

## 2008 Commercial Electrical Q & A

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1. I have a 10' long 1200 ampere 480/277 volt switchboard installed in an electrical equipment room. One end of the switchboard is against the wall on the far end of the room from the door. There is 45" from the front of the switchboard to a concrete block wall. The inspector says that I need a door at each end of the working space; however I feel we have a clear unobstructed path from the front of the switchboard to the door. Who is right?

Ans, The inspector NEC 110.26(C)(2)

110.26(C)(2) generally requires equipment rated 1200 amperes or more to have an entrance to the work space at each end of the equipment. 110.26(C)(2)(a) allows one entrance where there is a continuous unobstructed way of exit travel. 110.26(C)(2)(b) allows one exit where the depth of the work space is twice the requirement of 110.26(A)(1) and the entrance is not nearer to the equipment than that required by Table 110.26(A)(1).

2. I am installing an air conditioner unit. The name plate indicates the minimum ampere rating is 16.2 ampere and maximum fuse or circuit breaker is 25 amperes. I didn't have any #12 AWG wire on the truck and when I called the boss to bring me some he said I could use #14 AWG. Isn't this a violation?

Ans. No NEC 240.4(D), 240.4(G), Table 310.16, 440.4

NEC 240.4(D) indicates that unless allowed by 240.4(E) or (G) the overcurrent protection for #14 AWG wire shall not exceed 15 amperes. 240.4(G) references the overcurrent protection of circuit conductors for air conditioning equipment are permitted to be provided as referenced by 440, Parts III, and IV. 440.4(B) requires the minimum supply circuit conductor ampacity be indicated on the nameplate. Table 310.16 allows an ampacity of 20 amperes for #14 AWG wire if meeting the requirements of 240.4(D).

3. We are installing a fire pump at an existing facility that has a standby generator. There are 2 existing transfer switches, one for the emergency egress lighting and one for optional loads. Can we feed the fire pump from the emergency transfer switch?

Ans. No NEC 695.3(A)(1), 695.3(B)(1), 695.10

Fire pumps are required to be supplied by a reliable source of power. 695.3(A) requires either a utility source or an on-site power production facility. The emergency generator would not qualify as an on-site power production facility. 695.3(A)(1) allows a tap ahead of the service disconnecting means. If you want to use the generator as a standby source, 695.10 would require the transfer switch used for the fire pump circuit be listed for fire pump use.

4. I am wiring a small office building and the plan calls for unit equipment for required egress lighting and exit lights. The plan also calls for a separate circuit to be used to feed

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all of the unit equipment. It would be a lot easier and cheaper if I used a circuit that is in the area. Is this OK?

Ans. Yes in fact it may be required. NEC 700.12(F)

Unit equipment is required by 700.12(F) to be supplied by a local lighting circuit ahead of any switching. The exception to 700.12(F) only allows a separate circuit if the room is a large uninterrupted space supplied by 3 or more normal lighting circuits.

5. We recently finished wiring a large new sports bar in town. There are a number of flat screen TV's installed throughout, with the power cord and cable connection run through the ceiling tile to receptacles located above the ceiling tile. This municipality does not have a commercial electrical inspector but when the fire inspector did his walk through he indicated this was a violation. Is he correct?

Ans. Yes NEC 400.8(1), & (2), 820.113, 820.154

Flexible cords are not allowed above a suspended ceiling by 400.8(2).

6. We have an installation where we are feeding a 120/208 volt 3 phase distribution panel from a 277/480 volt panel via a 150 KVA XFMR. A question has come up with the local inspector regarding the tap rules. We have an overcurrent protection device for the primary feed to the transformer and we terminated the secondary conductors without a disconnecting means into a 600 amp rated MLO, 42 circuit appliance panelboard. Please let me know whether this is permissible or not. The secondary conductor length is less than 10 ft. and the total conductor length primary plus secondary is less than 25 ft. Is this OK?

Ans. No NEC 408.34, 408.36(A), 240.4(F), 240.21(C), 450.3

Lighting and appliance branch circuit panelboards are described in 408.34 and are required to be individually protected at not more than that of the panelboard by 408.36(A). NEC 240.4(F) indicates the secondary conductors of a Y connected transformer are not protected by the primary overcurrent device. 240.21(C)(2) indicates that for 10' or less of secondary conductor be sized not less than the load being supplied, not less than the rating of the overcurrent device at the termination of the secondary conductors, and not less than one-tenth the rating of the primary overcurrent device multiplied by the primary to secondary transformer voltage. It also requires the secondary conductors not extend beyond the panelboard being supplied and be enclosed in a raceway. 450.3 would require the secondary be protected at not more than 125% so a 600 ampere overcurrent device would be allowed.

- 7 I'm working on a new building on a hospital campus here in Madison. We're feeding the new building from the existing hospital physical plant. The feeders, with proper

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overcurrent protection, are being run underground from the physical plant (about a block away) and into the lower level of the new building. The feeders then run for some distance across the ceiling of the lower level of the new building prior to reaching the main electrical room. Is this OK?

Ans. Not if the length of the raceway inside the new building is more than 8'. NEC 225.31, 225.32, Comm.16.25(4)(a), 230.6

A disconnecting means for all ungrounded conductors entering or passing through a building is required by 225.31. This disconnect would need to be located outside or nearest the point of entrance to the building by 225.32. Comm.16.25(4)(a) would limit this length to no more than 8'.

8. Do I need to include the molded in cable clamps in a plastic device box when doing box fill calculations?

Ans. Yes 314.16(B)(2)

314.16(B)(2) indicates that where an internal clamp is present, whether field or factory installed, a deduction of 1 conductor based on Table 314.16(B) be made.

9. We are wiring a new office building and plan on using unit equipment to provide egress lighting, on the last similar job we had to add 4 more lights to satisfy the inspector when she did the final inspection. How can I avoid this on this job?

Ans. The easiest way is to have a photometric study done. IBC 1003.2.11.1, 1003.2.11.3

The building code IBC 1003.2.11.1, requires an illumination level of not less than 1 foot-candle for normal lighting whenever a building is occupied. IBC1003.2.11.3 Emergency illumination requires an illumination level of an average of 1 foot-candle and a minimum at any point of 0.1 foot-candle along the path of egress with a maximum to minimum ratio of 40 to 1

10. I have a question regarding the use of smurf tubing in a 4 story sprinklered office building of Type II construction. We would like to install it in the metal stud walls and bring it out of the wall to junction boxes located above the suspended ceiling. Will this be acceptable?

Ans. Yes NEC 362.10(1) & Exc.

362.10(2) requires ENT to be concealed behind at least a 15 minute finish rating in any building over 3 stories. The exc. to (2) allows it to be exposed where the building is sprinklered.

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11. Recently I was hired to check out an old service prior to reenergizing. I thought that I could reuse the existing grounding electrode conductor because it was of sufficient size however the electrical inspector told me that I could not use it because it was in a raceway with other conductors. I replaced it to satisfy the inspector. However I feel that I was required to do something that is not required and my customer had to pay for something that was unnecessary. I checked in Article 250 and can't find anything prohibiting this.

Ans. You are right there is nothing prohibiting this if installed correctly. NEC 230.7 Exc. 1, 250.92(A)(3), 250.92(B), 250.64(E)

Exc. 1 to 230.7 allows grounding conductors to be installed with service conductors. 250.92(A)(3) requires metallic raceway or armor enclosing a grounding electrode conductor to be electrically continuous between the service equipment and the grounding electrode. 250.92(B) gives the means of bonding, i.e. bonding locknuts, bonding bushings with a jumper, threaded hubs, and proper connector at electrode.

12. The inspector is requiring that we put listed grommets on all of the steel studs where ENT is installed. Are they required?

Ans. No NEC 300.4(B)(1)

300.4(B)(1) applies only to NM cable and requires bushings be installed in metal framing members.

13. I am wiring a 4 family condominium building. Each unit is fed from a separate 200 amp panel. Some of the branch circuit cables are bundled. I am being told it is a commercial building and thus requires derating of the conductors. Is this correct?

Ans. No. NEC 310.15(B)(2)(a), Comm. 16.30(1) exc. 6

NEC 310.15(B)(2)(a) requires cables to be derated when bundled together. Comm. 16.30 exc. 6 indicates the derating factors shown in Table 310.15(B)(2) do not apply to branch circuits supplying an individual dwelling unit.

14. I am installing the parking lot lights at a new car dealership. I will be using PVC conduit to run between the lights. Do I need to install expansion joints, underground, in the conduit runs between the lights?

Ans. No NEC 352.44

NEC 352.44 requires expansion fitting where the thermal expansion and contraction is  $\frac{1}{4}$  inch or greater  
NEC 352.44 requires expansion fitting where the thermal expansion and contraction is  $\frac{1}{4}$  inch or greater. The Carlon web site "carlon.com" has a link to a NEMA paper

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explaining the proper use and installation of expansion joints. This paper indicates expansion joints are to be installed in “aboveground” runs of conduit

15. I have a 50' X 75' storage building that is part of a small multi-building manufacturing facility. The building is presently fed with a 100 ampere 120/240 volt single phase feeder from the main plant. The owner would like to do some assembly work in this building and needs an additional 200 amperes of power. Can I run another feeder to supply the added equipment?

Ans. Probably not. NEC 225.30,

NEC 225.30 indicates the following. **Where more than one building or other structure is on the same property and under single management, each additional building or other structure that is served by a branch circuit or feeder on the load side of the service disconnecting means shall be supplied by only one feeder or branch circuit unless permitted in 225.30(A) through (E). For the purpose of this section, a multiwire branch circuit shall be considered a single circuit.**

**(A) Special Conditions Additional feeders or branch circuits shall be permitted to supply the following:**

- (1) Fire pumps**
- (2) Emergency systems**
- (3) Legally required standby systems**
- (4) Optional standby systems**
- (5) Parallel power production systems**

16. We are remodeling an existing bar and when the inspector did his final inspection he found an existing sub-panel was fed with a 3-wire feeder with the grounded conductor bonded to the enclosure. He wants us to install a 4-wire feeder but I say it's existing and we shouldn't be required to change it. Who's right.

Ans. Probably the inspector Comm. 16.03(3), 16.09 NEC 250.24(A)(5)

NEC 250.24(A)(5) indicates that a grounding connection shall not be made to a grounded conductor on the load side of a service disconnecting means. Comm. 16.03(3) indicates existing installations shall comply with the code that applied at the time. The language in 250.24(A)(5) has been in the code for quite some time so unless you know when the panel was installed and can prove the code at this time allowed it I would side with the inspector.

17. I inspected a commercial building and noted that the electrical boxes on the exterior wall were not being sealed. The construction of the exterior walls are masonry with 2" of foam insulation, a 2" air space then bat insulated metal studs on the interior covered by gypsum board. I feel they should be sealed. Is this correct?

Ans. Maybe depending on conditions. Wis. Enrolled Code.802.3.2 addresses penetrations in the building envelope.

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Where penetrations exist in the envelope they shall be sealed with caulking materials or closed with gasketing systems compatible with the construction materials and location. The complete envelope is considered from the exterior face of the brick to the interior face of the dry wall

18. I have a customer that is proposing to build a new building and purchase primary metering from the utility at 12470/7200 volts WYE configuration. They will provide their own transformer and underground primary conductors. What do I need to be looking for?

Ans. Part VIII of Article 230, 300.50,

The service point is the point of connection between the facilities of the serving utility and the premise wiring. The NEC will apply to all of the customer owned equipment and installation practices. 230.208 provides information on protection requirements.

19. I am going to be wiring a new design build office building. Do I need to have a lighting plan done and submitted for plan approval?

Ans. A lighting plan is required however plan approval is not. Comm 63

The plan needs to be available to the inspector if requested.

20. I have a 200 ampere 120/240 volt 42 circuit service panel and because of the need for more branch circuits I plan to install a second panelboard. Do I need overcurrent protection for the second panel? Does the feeder need to be a 4 wire?

Ans. Yes to both questions NEC 215.1, 215.3, 215.6, 250.24(A)(5) 250.134, 408.36

NEC 215.1 covers feeder sizing and overcurrent protection. 215.3 directs us to Part I of Art. 240 for overcurrent protection provisions. 250.24 (A)(5) indicates a grounding connection shall not be made to any grounded conductor on the load side of the service disconnecting means, thus a 4-wire feeder is required. NEC 408.36 would require that of the second panel is rated less than the 200 amperes, and meets the definition of a lighting and appliance branch-circuit panelboard, overload protection would be required at its ampere rating

21. I have a commercial property decorative pond which was built for storm water retention. They installed submersible pumps to circulate the water over a waterfall and also to be used for lawn sprinkling. How do I provide power for the pumps and any other concerns?

Ans. By definition this is addressed in Art. 682 page 543 Natural and Artificially Made Bodies of Water.

NEC 682.2 defines **Artificially Made Bodies of Water. Bodies of water that have been constructed or modified to fit some decorative or commercial purpose such as, but not**

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**limited to, aeration ponds, fish farm ponds, storm retention basins, treatment ponds, irrigation (channel) facilities. Water depths may vary seasonally or be controlled.**

NEC 682.11 requires the location of service equipment be a minimum of 5' horizontally from shoreline and 12" above electrical datum plane. 682.31(A) Requires equipment grounding conductors to be insulated, copper sized in accordance with 250.122 and not be smaller than #12 AWG. 682.32 covers bonding of non current carrying metal parts in contact with the water to the grounding bus in the panelboard.

22. I am installing a service for a new fire pump in an existing building. The fire pump controller will be located 15' inside the building. Because I am more than 8' inside the building am I required to install a service disconnect ahead of the controller?

Ans. Yes you are not allowed to enter the building more than 8' without a service disconnect being installed. Comm 16.25(4), 230.70(A), 695.4(B)(1)(2)&(5), 695.6(C)

NEC 230.70 requires a service disconnect to be located outside or inside nearest the point of entry and Comm. 16.25(4) limits this to not more than 8' of raceway or cable inside the building. 695.4(B)(1) indicates **Overcurrent Device Selection The overcurrent protective device(s) shall be selected or set to carry indefinitely the sum of the locked-rotor current of the fire pump motor(s) and the pressure maintenance pump motor(s) and the full-load current of the associated fire pump accessory equipment when connected to this power supply. The requirement to carry the locked-rotor currents indefinitely shall not apply to conductors or devices other than overcurrent devices in the fire pump motor circuit(s).** 695.4(B)(5) requires the disconnecting means shall be supervised in the closed position. 695.6(C) indicates the circuit conductors shall be sized at not less than 125% of the full load of the fire pump motor and the pressure maintenance motor and 100% of the associated fire pump accessory equipment

23 I understand that all standby generators are required to be located more than 20' from normal utility distribution equipment. Is this correct?

Ans. No the 20' separation requirement is only for emergency and legally required standby systems 700.12, Comm 16.45(2), emergency systems, 701.11, 16.48(1) for legally required systems.

It does not apply to optional standby systems under Art. 702. Comm. 16.45(2) applies only to Art. 700 for emergency systems and Comm. 16.48(1) applies only to Art. 701 for legally required systems.

24 I do wiring on center pivot irrigation machines and now find out that I must have a disconnecting means at the point of service and at the pump controller which in this case is located 800' from the service. Is this correct?

Ans. Yes 675.8(B), Comm 16.438

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Comm 16.438 requires a service disconnecting means with overcurrent protection shall be provided at the service point.

25. I installed neon tubing to light a cove area in an elevator lobby. I installed the ballast in an accessible location above the ceiling. The inspector is saying the opening in the ceiling needs to be 2'X3'. I feel I could use 410.84(A) which only requires accessibility. Who is right?

Ans. The inspector. 600.1, 600.21(E), 410.84(A)

NEC 600.1 indicates this Article covers electrical signs and outline lighting which would include this installation. 600.21(E) provides guidance for the access door and passageway of 3' high and 2' wide with a suitable permanent walkway at 12" wide extending from the point of entry to each component. NEC 410.84(A) part XIV applies to electrical discharge lighting systems of more than 1000 volts

26. At a 3-story hotel, we are installing 480-volt feeders up to each floor and the design calls for the grounding electrode conductor for the transformers to be installed in the power wiring conduit that feeds into the transformer disconnect at each floor. The building is wood frame so the grounding electrode system consists of the underground water piping and the concrete encased electrode. The power wiring is installed in PVC conduit with an equipment-grounding conductor. If we size the equipment grounding conductor to the required grounding electrode conductor size couldn't we use it for both applications? They're going to the same place.

Ans. No you need two separate conductors they are being used for two different things. 250.30

Equipment grounding conductors are required to carry ground fault current to facilitate the operation of the overcurrent device in the case of a ground fault. An equipment grounding conductor will only carry current in the event of a fault. The grounding electrode conductor connects the separately derived system to the grounding electrode to maintain the electrical equipment at the earth potential and may carry small amount of current under normal operating conditions. Thus the need for water meter jumper. NEC 250.30(A)(4) allows the use of a single grounding electrode conductor and installation of taps from each transformer

27. When a UFER ground is installed, is a supplemental electrode required?

Ans. No 250.50 250.52,250.53(D)(3) Comm 16.257

A concrete encased electrode is commonly referred to as a UFER ground. NEC 250.50 indicates that all grounding electrodes described in 250.52 (A)(1) through (A)(6) be bonded together to form the grounding electrode system. NEC 250.52 (A)(3) describes a concrete encased electrode to be 20' or more of ½" minimum steel reinforcing rods or 20' or more of minimum #4 AWG copper conductor encased by at least 2" of concrete to be considered

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a grounding electrode. NEC 250.53(D)(3) requires a supplemental electrode be installed for metal underground water pipe only. Comm. 16.257 presently requires the use of a concrete encased electrode only where available.

28. Can Type USE cable be installed to a service disconnect located inside a building?

Ans. No 338.10

Type USE cable does not have a flame retardant insulation and is not allowed to emerge above ground except to terminate in meter bases or other enclosures. Type USE/RHW would be allowed to enter a building because RHW is listed with a flame retardant rating

29. I am installing an 800 ampere feeder using 2 sets of paralleled 500 kcmil copper conductors in PVC conduit to a motor control center. What size equipment grounding conductor do I need to install?

Ans. 1/0 AWG 250.122(F)(1), Table 250.122

NEC 250.122 (F) requires an equipment grounding conductor to be installed in each raceway or cable. NEC 250.122(F)(1) indicates the equipment grounding conductor is to be sized using Table 250.122 based on the size of the overcurrent device protecting the circuit conductors

30. I am wiring a new office building that will have a conference room that is required to have 2 means of egress. I know I will need to install emergency egress lighting in the room. The building has an emergency generator and the owner does not want any unit equipment installed, however he also wants to be able to dim or turn off the emergency lights in this room when doing presentations. How can I do this?

Ans. There are controls available to allow you to accomplish this. 700.20 & UL FTBR

700.20 Indicates emergency lighting can be switched only if arranged so that only authorized persons have control. UL-FTBR and 924 are standards used to list controls for emergency lighting. There are manufacturers with relays and controls that are listed to switch or dim fixtures that will automatically restore emergency illumination levels upon the loss of power.

31. I have a contract to wire several sewage lift stations in my municipality. Now I'm being told these are hazardous locations and I need to do them per Art. 501. Is this correct?

Ans. Yes the interior of the pit is considered a Class I Div 1 location.

In Wisconsin there are 2 approved methods for wiring these lift stations. The first method involves installation of nonmetallic raceways for the cords from the wet well to a junction box where the conductors are spliced and then a threaded rigid metal raceway is used with an explosion proof seal installed as the first fitting after leaving the junction box to the

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controller. The conduits entering the junction box from the wet well also need to be sealed. This could be done with silicone sealant, or duxseal on the end of the conduit. The second method was adopted from Minnesota and allows nonmetallic raceways from the wet well to terminate with a cord grip that provides a seal. The cord is continued through a second grip into a raceway that enters the controller. The idea is that the cords are not installed through a typical explosion proof seal for ease of removal of pumps.

32. I am wiring a small mini-mall that is entirely wood frame except for a steel I-beam down the middle to help support the wooden roof trusses. It is supported on each end by the wooden walls and there are several steel posts spaced along it for added support. Would this be considered exposed structural building steel that would be required to be bonded?

Ans. No 250.104(C)

NEC 250.104(C) indicates the following **Structural Metal Exposed structural metal that is interconnected to form a metal building frame and is not intentionally grounded and is likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or the one or more grounding electrodes used.** This example is not steel that is interconnected to form a building frame and thus would not be required to be bonded

33. I recently did an office building rough in using Type AC cable for some of the receptacle circuits. The inspector is requiring anti-short bushings be installed on the cable. The cable actually came with a package of them but I lost them so I used connectors that have an insulated throat and are listed for Type AC/MC cable. Now I will have to remove all cables from the boxes to install them. Can he require this?

Ans. Yes 320.40

NEC 320.40 indicates that all terminations of AC cables shall have a termination that protects the wires from abrasion. In addition it requires an insulating bushing be installed between the armor and the conductors. The connector needs to be of such design so the insulating bushing or its equivalent be visible for inspection.

34. We recently installed a 60 ampere feeder to a small outbuilding. The owner only wanted 1 lighting circuit and 1 receptacle circuit in the building. I installed a small main lug panelboard and 2 circuit breakers. The inspector is telling me I have to install a main breaker. I feel I can use the 6 disconnect rule. Who is right?

Ans. The inspector. NEC 225.31, 225.36, Comm. 16.18, 408.36(F)

NEC 225.31 requires a disconnecting means be provided to disconnect all ungrounded conductors that supply a building. 225.36 requires this disconnect to be suitable for use as service equipment. Comm. 16.18 requires equipment to be installed per listing and labeling instructions. The manufacturer's instructions will indicate if the panel is suitable for service

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equipment and any other requirements for installation. Usually “Suitable for use as service equipment when a main breaker is installed”. 408.36(F) requires back-fed circuit breakers to be secured to the panelboard.

35. The new mini-mall we are wiring has a copper water line supplying the building. It then changes to plastic to each tenant space before changing back to copper for the plumbing in each tenant space. My question is do I need to bond all of this copper piping together? If so how and what size bonding conductors do I need?

Ans. Yes NEC 250.52, 250.66, 250.104, 250.122

NEC 250.52 requires 10' or more of metal water piping in contact with the earth to be used as a grounding electrode. Use Table 250.66 for the grounding electrode conductor based on the size of the service entrance conductors. NEC 250.104 (A) indicates that metal water piping systems are required to be bonded to the service equipment enclosure, grounded conductor at the service, the grounding electrode conductor, or one of the grounding electrodes. NEC 250.104(B) indicates that in buildings of multiple occupancies where the metal water piping each occupancy is isolated from the others by non-metallic piping you are allowed to bond from the equipment grounding terminal in that occupancies panelboard. These bonding conductors would be sized in accordance with Table 250.122 based on the size of the overcurrent device serving the panelboard

36. I recently installed a 30 HP, 3ph, 208 volt motor to pump manure from a sand separation facility on a large dairy farm. NEC 430.52 allowed me to size the branch circuit short-circuit and ground-fault protection, using an inverse time circuit breaker at 200 amperes. Am I required to size the equipment grounding conductor, using Table 250.122, for the 200 ampere breaker?

Ans. Yes NEC 250.122(D)

NEC 250.122(D) permits you to size the equipment grounding conductor to the size of the motor overload protective device only if protected by an instantaneous trip breaker or a motor short-circuit protector. You are using an inverse time circuit breaker.

37. We are going to be wiring a new church. The plan indicates it will be Type III-A construction. Is Type NM cable an acceptable wiring method for this building?

Ans. Yes NEC 518.4(B)

NEC 518.4(B) allows Type NM cable to be installed in an assembly hall where they are not required to be of a fire-rated construction. The commercial building code determines the different types of construction. Types III, IV, and V are considered non-combustible for the purposes of Comm. 16.

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38. While replacing some communication cables in an existing office building we found many cables that are no longer being used laying above the suspended ceiling. Do these as well as the ones we are replacing need to be removed?

Ans. Yes NEC 800.2, 800.3(C), 800.154

800.2 definitions indicates the following **Abandoned Communications Cable. Installed communications cable that is not terminated at both ends at a connector or other equipment and not identified for future use with a tag.** 800.3(C) requires the accessible portion of abandoned cables to be removed. There are similar requirements in Art. 640, 645, 725, 760, 770, 820, 830

39. The new manufacturing facility we are wiring is going to have a 480/277 volt service. We will be installing transformers to provide 208/120 volt loads. Are we required to use specific color coding on our branch circuits?

Ans. Identify by some means. NEC 210.5, 200.6, Comm. 16.185

NEC 210.5 (A) indicates 200.6 is used for identifying the grounded conductor. 200.6(A) allows the use of white for one system and gray for the other, or another color other than green with 3 continuous white stripes. 200.6(D) indicates that where the grounded conductors of different systems are installed in the same raceway, box, or other enclosure etc. each shall be identified by the system. NEC 210.5(C) indicates that where the premise wiring consists of more than one voltage the ungrounded conductors of branch circuits are required to be identified for each system where accessible. This can be done by color coding, tagging, marking tape, or other approved means. Type AC & MC cable can be ordered with color coded cable for different systems. NEC 210.5(C) also requires the means used for identification needs to be posted at each branch circuit panelboard.

40. We finished wiring a tenant space in a mini-mall before the heating contractor had completed the gas piping to the furnace. On the final inspection we got red-tagged for not bonding the gas piping properly because CSST was installed. I say we met our requirement in 250.104(B) by installing the equipment ground to the furnace. Who is right?

Ans. You both are. 250.104(B) Comm. 16.18

NEC 250.104(B) indicates other piping is required to be bonded to the grounded conductor at the service, the grounding electrode, or the grounding electrode conductor. It also indicates the equipment grounding conductor for the circuit that is likely to energize the piping is permitted to serve as the bonding means. The manufacturers of CSST have specific requirements for the bonding of their product. The manufacturers of CSST have specific requirements for the bonding of their product. Comm. 16.18 requires equipment be installed per the listing or labeling instructions and there are similar requirements in the plumbing and heating codes. The person installing the CSST is responsible to ensure the bonding is complete in accordance with the manufacturer's instructions. They may have to

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hire an electrician. See [www.csstsettlement.com](http://www.csstsettlement.com) for additional information and manufacturer's instructions.

41. Can a molded-case circuit breaker with "SWD" markings be used to switch HID lighting fixtures?

Ans. No 240.83(D)

NEC 240.83(D) indicates breakers marked SWD or HID can be used to switch fluorescent lighting. 240.83(D) indicates breakers marked SWD or HID can be used to switch fluorescent lighting.

42. We are wiring a new supper club in town. We installed GFCI protection on the 20 amp. 120 volt receptacles in the kitchen as required in NEC 210.8(B) (2) however we did not GFCI the receptacles in the bar area. On the final inspection we were written up for not having the receptacles near the under bar sinks protected. The only place I can find that protection is required for wet bar sinks is in dwelling units. Can the inspector require this?

Ans. Yes Comm. 16.20(2) (b), 16.20(2)

Comm. 16.20(2) (b) requires receptacles installed to serve the kitchen counter top surfaces in commercial kitchens to have GFCI protection. Comm. 16.20(e) requires receptacles installed to serve counter top surfaces and located within 6' of a sink to have GFCI protection

43. We are doing a service change on a small welding shop. It is a three phase 400 ampere 208/120 volt service with 2-200 ampere service disconnects. The building is a steel structure that I am not sure is effectively grounded. It is also supplied by a copper water line. My question is what do I use for grounding electrodes and how do we connect everything together?

Ans. The minimum would be the water pipe and building steel. NEC 250.24(1) 250.50, 250.52(A) (1) & (2), 250.64(D), 250.66

NEC 250.24 Requires a grounding electrode conductor be connected to the grounded service conductor at any accessible point to the service disconnect. 250.50 requires all grounding electrode conductors present to be bonded together. 250.52(A) (1) indicates the metal underground water pipe is a grounding electrode. 250.52(A) (2) indicates the metal frame of a building where connected to earth is another. 250.64(D) permits you to connect taps to a common grounding electrode when using multiple service disconnects. NEC250.66 and table 250.66 indicates the size of the grounding electrode conductors. If using 500 kcmil conductors to feed the service it would require a 1/0 AWG for a common grounding electrode. If using 3/0 AWG to feed each switch it would require a #4 AWG for a tap from each switch

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44. Does a cord and plug connected vending machine require GFCI protection?

Ans. Yes NEC 422.51

NEC 422.51 indicates vending machines manufactured or re-manufactured on or after Jan. 1, 2005 include GFCI protection as an integral and within 12" of cord cap. Vending machines not having GFCI protection integral with the cord would still require GFCI protection.

45. I am installing a generator set to supply emergency and legally required standby power for a new office building. It will be located approximately 35' from the building. Do I need to install a disconnect switch when I enter the building?

Ans. No 700.12(B) (6), 701.11(B) (5)

NEC 700.12(B)(6) indicates the following; **Outdoor Generator Sets Where an outdoor housed generator set is equipped with a readily accessible disconnecting means located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure.** 701.11(B) (5) & 701.11 indicates the same thing.

46. We are in the process of finishing a new medical clinic. The owner wants us to replace one of the receptacles with an isolated grounding receptacle in several of the exam rooms for a piece of electronic equipment being installed. Am I allowed to have an isolated ground receptacle in a patient care area because of the redundant grounding requirements in 517.13?

Ans. Yes NEC 517.16

NEC 517.16 allows the use of an isolated ground receptacle as allowed in 250.146(D). A FPN cautions about the use of IG receptacles because you lose the benefit of the parallel equipment grounding paths required for patient care areas. 517.13(A) & (B) does still apply to the branch circuit so an additional equipment ground will need to be installed for connection to the grounding terminal of the IG receptacle. Essentially you end up with a metal raceway, and 2 equipment grounds or a cable with an outer jacket approved as an equipment ground and 2 equipment grounding conductors.

47. I am installing an 800 ampere 480/277 volt service on a new manufacturing facility. The metering is being done in the pad-mount transformer and I will be installing parallel runs of 500 kcmil copper conductors in 2-3" PVC conduits to the service disconnect located inside the building. I will not be using the grounded conductor for any loads and because of the cost of copper today I would like to just leave it in the transformer. Will this be ok?

Ans. No NEC 250.24(C), 250.66

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NEC 250.24(C) requires an ac system of less than 1000 volts that is grounded at any point to have the grounded conductor brought to the service disconnect and bonded to the enclosure.

48. When will I be required to install disconnects for servicing fluorescent fixtures?

Ans. As of January 1, 2008 NEC 410.73(G)

49. The NEC requires conductors that are run through bored holes and foamed-in to be de-rated. Do the wires that are run through a nipple in the back of a panel and are foamed-in to prevent temperature migration need to be de-rated also?

Ans. No NEC 334.80

To be correct 334.80 requires derating of NM cable where 2 or more cables pass through a wood framing member that is fire or draft-stopped. This could be accomplished by the use of thermal insulation or sealing foam. 310.15(B)(2) Exc. 3 Indicates derating factors do not apply to conductors in nipples having a length of 24" or less. The question as written would not require derating

50. A large grocery store chain in our city is installing "minute clinics" at each retail location. A nurse who can take a person's temperature, prescribe medications and give injections staffs these. Although there is a waiting area and two "exam rooms" the only electrical equipment being used is a cash register. Would the receptacle outlets in these "exam rooms" require redundant grounding per Article 517?

Ans. Yes NEC 517.2, 517.10(A), 517.13(A) & (B)

NEC 517.2 Defines a health-care facility as follows: **"Health Care Facilities. Buildings or portions of buildings in which medical, dental, psychiatric, nursing, obstetrical, or surgical care are provided. Health care facilities include, but are not limited to, hospitals, nursing homes, limited care facilities, clinics, medical and dental offices, and ambulatory care centers, whether permanent or movable."** NEC 517.13(A) Wiring methods required to be a metal raceway or metallic cable armor that is in itself an equipment grounding conductor. 517(B) also requires an insulated equipment grounding conductor sized in accordance to 250.122 for the size of the overcurrent protection of the circuit. If they are not going to be using any electrical equipment in the exam rooms and do not want to comply with 517 don't install any receptacles.

51. I am installing some ceiling paddle fans for a covered open patio at a local supper club. Are there any restrictions I should be aware of?

Ans. Yes NEC 100, 314.27(D), 410.4(A), GPRT Comm. 16.18

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Art. NEC 100 definitions “**Location Damp. Locations protected from weather and not subject to saturation with water.**” This would be a damp location. NEC 314.27(D) requires a box used as the sole support of a ceiling paddle fan to be listed for the purpose. GPRT of the UL White book indicates fans intended to be mounted beneath a ceiling structure such as provided on porches or patios have been subjected to a water spray and marked as acceptable for this location. If installing a light kit 410.4(A) would require it to be marked “Suitable for Damp Locations.”

52. When installing a standby generator do I need to install ground rods at the generator?

Ans. If it is separately derived yes if not no. 250.20(D), NEC 250.30

The system would not be separately derived if the neutral is solidly connected to the service neutral. In this case the grounding electrode being used by the premise wiring system is utilized. NEC 250.20(D) indicates that a separately derived system that is required to be grounded by 250.20(A) or (B) shall be grounded per 250.30. If the generator is located outside ground rods would be an acceptable method.

53. We are wiring a new assisted care building. All of the rooms will have a small refrigerator, with a sink and a microwave on a small counter top. Do we need to install the small appliance branch circuits required by 210.52(B)?

Ans. No NEC 210.8(B)(2), Art. 100 2008

We have always used 210.8(B)(2) to define a kitchen. Art. 100, of the 2008 NEC describes a kitchen as follows. “**Kitchen. An area with a sink and permanent facilities for food preparation and cooking. This will apply to all kitchens.**” A microwave is not considered permanent cooking facilities.

54. We will be wiring an assisted care facility that will have permanent cooking provisions in each tenant space. What requirements will I need to meet?

Ans. You will need to be concerned with branch circuit requirements, GFCI, and AFCI protection. NEC 100, 210.11(C)(1), 210.11(C)(3) & Exc., 210.52, 210.8(A), 210.12  
NEC 2008 Definitions

You indicated the units have permanent cooking facilities therefore it would be considered a dwelling unit and would be required to be wired as such. NEC 210.11(C)(1) requires 2 or more 20 ampere small appliance branch circuits be provided for all receptacles specified by 210.52(B). NEC 210.11(C)(3) requires at least 1-20 ampere branch circuit shall be provided to supply bathroom receptacle outlets. Such circuits shall have no other outlets. 210.52 indicates the required spacing of receptacle outlets. NEC 210.8(A) requires GFCI protection for bathrooms, garages, outdoors, kitchens, laundry areas with sink

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55. Does the receptacle located behind a small floor refrigerator count as one of the required outlets for a hotel guest room?

Ans. Yes NEC 210.60(B)

NEC 210.60(B) requires the total number of receptacles to comply with 210.52(A) spacing / wall space. The receptacle shall be permitted to be located conveniently for permanent furniture layout. At least 2 receptacle outlets shall be readily accessible.

56. We are installing 2 feeders in the raceway. Per 300.3(B) can we install a single equipment grounding conductor?

Ans. Yes 250.122(C), 300.3(B)

NEC 250.122(C) allows a single EGC to be run with multiple circuits in the same raceway or cable if it is sized for the largest OVCD device protecting the ungrounded conductors.

57. We will be connecting a temporary job site office trailer. Can I mount a temporary mast and meter socket on the unit to supply it? Would a 30 ampere 240/120 volt circuit be allowed?

Ans. No Yes, 550.4(A), 590.2(A), 550.32(B), 550.32(A), 550.33(A)

NEC 550.4(A) **Mobile Home Not Intended as a Dwelling Unit A mobile home not intended as a dwelling unit — for example, those equipped for sleeping purposes only, contractor's on-site offices, construction job dormitories, mobile studio dressing rooms, banks, clinics, mobile stores, or intended for the display or demonstration of merchandise or machinery — shall not be required to meet the provisions of this article pertaining to the number or capacity of circuits required. It shall, however, meet all other applicable requirements of this article if provided with an electrical installation intended to be energized from a 120-volt or 120/240-volt ac power supply system**". 550.32(B) does not apply because of the requirement for a permanent foundation. Thus the service equipment is not allowed to be mounted on the trailer. NEC 550.4(A) also indicates that due to the use of the unit it shall not be required to meet the provisions of this article pertaining to the number or capacity of circuits required. Thus the 30 ampere circuit would be allowed if sufficient for the load requirements.

58. We have an extended stay motel unit with a cabinet mounted permanent oven unit installed. Must I hard wire it and provide a disconnecting means? Or can it be cord and plug connected?

Ans. Yes to both questions. 422.16(B)(3), 422.30, 422.31(B), 422.33(A)

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NEC 422.16(B)(3) indicates that wall mounted ovens and counter mounted cook tops shall be permitted to be permanently connected or cord and plug connected. 422.30 requires means be provided to disconnect each appliance. NEC 422.31(B) indicates if hard wired the switch or circuit breaker utilized as the disconnecting means shall be within site from the appliance or capable of being locked in the open position. 422.33(A) would require when using a cord and plug type connection it must be accessible.

59. Is the inside of a raceway using all watertight fittings and installed on the outside of a building considered a wet location? Does it make a difference if it is installed vertically or horizontally?

Ans. If unprotected location. Yes, No Art. 100, NEC 2008 300.9

NEC 100 **“Location, Wet. Installations under ground or in concrete slabs or masonry in direct contact with the earth; in locations subject to saturation with water or other liquids, such as vehicle washing areas; and in unprotected locations exposed to weather.”** The installation is not affected by direction vertically or horizontally.  
Both apply

60. At motel we are installing a new hot tub on an existing exterior concrete patio. I am hearing about equipotential bonding plane around this unit. How can I meet this requirement?

Ans. There are a number of concerns. 680.26(B) 680.26(C), NEC 2008 680.26(B)(2)

NEC 680.26(C) indicates that an equipotential common bonding grid is required and shall extend 3' horizontally under paved walking surfaces. The grid can consist of reinforcing steel rods connected together with tie wires, bolted or welded metal pool parts, or a minimum #8 AWG bare solid copper conductor. This grid shall be arranged in a 12" X 12" network with a tolerance of 4". This grid shall be bonded to all items in 680.26(B) which includes electrical equipment associated with the pool or hot tub. NEC 2008 680.26(B)(2) will require the equipotential grid under all surfaces.

61. We used Type AC cable to supply receptacles on the critical branch in a hospital. The inspector indicated we could not use AC cable for this application. What is acceptable?

Ans. Non-flexible metal raceway, NEC 517.30(C)(3)

NEC 517.30(C)(3) indicates a need for increased mechanical protection the emergency circuits in a hospital. Only non-flexible metal raceway, or Type MI cable are allowed. 517.30(C)(3)(3) allows flexible metal raceways and listed metal sheathed cable assemblies for specific installations.

62. When using a metal wireway 376.22 indicates I do not have to derate conductors according to the factors in 310.15(B)(2) until the number of conductors exceeds 30.

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Does this mean if I have a total of more then 30 or more then 30 in a given cross-sectional area?

Ans. 30 in a cross-sectional area. 376.22

63. We have an existing stanchion barn. We will be installing new lighting and receptacles. What type of wiring methods can I use and is there anything else I should be concerned with?

Ans. PVC Type UF cable NEC 547.5(A), 547.5(G), 547.5(E), 352.44, NEC 2008 406.8(B)(1)

NEC 547.5(A) allows the following wiring methods. Type UF cable, copper SE cables, jacketed Type MC, or other cables or raceways suitable for the location. Metallic raceways provide a problem regarding corrosion resistance and bonding requirements. 547.5(G) requires general purpose receptacles installed outdoors, in damp or wet locations, or dirt confinement areas for livestock and in areas having an EQ plane shall have GFCI protection. Receptacles in a damp location are required to have a damp location cover. 352.44 may require expansion fittings in conduit runs. NEC 2008 406.8(B)(1) will require receptacles installed in wet locations to be listed as weather resistant type.

64. I am hearing information about the need to derate conductors in cables or raceways exposed to sunlight on rooftops Can you discuss the impacts?

Ans. Yes NEC 310.15(B)(2)(c) and Table

Adjustment factors were always a requirement for ambient temperature. NEC 2008 310.15(B)(2)(c) now specifically addresses conduits or cables that are installed exposed direct sunlight on or above rooftops.

65. I am bidding on a multi-family project to start in mid 2008. The specs call for tamper resistant receptacles. Is this a new requirement?

Ans. Yes NEC 2008 406.11

In all areas specified in 210.52 all 125 volt 15 and 20 ampere receptacles shall be listed tamper resistant receptacles. This will apply to all receptacles in a dwelling as well as outside, in garages and basements.

66. I am wiring an apartment complex. Am I required to install an outdoor receptacle on a second floor balcony?

Ans. No 210.52(E), NEC 2008 210.52(E)(3)

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Presently there is no requirement however if one is installed it must be GFCI protected and an in use cover provided. NEC 2008 210.52(E)(3) will require a receptacle for balconies, decks, and porches that are accessible from the inside of the dwelling unit. There is an exception for those types of spaces that are less than 20 sq. ft. of area.

67 I understand for a motor circuit all I need is a lock on the overcurrent device to meet all disconnect requirements. Is this correct?

Ans. No 430.102(A) & (B), Comm. 16.38

NEC 430.102(A) requires a disconnecting means to be located within site of the controller. 430.102(B) requires a disconnect to be located within site of the motor. Comm. 16.38 exc. To 430.102(B) a disconnecting means in addition to the controller disconnecting means shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position. The locking device shall remain in place with or without the lock being installed.

68 We are installing some new equipment for a paint manufacturer. The room where the paint is manufactured, mixed, and sealed in containers is a Class I Div. 1 location. There is a large room adjacent to this room where they store the paint drums and pails and prepare them for shipping. These rooms are connected by a large overhead door which is used by forklifts to move the paint container out of the mixing room. My question is do I have to consider the storage room a hazardous location also?

Ans. Yes NEC 500.4(A), 500.5(B)(1), 500.5(B)(2)

NEC 500.4(A) indicates that all areas designated as hazardous shall be properly documented and available to the installer and inspector. 500.5(B)(1) Class I Div 1 are those areas in which ignitable concentrations of flammable gases exist under normal operating conditions or frequently exist. 500.5(B)(2) Class I Div 2 are areas in which flammable liquids, gases, or vapors are processed or used but are normally confined. Class I Div 2 locations can also be adjacent to Div 1 locations. This is probably at the least a Class I Div 2 location for at least an area close to the connecting door. Some of the mitigating things would be quantity of flammable materials, ventilation, and total area involved.

69. We recently wired a walk-in cooler at the local liquor store. We used EMT conduit and some short pieces of flexible metal conduit to some of the equipment. The inspector is calling this a wet location and says we cannot use flexible metal conduit and we need wet location fittings on the EMT. Is he correct?

Ans. No NEC 100, 348.12(1), 300.7(A)

**Location, Wet. Installations under ground or in concrete slabs or masonry in direct contact with the earth; in locations subject to saturation with water or other**

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**liquids, such as vehicle washing areas; and in unprotected locations exposed to weather.**

**Location, Dry. A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction.**

This would be considered a damp location. 348.12(1) allows flexible metal conduit as a wiring method in wet locations with restrictions however the 2008 NEC will no longer allow FMC to be used in wet locations.

70. I recently completed the installation of a new elevator in a church. We installed separate branch circuits with disconnects in the machine room for the car lighting, machine room lighting and receptacles, and the pit lighting and receptacles. The inspector now is indicating that we need to install a circuit breaker panel in the machine room to supply these circuits because the over-current protection is required to be located in the machine room. Is this correct?

Ans. No 620.22(A), 620.23(A), 620.24(A)

NEC 620.22(A) requires a separate branch circuit for car lighting and receptacles. It also requires the over-current device for this circuit to be located in the machine room. which could be a fusible switch or circuit breaker. 620.23.(A) addresses a separate branch circuit for the machine room lighting and receptacles but makes no mention of the over-current device. 620.24(A) requires a separate branch circuit for the pit lighting and receptacles but also makes no mention over-current protection.