of installation will be able to carry the load. 310.10(H)(1) requires that conductors 1/0 and larger can be permitted to be installed in parallel.

55. I am installing 10 feet of PVC conduit on the outside of a house for an outside light. Am I allowed to use NM cable inside the conduit since the NM cable originates from a switch inside the house?

Answer: No - 300.9 - says that the interior of a raceway in wet locations such as outdoors is considered a wet location. 334.10(A) requires that NM cable is to be used in a dry location. 334.12(B) prohibits NM cable to be used in wet or damp locations.

56. The main service disconnect is located on the outside of the house with a 4-conductor cable to a subpanel located in the utility room. The subpanel is about 5 feet away from the underground metal water pipe and the Ufer ground connection. Can I connect both electrodes to the equipment ground bar in the subpanel?

Answer: No - 250.121 - The equipment grounding conductor shall not be used as a grounding electrode conductor. You must install a separate grounding electrode conductor to the main service disconnecting means.

250.121 Use of Equipment Grounding Conductors. An equipment grounding conductor shall not be used as a grounding electrode conductor.

Exception: A wire-type equipment grounding conductor installed in compliance with 250.6(A) and the applicable requirements for both the equipment grounding conductor and the grounding electrode conductor in Parts II, III, and VI of this article shall be permitted to serve as both an equipment grounding conductor and a grounding electrode conductor.

57. I am using 2 pole breakers rated 120/240 volts in a breaker panel with a 120/240 volt 3 phase service with a B phase wild leg. I was told I can not use this type of breaker on the B phase. Why is that?

Answer: 240.85 - the voltage to ground shall not exceed the lower of the 2 voltage values of the circuit breaker's voltage rating. B phase voltage is around 208 volts to ground which is higher than 120 volt rating of the circuit breaker. So use a circuit breaker with a straight 240 volt rating on the B phase, or install the breakers on phases A and C.

58. I am installing receptacles in a locker room, there are no sinks in the locker room, so this room does not meet the definition of a bathroom. There is a shower area through a doorway. Are the receptacles in the locker room required to be GFCI protected?

Answer: Yes - 210.8(B)(7) - Receptacles in locker rooms with associated showering facilities are required to be GFCI protected.

59. I am feeding equipment with 4 - #6 AWG, all conductors are Black. Am I allowed to identify the neutral with white tape and the equipment ground with green tape at the terminal connections?

Answer: No - 200.6 for the neutral conductor. Conductors #6 and smaller must be identified the entire length by one of the methods listed in 200.6, Conductors #4 and larger can be identified with white tape at the terminations.

250.19 for the equipment ground wire, conductors #6 and smaller must be green or bare the entire length of the conductor. Conductors #4 and larger can be identified with green tape or the visible length of conductor stripped

60. What is the minimum service size for 2 2-wire branch circuits?

Answer: 230.79(B) - 30 amps

230.79 Rating of Service Disconnecting Means. The service disconnecting means shall have a rating not less than the calculated load to be carried, determined in accordance with Part III, IV, or V of Article 220, as applicable. In no case shall the rating be lower than specified in 230.79(A), (B), (C), or (D).

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

(B) Two-Circuit Installations. For installations consisting of not more than two 2-wire branch circuits, the service disconnecting means shall have a rating of not less than 30 amperes.

(C) One-Family Dwellings. For a one-family dwelling, the service disconnecting means shall have a rating of not less than 100 amperes, 3-wire.

(D) All Others. For all other installations, the service disconnecting means shall have a rating of not less than 60 amperes.

61. Are tamper resistant receptacles required in class rooms in an elementary school building?

Answer: Yes, 406.12 (Tom, could you please explain this entire code section)

406.12 Tamper-Resistant Receptacles. All 15- and 20-ampere, 125- and 250-volt nonlocking-type receptacles in the areas specified in 406.12(1) through (7) shall be listed tamper resistant receptacles.

(1) Dwelling units in all areas specified in 210.52 and 550.13

(2) Guest rooms and guest suites of hotels and motels

(3) Child care facilities

(4) Preschools and elementary education facilities

(5) Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities

(6) Subset of assembly occupancies described in 518.2 to include places of waiting transportation, gymnasiums, skating rinks, and auditoriums

(7) Dormitories

