

1. The fire pump controller (service rated) is located in a fire pump room about 6 ft. from the outside wall. The contractor used EMT from the meter on the exterior of the building to the controller. Is this acceptable?

Answer: YES

Code Reference: NEC 695.6(A)(1), 695.6(D)

695.6(A)(1) requires fire pump conductors be installed in accordance with requirements in Part IV of Article 230. 230.50 is within Part IV and EMT is allowed to enclose service entrance conductors in accordance with 230.50(B)(4).

A change in the 2011 NEC section 695.6(D) has added EMT to the list of raceways allowed to enclose the feeder conductors between the fire pump controller and the fire pump.

2. Is a cord-and-plug connection permitted for permanently-installed, 3 phase, 460-volt motors?

Answer: YES

Code Section: NEC 430.109 (F), 400.7

NEC 430.109(F) permits a cord and plug connection to be used as a motor disconnect. The NEC allows cord and plug connections for motors in many applications as long as the rules for the flexible cords are not violated and the ratings of the plugs and receptacles are adequate. "Frequent Interchange" is a common reason for using such connections, but these applications are still limited by the permitted uses of cords. Check with your local AHJ to review the use of the motor, and necessity for frequent interchange.

3. What is the minimum size conductor permitted for use in a parallel installation?

Answer: 1/0 AWG

Code Section: NEC 310.10

1/0 conductors are the minimum allowed for the ungrounded and the grounded conductors. Equipment grounding conductors smaller than 1/0 are permitted in parallel.

4. Within sight means visible and not more than _____ feet from the equipment.

Answer: 50-feet

Code Section: Article 100 Definitions

Article 100 defines "within sight", the definition states 50 feet is the maximum distance allowed and as the question states, must be visible.

5. A load is considered to be continuous if the maximum current is expected to continue for _____ hours or more

Answer: 3 Hours at maximum current

Code Section: Article 100 Definitions

Article 100 defines a continuous load which is expected to be operated for 3 hours or more. Lighting in a retail store or an office building is a common example of a continuous load.

6. I am bidding on wiring a building where they paint trains. Are the lights in the hazardous locations required to be sealed?

Answer: Yes.

Code Section: NEC 501.15

Article 516 covers this type of occupancy. This Article also specifies where the hazardous locations are based on the type of spraying operation. Article 501 and specifically section 501.15 requires enclosures to be sealed in order to restrict the passage of gases and explosive vapors. Many light fixtures approved for hazardous locations are internally sealed. Therefore the need for a separate seal-off is not required.

A seal-off is also required where the conduit leaves the hazardous location and enters an area of lower or no hazardous classification.

7. What is the maximum size circuit breaker allowed to properly protect a 75 KVA transformer, 480 volt primary, 3 phase, with a 120/208 4 wire, 3 phase secondary.

Answer: 225-Amperes or 125-A

Code Section: NEC 450.3(B), 240.6

The primary current is 90-Amperes at 480-Volts. Two types of transformer protection may be used. Either the primary device only or a combination of the primary and secondary devices can be sized or rated to protect the transformer.

225-amperes is the maximum size fuse or breaker if the transformer is protected from overload by the use of primary plus secondary protection. The maximum size OCPD device is 250% of the primary current:

$$90 \times 250 = 225\text{-amperes}$$

No rounding up to the next higher size is allowed.

If the transformer is protected from overload by the primary device only, then 125-amperes is the maximum size fuse or breaker. The maximum size OCPD device is 125% of the primary current:

$$90 \times 1.25 = 113\text{-Amperes}$$

Rounding up to the next higher size is allowed.

Note: The options of providing primary protection only still requires a secondary protective device. In this case the secondary overcurrent protective device is rated or set to protect the secondary conductors.

8. What is the maximum height off the floor for a circuit breaker?

Answer: 6-foot, 7-inches

Code Section: NEC 240.24(A) & 404.8(A)

Circuit breakers shall be located no more than 6'7" above the floor or working platform. There are exceptions in 404.8(A). One applies where the circuit breaker is located on a busway. Suitable means must be provided to operate the circuit breaker from the floor. Another exception allows circuit breakers to be more than 6'7" above the floor when the breaker is located adjacent to equipment located higher than 6' 7" and to be accessible by portable means.

9. I have installed a 45 KVA dry type transformer above the suspended ceiling in a closet of a medical clinic. The AHJ has concerns about ventilation. The space above the ceiling is 4' by 4'. Is this installation permitted by NEC 450.13(B)?

Answer: Yes. Ventilation must be addressed.

Code Section: NEC 450.13(B) & 450.9

Dry type transformer not exceeding 50 KVA are allowed in the area above a suspended ceiling. NEC 450.9 does require ventilation for transformers. The ventilation rate would be determined by consulting the project Engineer and/or the manufacturer of the transformer. The operating temperature of the transformer must be maintained within the nameplate limits. The ventilation may be natural or mechanical.

10. Can EMT conduit be directly buried in the earth?

Answer: No.

Code Reference: SPS 316.358

This is a department rule in addition to the requirements of NEC 358.12: Electrical metallic tubing may not be used in direct contact with earth, in concrete slabs or floors poured on earth, or in exterior concrete walls below grade.

In Wisconsin, EMT prematurely deteriorates in the types of soils found in the region.

11. What is the largest required size of a copper grounding electrode conductor?

Answer: 3/0 AWG

Code Reference: Table 250.66

3/0 copper is the largest copper conductor required to be installed to any grounding electrode listed in 250.52(A)(1) thru (A)(7). Grounding electrode conductor sizes are given by Table 250.66.

Several types of electrodes are permitted to have smaller size conductors. Concrete encased electrodes in (A)(3) only require a maximum 4 AWG copper. Ground rings in (A)(4) only require a minimum of a 2 AWG copper. 250.66(A) permits a maximum of a 6 AWG to the ground rods.

However, a 4-AWG is often used to comply with the physical protection requirements of 250.64(D).

12. Can I put a typical dry-type transformer with ventilation openings in a plenum ceiling?

Answer: Yes.

Code Reference: NEC 450.13(B), 300.22, ANSI/UL 2043-2008

Several conditions must be met.

NEC 450.13(B) allows dry type transformers 600 volts or less and not exceeding 50KVA to be installed in a hollow spaces above ceilings. (Drop Ceiling).

NEC 300.22 (C)(3) permits the installation provided the transformer has adequate fire-resistant and low smoke producing characteristics. The transformer does not have to be listed for use in air-handling spaces. ANSI/UL 2043-2008 provides listing information on typical transformers.

13. I am wiring a new grain facility with underground tunnels. The tunnels are for conveyors that transport grain from the bins to a train loading area. Are conduits in the tunnel required to be wired with seal off fittings to prevent the dust from traveling to unclassified areas? What type of enclosures, conduits and fittings are required to be used in these areas. The Electrical Engineer indicates the tunnel is a Class II, Division II location.

Answer: "Seal Fittings Required?"-No. Dust Tight-Enclosures Required?-Yes. Many options on wiring methods and enclosures.

Code Reference: NEC 502.10(B) & Table 110.28

NEC 500.4(A) assigns the responsibility of classification of hazards to a qualified person, such as a Professional Engineer, that is familiar with both the process as well as the hazards. Detailed plans shall be submitted to the AHJ for review and to use in inspection of the hazardous areas. Class II locations are where dusts may be present or accumulate but normally are in such small quantities that this will not cause an explosion.

"Seal-off" Sealing in Class II locations are completed in a different manner than in Class I locations. Sealing for Class II locations is accomplished by sealing putty or horizontal raceway not less than 10', or a vertical raceway a minimum of 5' extending downwards from the dust-ignition-proof enclosure, or a combination of the 10' horizontal and 5' vertical downward conduits.

NEC 502.10(B) lists the different wiring methods allowed in this Class II location, including but not limited to RMC, IMC, EMT, dust-tight wireways, MC, TC, and MI cables installed in cable trays. Where flexible connections are required, then LFMC, LFNC and flexible cord listed for extra hard usage terminated in listed dust tight fittings may be installed.

All boxes and fitting shall be dust-tight. Table 110.28 lists the enclosure types that are acceptable. Examples include NEMA 4X, NEMA 6 and others.

14. Under what conditions are limited service fire pump controllers permitted?

Answer: DSPS approval only.

Code Reference: NFPA 20

Limited Service fire pump controllers are only permitted with department approval. A written risk analysis shall accompany the request. The submitter shall justify the selection by considering factors such as:

The source of water for the sprinkler system, the impact on sprinkler operation in the event the controller does not automatically operate the fire pump, the type of fire service available, the fire department response time, also, the availability of other resources, such as, on-campus fire department or maintenance personnel.

15. A large switchboard is located on the back wall in an electrical closet? A double door is located directly opposite. The board is rated 1600-amperes and is well over 6-feet wide. Can they use the continuous and unobstructed exit exception? Do they still need double the workspace?

Answer: Use Continuous and Unobstructed?-Yes. Double Workspace Required?-No.

Code Reference: NEC 110.26(C)(2)(A)&(B)

Table 110.26(A)(1), Working Spaces, determines the minimum depth of the workspace based upon the voltage and conditions. The general requirement is for an egress from each end of the work space.

NEC 110.26(C)(2)(A)&(B) gives two options questions. A single entrance to and egress from the working space shall be permitted where "**either**" of the conditions in 110.26(C)(2)(A) or (B) are met. A double working space depth requirement would not be required as long as the location permits a continuous and unobstructed way of egress travel.

Also NEC 110.26 C(3) requires any personnel doors within 25-feet have panic hardware and open in the direction of egress from the work space.

Provide the AHJ with a detailed plan and request approval prior to installation.

16. Our school system has a central kitchen. The prepared food is transported to the schools. The containers are placed on "warming trays". The warming trays are cord-and-plug connected. Is GFCI protections required for the 20-ampere circuits that supply these warming trays?

Answer: Yes.

Code Reference: NEC 210.(8)(B)

NEC 210.8(B) requires all 125-volt single phase 15 & 20 ampere receptacles installed in a non-dwelling kitchen be GFCI protected. If the warming tray receptacles are located in the central kitchen of the school they would require GFCI protection. The receptacles that supply power in the school would not require GFCI protection.

17. We have a generator for emergency and stand-by power. It sits on the fuel tank. The inspector says we have to build a platform in front of the panel board. The panelboard is mounted on the side of the generator. It supplies power to auxiliary loads such as the block heater and battery charger. He says we need the platform to be at least 30" X 36" and the

handle of the breakers must be less than 6-foot, 7-inches from the top of the platform. What is wrong with using a step ladder like we've done for years?

Answer: Permanent Working Platform Required.

Code Reference: NEC 240.24(A), Article 100 Definitions

NEC 240.24(A) requires the over-current devices be readily accessible and not more than 6'7" above the floor or working platform. Article 100 defines readily accessible as capable of being reached quickly for operation without requiring a person to resort to portable ladders. Using a step ladder violates the accessibility requirements of the code. Consult with AHJ on individual installation details.

18. The addition to the school has a concrete-encased electrode. We are not changing the service. The existing service is connected only to building steel and metal water piping. Do we have to connect to the new electrode?

Answer: Yes.

Code Reference: NEC 250.50 NEC 250.52(3)

NEC 250.50 requires all grounding electrodes present at each building or structure served to be bonded together to form the grounding electrode system. If the existing service does not have a concrete encased electrode installed, the concrete electrode at the school addition would be required to be used as a grounding electrode and bonded to the existing service. NEC 250.52 (3) describes the building construction that makes up a concrete encased electrode.

19. Water treatment plants have multiple underground metal water pipes that enter and leave the building. Which one is required to be bonded to the service? Do they all have to be bonded together?

Answer: Any one. All bonded together.

Code Reference: NEC 250.50 & NEC 250.58

NEC 250.50 requires all metal water pipes that are present at each building or structure be bonded together to form the grounding electrode system. NEC 250.58 requires a common grounding electrode be used. When all present water pipes are bonded together, they are considered a single grounding electrode.

20. My local inspector says that conduits must be "spaced" apart. Or else, the conductors in all raceways must be derated. And the same goes for cables. Is this a State Code requirement?

Answer: No.

Code Reference: NEC 310.15(B)(3)

NEC 310.15(B)(3) addresses ampacity adjustment or "derating" factors. Adjustment is required only when the number of conductors "**within**" the raceway or cable exceeds three. Adjustment is also required when single conductors or **multi-conductor cables** are installed without maintaining spacing for a continuous length longer than 24".

Raceways are not required to be spaced.

21. I am hooking up machines and equipment in a large metal building. I want to use cord-drops from boxes. The machines are small and are often moved around. The inspector said I can use drops only if done from a busway. Can you provide me with the Code Section to back my choice?

Answer: Yes.

Code Reference: SPS 316.400, NEC 400.7 & 400.8

SPS 316.400 permits cord drop from other than busways. The installation must still follow one of the permitted uses in 400.7. NEC 400.7 lists the acceptable uses of flexible cords and cables. NEC 400.7(A)(6) permits cords as the wiring method for machines in order to facilitate frequent interchange. The cord must be equipped with suitable strain relief and an attachment plug. Cord drops cannot be used if the intended use is not listed in NEC 400.7. NEC 400.8 prohibits Flexible Cords and Cables as a substitute for the fixed wiring of a structure. The machines may be installed using any acceptable chapter 3 wiring method. Provide the AHJ with a detailed plan and request approval prior to installation.

22. Vending machines have been required since 2005 to have GFCI protection as part of the cord. There seems to be a lot of machines built before that date out there. If the vending machine has a GFCI as part of the cord and the receptacle is behind the machine, does the GFCI device have to be readily accessible? ?

Answer: No

Code Reference: NEC 422.51, 210.8

NEC 422.51 addresses the question. If the GFCI is an integral part of the cord, no code requirements exist to require the GFCI on the cord to be readily accessible. The requirements for ready access in 210.8 only apply to the locations listed in 210.8(A), (B) and (C).

23. A feeder to a fire pump has to run through an existing building. There is no way to get it under the concrete. What are my options?

Answer: Fire Rated System listed for 2 Hour Protection.

Code Reference: 695.6(2)(D)

NEC 695.6(2)(D) gives us several other options.

The conductors can be protected by a fire rated assembly listed to achieve a minimum fire rating of 2 hours and dedicated to the fire pump circuits.

The conductors can be a listed electrical circuit protective system with a 2- hour fire rating.

The conductors can be encased in a minimum of 2-inches of concrete.

UL guide information for electrical circuit protective systems (FHIT) contains information on proper installation requirements to maintain fire ratings

Provide the AHJ with a detailed plan and request approval prior to construction.

24. I m planning on installing a “T” conduit fitting and intend on splicing only the equipment grounding conductors within the “T” fitting. Am I required to attach the equipment grounding conductor to the “T” fitting as is required by 250.148(C) for junction boxes? Can I drill a small hole in the “listed” fitting to connect the equipment grounding wires?

Answer: No. Yes.

Code Reference: NEC 250.148

NEC 250.148 requires the equipment grounding conductor to be connected to a box when the EGC is spliced or terminated to equipment within the box. A conduit body is not a "box". It may be used as an outlet, splice, or pull box. And when used in this manner, the requirements that apply to conduit bodies in Article 314 must be followed. 314.4 requires boxes be grounded per various sections of Article 250 including 250.148. This requirement does not apply to conduit bodies.

A small hole, ¼ -inch or less, may be drilled in the conduit body to allow water to drain out or similar reasons.

25. To avoid the common trip circuit breakers, we are proposing to install separate neutrals for each ungrounded conductor for a total of 12 current carrying wires in a ¾” EMT conduit. Can we install 20 ampere circuit breakers on these circuits?

Answer: No.

Code Reference: NEC 310.15(B)(3)(a)

Assuming all conductors are #12 THHN copper, NEC 310.15(B)(3)(a) requires derating of 50% when 12 conductors are in the same raceway. The allowable ampacity of 12 AWG conductors with THHN insulation is 30 amperes @90°C is:

$$50\% \text{ of } 30 \text{ amperes} = 15 \text{ amperes}$$

The maximum size breaker and the maximum amperes permitted by your proposed installation is 15 amperes.

26. GFCI receptacles have to be readily accessible. If a receptacle is installed off the corner behind the vending machine, would that be considered readily accessible?

Answer: Not all GFCI devices have to be readily accessible.

Code Reference: NEC 422.51, SPS 316.110 & Article 100 Definitions.

NEC 422.51 requires that cord-and-plug connected vending machines be GFCI protected. A GFCI-type receptacle located behind the vending machine is not "readily accessible". These machines are not easily moved, Article 100 defines "readily accessible" as capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth."

The GFCI manufacturer's instructions require ready access for testing. So a suitable location for the GFCI device must be found.

27. Can NEC Table 310.15(B)(7) be applied to the overhead riser conductors on an electric service which supplies 3 apartments? Can this table be applied to the conductors that supply each apartment's panel-board? What about the house panel?

Answer: "service supplying three apartments"-No.

"each apartment's panel-board"-Yes.

"house panel"-No.

Code Reference: NEC 310.15(B)(7)

The riser conductors supply multiple dwelling units. Therefore conductors smaller than that required by NEC 310.15(B)(16) cannot be used. NEC 310.15(B)(7) states the table is only to be used for "individual" dwelling units of one family, two-family, and multifamily dwellings. The table can be used to size conductors supplying each apartment's panel-board. This answer assumes the service and feeders are 120/240-volt, three-wire, single-phase.

28. We intend to extend a 12-volt circuit from a self-contained, battery-back-up exit sign to supply remote "heads". The remote heads are located outdoors. Can the 12-volt wiring be installed with properly sized Class 2 cable? Do the connections at the remote heads need to be in junction box? Or can the splice be tucked in behind the remote heads due to the fact this is a low voltage circuit?

Answer: Class 2 Cable?-No. Connections in a box?-Yes.

Code Reference: NEC 700, 300.7 and SPS 316.700

The permitted wiring methods for emergency circuits are raceways, Type AC, and type MC cables. The circuit from the emergency source (battery in exit sign) to load (remote head) is an emergency circuit. This circuit must be wired in accordance with NEC 700 and SPS 316.700. The Chapter 3 wiring method must be installed as a complete system.

29. We have a car dealership that have windows designed not to be able to be seen through. They are etched glass and when standing outside, you can not see into the building. Do I need to put show window outlets over these windows?

Answer: No

Code Reference: Article 100 & NEC 210.62

Article 100 defines a show window as any window used or designed to be used for the display of goods or advertising material. If the window is made of etched glass and cannot be seen into the building, it would not meet the definition requirements. Show window receptacles would not be required per NEC 210.62

30. Does landscaping bark qualify as "fill" for cover in an underground installation?

Answer: Up to the AHJ.

Code Reference: None

The NEC does not specify what constitutes cover or fill. Using landscaping bark would be up to the AHJ depending on conditions.

Some things to consider:

Landscaping bark is used in gardening and landscaping for decorative purposes and preventing water loss and erosion of soil. It is laid on the top of earth cover (soil) for these purposes.

Landscaping bark is less dense than soil and does not compress a great deal. It also decomposes over time.

Consult with your AHJ prior to using.

31. Is a wire-type equipment grounding always required when flexible type metal conduits are installed?

Answer: No

Code Reference: NEC 250.118(5)

NEC 250.118(5) addresses the use of Listed flexible metal conduit as an equipment grounding conductor. All of the conditions must be met:

1. Installed with listed fittings.
2. The circuit conductors are protected at 20 amps or less.
3. The combined length of the conduit does not exceed 6-feet.
4. And where flexibility after installations is not necessary.

Go OVER NEC 250.118(5), page 122

32. A sheep barn is all steel construction with a dirt floor. The waterers are not wired with an electrical supply. Is an equal potential plane required?

Answer: NO

Code Reference: NEC 547.2 & 547.10.

NEC 547.2 defines an equal potential plane as an area where wire mesh or other conductive elements are embedded in or placed under concrete. The sheep barn in the question has a dirt floor and the waterers do not have electricity run to them. NEC 547.10 requires an equipotential plane in indoor area "with concrete floors" and where metallic equipment is located, subject to contact by the animals, and the equipment may be energized.

33. I know you now have to derate conductors run across a roof deck. What outside temperature do we use as the starting point? A typical example would be a 200amp circuit with 3/0 THWN-2 conductors run on strut about 1-1/2 inches above the roof.

Answer: Between 77 to 91 °F.

Code Reference: NEC Table 310.15(B)(16) & ASHRAE Handbook

One source for finding the average temperatures throughout Wisconsin is the ASHRAE handbook. You can find this online. Ambient temperatures listed in the handbook for Wisconsin are between 77 to 91 degrees F. The insulation temperature rating determines what column in Table 310.15(B)(16) is used as the starting point. Table 310.104 indicates that THWN-2 insulation has a 90 °C temperature rating in both dry and wet locations. The allowable ampacity of the 3/0 conductor is 225-amperes. The adjustment factor for Madison would be 0.76. This is based on a average daytime high temperature of 91°F plus a 40 °F adjustment for placement of

the conductors 1-1/2-inches above the roof. The conductors would have an adjusted ampacity of 171-amperes. For Superior, the adjustment factor would be 0.82. The adjusted ampacity is 185-amperes.

34. Can schedule 40 or 80 PVC conduit be installed with the directional boring type installation? My question is, will the glued joints stay together when it is being pulled through and stay water tight?

Answer: Yes.

Code Reference: SPS 316.110 (1), 300. 5(K)

PVC conduit must be approved for direct boring installation. PVC is manufactured and listed for this type of installation if the PVC is marked "Directional Boring" or "Dir Boring" according the UL white book category "DZYR".

35. I have an old neon sign that was on the outside of my building for years. I would like to install it inside the new building for nostalgia. The inspector says the sign has to be "listed". It was on my building for forty years. Do I have to get it listed now?

Answer: Yes.

Code Reference: NEC 600.3 & SPS 316.003 (3)

Relocating the sign from the exterior to the interior of the building is a new installation. All new installations shall conform to current code. NEC 600.3 requires the sign to be listed. There are several safety related concerns. The existing ballast may be unsuitable for use inside of the building. The insulation and splices may have deteriorated over the 4 decades of outdoor use.

You may have the sign rewired by a sign shop authorized to list signs. It would then be acceptable for use in the new indoor location.

36. When does the Code require the neutral be counted as a current carrying conductor when installing conductors in conduits? The system is 120/208 volt, 3 phase, 4-wire system.

Answer: 3-wire circuit from 4-wire system. Majority of loads produce harmonics.

Code Reference: NEC 310.15(B)(5)(a)(b)&(c)

See NEC 310.15(B)(5)(a)(b)&(c) for requirements. Read over requirements on page 152.

"The neutral wire of a 3-wire circuit from a 4-wire 3-phase wye system or a 4-wire 3-phase wye circuit where the majority of the loads are nonlinear is required to be counted as current carrying when applying the provisions of 310.15(B)(3)(a)."

37. Is a "splash pad" considered a swimming pool? Are the bonding requirements of 680.26 applicable?

Answer: YES

Code Reference: NEC 680.2

Splash pads are areas for water play that has a minimal amount of standing water. These areas are said to eliminate the need for lifeguards or other supervision, as there is little risk for drowning. Typically there are ground nozzles that spray water upwards out of the splash pads rain deck. Splash pads are often surfaced in textured non-slip concrete or in crumb rubber. Splash pads are similar in construction to swimming pools. The hazards are also similar. Splash pads would require the bonding requirements of NEC 680.26.

38. I have a 3000 amp, 277/480 volt switchgear which has been damaged by smoke from a Utility transformer fire. The switchgear received the smoke thru the PVC conduits which are supplying the switchgear from an outdoor transformer. There was no heat damage from a visual inspection of the gear, but all wires and bus-bars are covered with a film of smoke. What is the proper method of cleaning these conductors, terminations and bus-bars?

Answer: Manufacturer's Instructions

Code Reference: SPS 316.010 & SPS 316.110

SPS 316.010 requires all electrical equipment to be cleaned and inspected at proper intervals, SPS 316.110 also requires electrical equipment to be installed and used in accordance with the listing and the manufacturer's instructions.

Consult the manufacturer of the specific equipment for a written "engineering judgment". Provide a copy to the AHJ. Ask the AHJ if they want to witness the cleaning. Then a qualified testing agency should test the circuit breakers, busbar conductivity and isolation from ground, and any GFPE devices, prior to energizing.

NEMA does have a guide for smoke damaged electrical equipment. It is available at www.nema.org. This manual provides general guidelines for evaluating heat, fire or smoke damaged equipment. Some equipment may have to be replaced. Other types of equipment may be cleaned and reconditioned. The latter type of equipment must be tested and can be put back into use if testing indicates the particular device is safe.

39. I am installing a feeder to light poles at an athletic field. Each light pole is equipped with a panel-board. Am I required to consider this a separate structure and install a main breaker for these panel-boards and install grounding electrodes? Can I utilize the rerod in the concrete base as an electrode and not install ground rods?

Answer: YES. YES.

Code Reference: SPS 316.100(2)(a)

A pole with a distribution panel mounted on it is considered to be a separate structure and the requirements of NEC 225-II and NEC 250.32 apply. Since the electrical equipment is mounted on poles or similar structures and used as a distribution point, the distribution equipment should be "suitable for use as service equipment" in accordance with 225.33(A).

NEC 250.32 requires electrical equipment in a separate structure to be referenced to the earth. The re-bar or re-rod in the concrete foundation can be used in place of the ground rods. The

installer must verify that the re-rod is a minimum of 1/2" in diameter and a minimum length of 20' is present. The 20' may consist of smaller lengths provided the total length of all pieces of re-rod equals or exceeds 20'.

This will be difficult for an inspector to verify at the time of final inspection. Provide the AHJ with a detailed structural plan and request approval prior to pouring concrete.

40. I am planning to connect prewired office furniture partitions. I was planning on using a multi-wire circuit for each office partition system (OPS). Is this permitted?

Answer: YES

Code Reference: NEC 605.6 & 605.7

Previously, the 2008 NEC 605.6 & 605.7 had language that required multi-wire branch circuits to be provided with means to disconnect all ungrounded conductors simultaneously. Since 2011 NEC, Section 210.4(D) requires this for all multi-wire branch circuits in all installations, the additional language in 605 was no longer needed.

NEC 605.8 applies only to partitions that are cord and plug connected. 605.8(D) does not allow the partition to contain a multi-wire branch circuit.

41. The fire pump controller is located in a mechanical room. It is 7 ft. from the outside wall. The contractor used IMC from the exterior meter to the controller. The service rated controller could be located closer to the point where the IMC enters the room. Is this an acceptable installation?

Answer: NO.

Code Reference: SPS 316.230 (3)(b), NEC 230.70(A).

The state code rules are in addition to the NEC. Therefore the service equipment must be located at a readily accessible location nearest to the point where the conductors enter the building. The fact that the installer used IMC does not change this. The IMC would have to be encased in 2-inches of concrete or under 2-inches of concrete to be considered "out of" the building.

A full service fire pump controller is listed as "Suitable for Use as Service Equipment." The controller must also be located within sight of the fire pump motor per 695.12(A).

Provide the AHJ with a detailed plan at the time you apply for a permit. Request approval prior to installation.

42. A low voltage door access system is being installed in an airplane hanger area. The Inspector indicated the 24-volt, Class 2 control wiring must be installed in metal conduit or MC cable. Is this correct?

Answer: Yes.

Code Reference: NEC 513.7(A)

NEC 513.7(A) requires all fixed wiring in the hanger but not in a Classified location to be installed in metal raceways or Type MI, MC, or TC cables. The listed Class 2 control cable must meet this requirement. The exception that allows any Chapter 3 wiring method to be used only applies to adjacent rooms or areas that are suitably cut off from the hanger area.

43. I have recently installed a Samsung "mini-split" Air Conditioner unit. The factory has sent a SOOW cord to interconnect the 220 volts from the outside compressor unit to the inside fan units. The Inspector says I have to replace the SOOW cord with conduit or some other Chapter 3 wiring method. The unit is listed by ETL. Are cords permitted since it is a listed unit and the cord is factory supplied?

Answer: NO.

Code Reference: NEC 400.7 & 400.8

The installation must comply with SPS 316 and the NEC. Installing cords thru walls or cords concealed within walls and ceilings is not allowed by NEC 400.8. The wiring method between the units must be completed with a Chapter 3 wiring method appropriate for the building. SPS 316.110(1) permits listed equipment to be used in Wisconsin where the listing complies with the requirement of the State Electrical Code.

44. Can I bury a gas line and an electric line in the same trench?

Answer: Not Prohibited by SPS 316. Check with local AHJ & Utility

Code Reference: None

SPS 316 and the NEC do not address this issue. Check with your utility and local AHJ as to other rules that may regulate this practice.

45. Am I allowed to install permanently mounted light fixtures in a free stall barn and connect the cord directly to the junction boxes?

Answer: NO.

Code Reference: 410.62(C)

The Code permits electric discharge and LED luminaires to be cord connected. An alternate is any permitted Chapter 3 wiring method for that occupancy and location. If a cord is used, the cord must terminate into a grounding attachment plug. The receptacle must be located directly above the luminaire.

The alternatives to the attachment-plug-receptacle connections are busway plugs, components of manufactured wiring systems, listed luminaire assemblies with cord-canopy provisions and intended for attachment to an outlet box mounted above a suspended ceiling.

410.62(B) does permit the cord to be directly connected to the outlet box if the luminaire requires adjustment or aiming after installation. Check with the AHJ if you have questions on a specific installation.

46. The 2014 NEC has raised the threshold voltage to 1000V. We anticipate conductors rated for these higher voltages to be available by mid year. Will we be enforcing the new threshold voltage in Wisconsin?

Answer: No

Code Reference: SPS 316.014 (1)(a), NEC 690.80, 694.80

This change in the 2014 NEC will not generally affect installers. Designers may want to note this change. Installers of specialized systems such as some Photovoltaic system and wind energy systems are more likely to encounter equipment that operates between 600- and 1000-volts. Such systems must comply with Article 490 as well as other requirements applicable to systems over 600-volts.

47. I want to add another meter for a basement apartment. Am I permitted to splice the new conductors to the existing service conductors in the existing wireway?

Answer: Yes, with conditions.

Code Reference: NEC 230.42(A)-(C), 230.46 & 376.56(A)

There are several considerations:

1. The service entrance conductors must be sized in accordance with NEC 230.42(A)-C. Adding additional loads to existing service entrance conductors could result in an unsafe overload condition on the wiring.
2. All spliced service entrance conductors shall be installed per NEC 230.46.
3. The conductors, including splices and taps shall not fill the wireway to more than 75% of the cross-sectional area.

48. Is there an approved method of repairing the outer sheath of a NM or SER cable? The sheath has been cut by accident.

Answer: Yes. Up to AHJ.

Code Reference: SPS 316.010, SPS 316.110

This question comes up frequently at Code seminars and in on-line Code forums. A common response from the listing agencies that has not been directly stated is a minor cut or scar to the sheathing may be taped up. The thickness of the tape should equal the thickness of the sheath. A minimum of 3 layers of listed electrical tape should be sufficient to restore the outer sheath of the cable.

Damage to the insulation of the conductor cannot be repaired.

49. A HVAC fan/coil unit is mounted in an accessible ceiling cavity. Can the disconnecting means for the unit also be located above the ceiling? Is working space required?

Answer: Yes. Yes.

Code Reference: NEC 404.8(A), NEC 110.26(A)

The disconnecting means is allowed to be located above the ceiling and at the equipment it serves. NEC 404.8(A) Exception #2 allows the disconnecting means for motors, appliances, and other equipment, to be located higher than 6'-7" and to be accessible by portable means. Working space is for equipment that requires access to live parts for repair or service tasks. Examples of such equipment associated with an HVAC unit would include overcurrent and overload devices and the control panel for the unit.

50. I installed SER cable for a service. The inspector said I have to tie one end of the bare equipment grounding conductor to the enclosure or the neutral bar. This conductor doesn't do anything and we have cut the ends off for years. Do I have any other options?

Answer: Yes.

Code Reference: NEC 250.4(A)(4)

The Code requires normally non-current carrying electrically conductive materials that are likely to become energized to be connected together and to the electrical supply source in a manner that establishes an effective ground fault current path. So it could be tied to ground on one end.

It also could be cut back and/or taped such that it was not likely to become energized. There are no special Code rules to address "spare" conductors within an electrical enclosure. However, the method of installation must ensure that spare conductors are unlikely to become energized via contact with live parts in the same enclosure.

51. The new PV modules come with a built-in DC inverter. The inverter output is 120-volts AC. Often the home run back to the electrical panel is very long. And PV specifications limit the voltage drop to less than 1%. If the conductors are oversized for voltage drop does the equipment grounding conductor also have to be increased? What about if the conductors are run in EMT and a supplementary equipment grounding conductor is also used?

Answer: Yes. Yes.

Code Reference: NEC 250.122(B)

NEC 250.122(B) Requires that 'Where conductors are adjusted in size for any reason, equipment grounding conductors shall be adjusted proportionately.

The calculation is:

Step I- Determine the proportionate Increase.

To get the ratio:

Divide the selected feeder or Branch circuit conductor area by the required feeder or conductor area.

Ratio = Selected feeder or Branch circuit conductor area ÷ Required feeder or conductor area

Step II – Adjust the Size of the EGC proportionally

To get the required EGC circular mil area:

Multiply the ratio by the Table 250.122 Equipment grounding conductor circular mil area.

Required EGC circular mil area = Ratio × Table 250.122 Equipment grounding conductor circular mil Area

Note: Table 8, page 721, give AWG sizes in Circular mils

52. I ran across a new type of luminaire “retro-fit” kit. The ballast is removed from a fluorescent fixture. The sockets are then connected to the branch circuit conductors. A “LED lamp” is inserted into each fluorescent fixture. NEC 410.6 requires all luminaires be listed. Is this okay?

Answer: Yes for a listed luminaire conversion kit.

Code Reference: SPS 316.110

The acceptable option is a listed luminaire conversion kit. This kit would be UL classified under the product category (IEUQ). According to UL "these products have been investigated to determine that, when used in accordance with the manufactures instructions, they do not adversely affect the operation of the complete unit".

Using this type of kit and following the installation instructions would make the installation acceptable.

53 My inspector says I have to bond the metal meter cabinet for an 800-ampere service. The power company says I can't. Is the bonding always required?

Answer: Yes.

Code Reference: NEC 250.4(A)(3) &(4), 250.110

Maybe the confusion is over the terms “grounding” and “bonding”. Many utilities prohibit the grounding electrode conductor from being connected to the grounded conductor within a meter cabinet.

The utility may not prohibit bonding of the cabinet. NEC 250.4(A)(3) & (4) requires electrically conductive materials that are likely to become energized be connected together and to the electrical supply source in a manner that establishes an effective ground-fault current path. 250.80 Specifically requires service raceways and enclosures be connected to the grounded system conductor for this reason.

Lack of bonding could result in an energized enclosure.

54. Attached is a cut sheet for a socket adaptor. It's made to fit into an incandescent socket. It does not come out (easily) once it is screwed in. Can I convert the incandescent luminaire and comply with the electrical code? Can I use the lower wattage of the converted luminaire to comply with the energy code?

Answer: Yes. No

Code Reference: SPS 316.110

SPS 316.110 requires the fixture be installed in accordance with the manufacturers' installation instructions.

The energy Code currently requires the maximum wattage of the incandescent fixture be used to determine energy Code compliance.