

Residential Questions and Answers 2011

1. I have an above ground swimming pool 18' ft. by 4' ft. deep, with metal T bar and upper ring for supports, that is set on a plastic mat or tarp (high grade material), so that we are insulated from earthen contact below. Some neighbor told me that I need to bury a # 8 copper bare wire around the pool area. Since it will attach to nothing is it needed? The neighbor can no longer swim in our pool. Are we safe as it is?

Ans. No 680.2, 680.26.(B)(2)

Poke a hole in the liner and do not use it or make it a safe installation. Per 2008 NEC 680.2, pg 559, definitions, you exceed the limits for a storable pool and therefore must meet the requirements of Parts I and II of the article. Your answer lies in section 680.26 (B) (2) and (b), pg. 566, bonding of perimeter surfaces and alternate means. Install a #8 AWG bare solid copper conductor, between 18" & 24" from the pool and bond to metal pool structure, motor and any other metal parts within 5' of the pool.

2. I am replacing several receptacles in a bedroom of my house because the old ones no longer securely hold the plugs. Do they need to be replaced with tamper-resistant receptacles?

Ans. No Comm. 16.003(4)

NEC 406.11 requires tamper-resistant receptacles to be installed in all areas specified in 210.52. Comm. 16.003(4) indicates repairs to electrical installations comply with the code that applied when installed. Unless the installation was originally installed after March 1, 2009 they would not be required to be tamper-resistant. NEC 2011 406.4(D)(5) will require replacement receptacles to tamper-resistant.

3. We drill water wells as well as installing and repairing pump systems. When the new electrical licensing requirements become effective on April 1, 2013 are we going to be out of business unless we hire an electrician to perform the electrical installation and repairs?

Ans. Drill the well, OK - Electrical installation, can't do - Repairs - OK

Comm. 5 contains the rules for the required licensing of electricians which will become effective 4-1-2013. Comm. 5.41 will require that no person or entity can engage in the business of installing, repairing, or maintaining electrical wiring unless the person or entity holds a license issued by the department as a licensed electrical contractor. You will need to hire an electrical contractor to install the new circuit to the well or become an electrical contractor and employ a master electrician for the new installation. (g) in the exemptions found in the note to Comm. 5.41(b) would allow you to install and maintain the pump.

4. After we finished a new house the plumbing contractor installed CSST gas tubing to the water heater. Now the inspector wants us to do some additional bonding to the gas system. I feel we met our requirement by the equipment grounding conductor installed with the branch circuit to the furnace. Who is right?

Ans. You are 250.10(B), Comm. 16.110

250.104(B) indicates other metal piping systems, such as gas piping is required to be bonded sized in accordance with Table 250.122 for the circuit that could energize the piping. It also indicates the equipment grounding conductor installed with the branch circuit that could energize the piping can act as the bonding means. Comm. 16.110 requires the listing and manufacturers instructions shall be followed. CSST manufacturers require additional bonding. You have met your requirements and the installer would be required to meet the CSST instructions.

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5. I have a two stall garage that is 120' ft. from my home. I have to replace the old 60 ampere Range & Main 120/240 volt fuse box now in use but it only has a three wire feeder circuit going to it. The local inspector citing Wis. Comm. 16.009 & 16.010 has said I need a new four wire feeder with ground rods and a raceway out of the ground to the panel. Existing wires come up out of the earth and are not located where damage can occur to them on the inside of the wall. Who can I get to override her requirements? Second can I just run a new fourth wire out to it along or close to the original URD cable route my uncle put in?

Ans. 3-wire feeder can stay, 250.32(B) Exc. Raceway required 300.3(B).

The exc. to 250.32(B) allows existing 3-wire feeders to be used if there are no parallel metallic paths to the building such as a metal pipe, wire, etc. The grounded conductor needs to be bonded to the building disconnecting means and grounding electrode at the garage. If they are individual conductors installation in a raceway would be required when they emerge from earth 300.3(B) .

6. Can a single gang plaster ring be installed on a switched lighting outlet on a ceiling under any circumstance? NEC 314.27(A) seems to indicate light fixtures are required to be supported with larger than 6-32 screws.

Ans. You are correct 314.27(A)

314.27(A) indicates a ceiling box intended to support a light fixture shall be designed for the purpose. They are required to support a luminaire weighing a minimum of 50 lb. The exc. allows a wall mounted luminaire, weighing not more than 6 lb., to be supported by a box or plaster ring with not less than two No. 6 or larger screws. 314.27(E) allows a single gang plaster ring to be installed on a ceiling box with No. 6 or smaller screws where it will support utilization equipment weighing not more than 6 lb.

7. We recently ran a new underground feeder to a detached garage using an IMC raceway. There is an above ground pool located about 6' from the garage and the raceway is located about 3' from the outside edge of the pool. The inspector indicated this was a violation because we are to close to the pool. I feel this is OK because it is in IMC. What do you think?

Ans. The inspector is correct. 680.10

Underground wiring is required to be located more than 5' horizontally from a pool unless it is necessary to supply equipment for the pool by 680.10. It can be closer where space does not allow it to be located more than 5' if installed in RMC, IMC, or PVC.

8. I installed a receptacle on the end of a kitchen peninsula that has a sink installed in it. The counter extends 12" behind the sink to provide seating for a breakfast bar. The inspector says the sink divides the peninsula and we need to add another receptacle. Is she correct?

Ans. No 210.52(C)

210.52(C)(3) requires at least one receptacle be installed in a kitchen peninsula where the long dimension is at least 24" and the short dimension of greater than 12" measured from the connecting edge. 210.52(C) indicates where the counter in a peninsula or island extends behind a sink, range, or counter top cooking unit and is less than 12" wide the peninsula is considered divided and a receptacle would be needed at each counter space. You have 12" OK.

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9. I am not a believer in the ability and use of re-bar in concrete walls and footings as a grounding electrode. I know it will corrode over time and not be effective. So I am not enforcing that as a requirement and if one chooses to use it they must still put in two rods for grounding it right. My contractors are happy, I am happy and the owners do not care. Catch me if you can.

Ans. Wrong 250.50, 250.52(A)(3)

NEC 250.50 pg 104 indicates all grounding electrodes present as described in 250.52 (A)(1) through (7) are required to be bonded together to form the grounding electrode system. If it is present it must be used. When someone calls and wants to start a lawsuit because it was not used, I will state the same code section and see you and the contractor in court. Pay me now or later or possibly never but I sleep well at night and don't worry.

10. A new home I recently finished has a loft open to the great room below. It is about 10' long and 8' wide and you need to walk through the loft to enter one of the second floor bedrooms. We installed a receptacle in the wall at the end of the railing, opposite the stairs. The inspector says this receptacle is too far from the end of the stair opening and we need to install another. I say this is just a hallway and I only need one. Is she correct?

Ans. Yes 210.52(A)

210.52(A) requires receptacles be installed in bedrooms, living rooms, dens, and similar areas of a dwelling. The general rule indicates a receptacle be installed so no point along the floor line of a wall or railing is more than 6' from a receptacle. This loft is large enough to be considered a room and would require receptacles to be installed as such. A floor receptacle within 18" of the rail and less than 6' from the stairs would be fine.

11. We install sewage systems. Many of these systems require a pump and alarm at the septic tank and we typically install a 12/3 UF to supply them because they are required to be on separate circuits. We have been doing it this way for years and now the new inspector failed the job. I think, because he is new, he doesn't know what he is talking about.

Ans. He's right Comm. 16.300(a)4

As installed the circuit is considered a multi-wire branch circuit and as such is prohibited by Comm. 16.300(a)4. Multi-wire branch circuits use both ungrounded legs of a 120/240 volt system and a common neutral conductor and is permitted to be considered multiple circuits. 210.4(B) requires a means of disconnecting both ungrounded legs of the circuit simultaneously and because of this, in the case of a fault, both the motor and alarm would be disconnected at the same time.

12. A customer is adding a sunroom to the back of his home. It has window panels that can be removed in good weather, basically making it into a screened porch, and will not be heated. The owner only wants 2 receptacles because she will only be using it for a sitting room when the weather is good. Will this be OK?

Ans. Yes 210.52

A porch that has a roof and wall screens which has no permanently installed glazed windows is treated like a deck, porch, or patio. It requires one receptacle outlet to serve the area and that area is considered exposed to weather (damp/wet location).

13. While I was away a few weeks on business, my wife the resident Better Homes & Garden, engineering specialist, designed and installed a 16' ft. X 16' ft. X 4" in. thick concrete slab with a

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4' ft. round fire pit ring in the middle of it. As is the case with the fickle finger of fate/luck she put the fire ring directly over my underground feeder going out to our 24' ft. X 24' ft. enclosed warming house to our hockey rink. My concern is that with a 14" inch burial depth for our USE-2/XHHW, feeder circuit is the heat of the fire going to affect the wire and possibly cause damage or failure to them?

Ans. Maybe, but you have another problem. 300.5

You do have problems and replacing the wire is not one of the options. 300.5 (A) on pg. 128, requires a 24" inch burial depth for the direct buried cables, so whoever put them in did it wrong. Also remember, if you replace the feeder to achieve the proper burial depth, it is now required to meet 250.32 and equipment grounding conductor is required. The effects of heat through the earth given distances are another science and I would feel it would not be an issue.

14. A customer hired us to install a receptacle for a small submersible pump near her new water garden. We attached PVC conduit on the exposed foundation for a short distance, because she didn't want us disturbing her flower garden along the house, then continued it underground to the receptacle. Because the total run was only about 25' I just continued with the NM from the house to the receptacle. When the inspector looked at it he indicated no NM underground. I replaced the underground piece of NM with THWN from the LB where the conduit goes underground. Now he says I can't use the NM outside even in the raceway. It's not underground so what's the problem now?

Ans. No NM in a wet location 300.9, 334.12(B)(4)

300.9 indicates where raceways are installed in a wet location above grade the interior of the raceway is considered a wet location. 334.12(B)(4) does not allow NM cable to be used in a damp or wet location. Also remember all receptacles installed in a damp or wet location are required to be listed as weather resistant. 406.8(A)&(B)

15. On a recent remodel I installed a short piece of EMT to support several new NM cable circuits we installed under several adjoining basement ceiling joist spaces that were enclosed for a cold air return. The inspector says we have to attach an equipment ground to this metal raceway. I don't think we need to but I can't find a code reference. Can you help me?

Ans. Yes 250.86 Exc. 2

Exc. 2 to 250.86 indicates short pieces of metal enclosures or raceways used to provide support or protection of cables do not need to be connected to an equipment grounding conductor.

16. The 200 ampere service panel is located the middle of the back wall of my finished basement bar room of my new home. A room on both sides of the bar room is unfinished basement area. In one of the unfinished rooms is the 120 volt sewerage ejector pit and pump, cord and plug connected, and the sump pump is located in the other. I do not want to GFCI protect the pumps. Is there another way?

Ans. Yes 210.8(A)(5), Comm. 16.210(2)(b)Exc., 210.52(G)

Yes per 210.8 (A) (5) pg. 47 requires all 15 and 20 ampere 120 volt receptacles in an unfinished basement to be GFCI protected. Comm. 16.210 (2) (b) pg. 3, exception; a GFCI receptacle must be installed within 3' ft. of the single non-GFCI receptacle for the pump. 210.52 (G) pg. 54 requires a receptacle in each unfinished room of the basement.

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17. I installed a new 60 ampere 120/240 volt feeder to a new detached garage using #4 AWG Al. 4 conductor USE cable. The inspector red tagged the job saying the USE cable cannot enter a building. The cable is in raceway from the point of emergence from the ground into the panel. My point is because it is in a raceway it is protected and not a big deal. What do you think?

Ans. USE can't enter the building 338.12(B)(1)

USE cable cannot enter a building. 338.12(B)(1) You will need to splice it outside to an approved conductor. You should use a dual rated conductor such as USE/XHHW to prevent this problem.

18. We installed 4-12/2 NM cables through a wall from the attic to the basement. The inspector is now telling me we cannot put these on a 20 ampere breaker. I think he is wrong. I know we discussed this at last year's class however I can't find the code reference. Can you help me?

Ans. You are correct. Comm. 16.310(1)

Comm. 16.310(1) indicates where more than 2 NM cables with 2 or more current-carrying conductors are installed in the same hole which will be fire or draft stopped the allowable ampacity must be adjusted in accordance with Table 310.15(B)(2)(a). 8 conductors require 70% derating to be applied. $30 \times .8 = 24$ amperes Your OK. Remember this also applies if the cables are not separated and will be in contact with thermal insulation. Comm. 16.310(2).

19. We installed a GFCI protected receptacle in the ceiling of an unfinished basement room to supply a cord and plug connected whole house exhaust fan. This room also contains the furnace. The inspector is requiring us to install another GFCI receptacle within 25' for servicing the furnace. Because the one in the ceiling is within 25' I feel we have met the requirement. What do you think?

Ans. Need another. 210.63

210.63 requires a receptacle to be installed within 25' of HVAC equipment for servicing. It has to be accessible and on the same level. The definition of accessible in Art 100 indicates the following. "Admits close approach, not guarded by locked doors, elevation, or other effective means." The one on the ceiling would not comply.

20. In our new master bedroom we have mirrors on the ceiling, and a Hydro-tub unit in the same room area. I know it must have a GFCI outlet below the tub surround and any receptacles located within 6' of the tub must be GFCI protected. But now the inspector said we must also provide AFCI protection. I ask if they will both work together and can we get an AFCI device type receptacle?

Ans. Yes

Interesting question, 210.12 (B) pg. 49, indicates AFCI protection and 680.70.71 pg. 573 requires an individual branch circuit and GFCI protection for the tub. We have been told the two protection schemes are compatible and can be used together in the circuit. I understand there is now an approved AFCI device however the entire branch circuit is required to be protected so a breaker would be your best option for this installation or you would have to use a metal raceway or sheathed cable for the portion not protected. NEC 2011 680.73 requires the face of the receptacle under the tub to be in direct view and not more than 1' from the opening. Also 210.8 will now require that the GFCI receptacle cannot be located under the tub.

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21. Can you explain the difference between a manufactured and a modular home as they pertain to the electrical code?

Ans. Manufactured home Comm. 20.07(52m) Modular home Comm. 20 & 21

Comm. 20.07(52m) indicates manufactured home as described by s101.91 (2) of the statutes means a structure to be used as a dwelling with or without a permanent foundation and is certified by the federal dept. of housing and urban development. It will have a label attached typically somewhere on the outside that indicates it was built to HUD standards. The interior wiring is installed per the NEC however it may not be the current NEC. The electrical service to it is installed per Art. 550 of the current adopted NEC in Wis. Unless the manufacturer's instruction indicate otherwise, the electrical service cannot be installed on the home and a 4-wire feeder complying with Part III of Art. 550 is required to the electrical panel in the home. A manufactured home is built to Comm. 20 & 21 standards to meet Wis. UDC requirements and follows the current Comm. 16 and the NEC. It will have a label attached to it, typically located under the kitchen sink, indicating it is a build to Wisconsin standards.

22. I installed a self-contained hot tub on my existing concrete patio. The electrical contractor said he will have to saw a ring around the tub to install an equipotential bonding ring around the perimeter. I don't want my concrete all cut up is there something else I can do?

Ans. Yes. Comm. 16.680(1)

680.42 indicates outdoor spas and hot tubs are required to be installed meeting the requirements of Parts I and II of Art. 680. 680.26(B)(2) indicates perimeter bonding is required within 3' of the hot tub. However Comm. 16.680(1) indicates this does not apply for listed self contained hot tubs constructed with nonmetallic walls.

23. My wife enjoys wine with supper and wants to install an 18 bottle open wine rack on the kitchen counter top. It will potentially cover up one of the counter top receptacles but since the rack is open on both sides we can still reach through it and use the receptacle. Is this OK?

Ans. No 210.52(C)

Depending on if the inspector gets to try the wine selections. Per 210.52 (C) (5) pg. 54 a receptacle outlet rendered not readily accessible shall not be counted as the required counter top receptacle for that given space. per 210.52 (C) (1). If she really wants the wine rack there an additional counter top receptacle GFCI protected may be required.

24. A duplex we are working on has separate basements however only one sump pump pit installed in one of the basements. Evidently, the drain tile from both units dump into one pit. We installed a separate meter and panel for each unit and supplied the sump pump from the panel in that unit. The inspector says this is a problem and now we will have to install another meter and panel to supply the sump pump from the house meter. The house panel will only have the sump pump on it. Isn't there another way?

Ans. Yes Comm. 16.210(5), 210.25(B)

You didn't indicate whether this was a existing or new duplex. If it is an existing dwelling and you are doing a service change Comm. 16.210(5) indicates for upgrades to existing 2-family dwellings only, separation of common area circuits is not required. If it is new 210.25(B) requires common loads not be supplied from a tenant panelboard so install another meter and panel or another sump pit.

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25. A customer is complaining about her walking track unit, that is cord and plug connected, in the finished basement exercise room of her new home is tripping the AFCI breaker. After replacing the breaker and checking everything else I am at a loss as to what else I can do. The electrical panel is in the same room. Would it be a problem if I supply a circuit to a junction box and hard wire the unit using liquid tight flexible metal conduit? Can the circuit breaker in the panel act as the disconnecting means? Must it have a locking means as well?

Ans. No, Yes, No 422.32

422.32 page. 281 the circuit breaker would work if within sight. A circuit breaker if properly marked as required by 110.22 pg. 36 and 408.4 pg. 262.

26. I feel a UFER ground is superior to ground rods and have been giving the basement contractor 20" of bare #4 AWG copper to install in the footing if they are not using re-bar. He knows it is required to be encased by at least 2" of concrete and is very good about getting it installed properly. The local inspector is still requiring me to install the ground rods which I don't think is required. What do you think?

Ans. Not required 250.52.A)(3)

Ground rods are not required with a UFER ground. 250.52(A)(3) indicates if a concrete encased electrode is installed meeting those requirements it must be used as an electrode. It is not required to be supplemented by another electrode as a metal underground water pipe would be. Contact the inspector before pouring so he can inspect for proper installation.

27. When using my new AFCI tester on required circuits in a dwelling some of the circuits would not trip off. When I told the contractor about the problem he indicated he has an AFCI breaker installed and it trips when he uses the push to test button so he is done. What do I do now?

Ans. Nothing Comm. 16.110

The listing and manufacturing instructions indicate the use of the test button on the device is to be used for testing AFCI and GFCI devices.

28. I used a 2" PVC raceway from the top of the panel to the basement ceiling and ran my home runs down it. The owner has decided to finish the room in the basement where the panel is located and the end of the pipe will become inaccessible above the ceiling. Is this going to be a problem

Ans. No Comm. 16.312 Exc.(2)

While 312.5(C) exc. (b) indicates the raceway cannot penetrate a structural ceiling Comm. 16.312 Exc. (2) omits this requirement. Also Comm. 16.312 allows the raceway to be a minimum of 12" rather than 18" as the NEC required.

29. Can I use Type FCC Flat Conductor Cable or a Nonmetallic Extension on the floor or the walls for my home office in my basement, where I have access to grade via two 8' ft. patio doors?

Ans. No, 324.12 (4), 382.10

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In uses not permitted 324.12(4) it can not be used in residential, schools and hospital buildings. Note, also where it can be used the wiring system is designed for installation under carpet squares only. Thus not under rolled carpet. For the second part of the question Article 382 Nonmetallic Extensions per 382.10 it can be run on the wall exposed or concealed as an extension from an existing outlet. And only in the room that it originates in.

30. The owner of the new house wants to install all of the ceiling lighting as can lights and track lighting. I told them they must have at least one ceiling light box that is fan rated and a multi-wire circuit run to it for switching the lights and fan separately even if they do not intend to use it. Some people just do not understand electrical code requirements. Am I right?

Ans. No 314.27(A)

And I would recommend that your bathroom reading material be an NEC code book. Per 314.27(A) pg. 172 & (D) pg. 173; if a box is installed it must comply with the code but it is not required. Also per Wis. Comm. 16.314 (2) it must be a fan rated box?

31. We are seeing new homes being wired with more elaborate low voltage systems such as alarm, video, sound etc. As an inspector am I required to be looking at these installations?

Ans. Yes 725, 760, 800, 820

The installation of these systems is found in the NEC and is required to be installed and inspected following the requirements found in there respective articles. 725 for Class 1, 2, and 3 circuits, 760 for fire alarms, 800 communication systems, 820 cable systems.

32. The utility in my area is setting a meter pedestal with a main breaker at the lot line. If the home has a concrete encased electrode are we required to bond it to the pedestal?

Ans. No 250.50, 250.32, 225.32

If the meter pedestal is not mounted on, or very near the building, it is not considered part of the structure and would not be required to be bonded to the UFER ground. Ground rods would be required at the pedestal. 250.50 requires all grounding electrodes at the building or structure to be bonded to the service or building disconnect for the building. For this installation you would be required to install a 4-wire feeder to the house by 250.32 and a building disconnect per 225.32. The UFER ground would be required to be used as the grounding electrode required by 250.32 for the structure.

33. I recently bid a job to install a generator at a home. Because the owner is out of town a lot he wanted automatic transfer for the heat, well, freezer and refrigerator. I calculated the load to determine the generator size and planned on using a transfer switch to supply a separate panel supplying the loads he indicated. My competitor used my load calc but is not going to install a separate panel for the loads. He told the owner he would just supply the existing house panel. Can he do this?

Ans. He can do it but it would be wrong. 702.5(2)(a)

This is an optional system and must be installed to meet the requirements in Art. 702. If using automatic transfer equipment 702.5(2)(a) requires the source to be capable of carrying the full load that could be transferred or a system for automatic load management.

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34. I know I am required to have a disconnecting means within sight of a motor. What do I do for a submersible well pump? Obviously I can't put it at the bottom of the well casing so do I install at the top and put on a locking means?

Ans. That's an option. 430.102

The general rule is found in 430.102(A) & (B). (A) requires a disconnect within sight of the motor controller. The requirement for motors is found in (B). It requires a disconnect within sight of the motor in (1). (2) allows the controller disconnect to act as the motor disconnect when it is located within sight of the motor. The Exc. indicates that where it is impracticable to locate the motor disconnect within sight the disconnect for the controller can act as the motor disconnect where means are provided for locking off. The locking means must remain in place with or without the lock being installed.

35. A new home we are working on has a walk out basement. The exposed wall is about 20' long and they will be insulating it and covering with drywall to protect the insulation, however the basement will be unfinished. I want to install receptacles in this wall but the owner said if it's not required he's not paying for them. My question is are they required?

Ans. No 210.52

210.52 (A) indicates receptacles meeting the spacing requirements shall be installed in kitchens, family rooms, dens, bedrooms etc. 210.52(G) requires at least 1 receptacle in a basement or each unfinished area if a portion is finished. If the basement is not going to be finished to be used as one of these rooms I would not require receptacles. Of course when the room does get finished receptacles will be required in the wall and it would be a lot easier to do it now.

36. I like to use 12/3 NM cable to supply the 2 required small appliance branch circuits to the kitchen counter top receptacles. Because the 2 ungrounded conductors are not attached to the same device I feel I can use 2 single pole breakers but the inspector doesn't agree. What do you think?

Ans. The inspector is right. 210.4

210.4(B) now requires a disconnect that will simultaneously open all ungrounded conductors of a multi-wire branch circuit. Previously such a disconnect was only required when they supplied the same device. Also 210.4(D) requires the conductors of the cable to be grouped with wire ties or a similar means in the panelboard where they originate.

37. I know carbon monoxide detectors are required in multi-family homes of more than 2 units. I think they are a good idea but in today's economy many builders will not let me install them in 1 or 2 family dwellings. Is there any talk of requiring them in these units?

Ans. Yes Comm. 21

The requirement is coming. Comm. 21 will require CO2 detectors for new 1 & 2 family homes beginning Feb. 1, 2011. They will be required to be powered by the electrical system, have battery backup, and be interconnected. On each floor level with a bedroom they shall be located outside of the bedroom within 21' of the door, and one on each floor level without a bedroom.

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38. A customer is finishing part of the basement in her new home into a family room and bathroom. The service panel is going to end up in the bathroom. We will have the required working clearances, and it's really only a ½ bath, no shower or tub so I don't think it will be a problem. What do you think?

Ans. It's a problem Art. 100, 240.24(E)

The definition of a bathroom in Art. 100 indicates if it has a basin and one or more of the following, a toilet, bathtub, or shower it is a bathroom. 240.24(E) does not allow overcurrent devices in a dwelling bathroom.

39. When doing a service change on a single family home am I required to install AFCI breakers for the circuits that require protection by 210.12?

Ans. No Comm. 16.003(3)

Comm. 16.003(3) indicates existing installation must comply with the code that applied when the installation was installed. If the panel is located at the same location so the existing circuits do not have to be extended to the new panel they would not need to be AFCI protected.

40. When I roughed in the basement of a new home I installed fixture boxes at various locations for the lighting. The owner has decided she wants fluorescent lights and supplied 4' fixtures that come with a short cord to plug into a receptacle. Can I cut off the plug and hard wire them into the boxes installed?

Ans. No 410.62(C)

Flexible cord is allowed to supply electric-discharge luminaires where the fixture is located directly below the outlet, the cord is visible its entire length, and is terminated in a grounding type attachment plug. 410.62(C).

41. I installed a 2" PVC conduit to my detached garage for the electrical feeder. I would also like to have cable TV, and telephone installed. Can I put all of these systems in the same raceway?

Ans. No 820.47, 820.133(A)(1)(b), 800.47, 800.133(A)(1)(c)

CATV and communication cables are not allowed to be installed in the same raceway or junction box with power and light circuits unless separated by a barrier. 820.47, 820.133(A)(1)(b), 800.47, 800.133(A)(1)(c)

1. I am installing a 480 volt to 120/208 volt 25 KVA transformer. Is it OK to use the 8 AWG copper equipment grounding conductor run with the primary branch circuit to also act as the grounding electrode conductor for the secondary of the transformer?

Ans. No NEC 2011 250.121

While not clearly stated in NEC 2008 it has never been allowed. They serve 2 different purposes. They are sized differently, and equipment grounding conductors do not normally carry current, while grounding electrode conductor may carry current under normal conditions. NEC 2011; 250.121 now clearly states it is not allowed.

2. A customer has a manufacturing facility with a 1600 ampere 277/480 volt service. They are installing a new plasma cutting machine which requires an 800 ampere 480 volt supply. Because the existing service is not capable of supplying the added load we would like to add a second service. My question is do we need to group the new service disconnect with the existing 1600 ampere service or can we locate it near the machine?

Ans. Either way 230.2(C)(1), 230.71

Where the capacity requirements are greater than 2000 amperes a second service is allowed by 230.2(C)(1) without meeting the requirement for grouping of disconnects required by 230.71.

3. I used USE cable for an underground 200 ampere feeder from a barn to machined shed. The state inspector said I can not enter the building with these conductors. What the problem? I have been doing it this way for years.

Ans. Not allowed 338.12(B)(1)

Underground service-entrance cable, USE, cannot be used for interior wiring. It will have to be terminated outside and use a conductor allowed in Table 310.13(A) to enter the building. If using a cable such as USE/RHW it can enter the building.

4. I am in the process of bidding a new medical clinic. Do I need to install "hospital grade receptacles" in the exam rooms?

Ans. No 517.18(B), 517.19(B)(2)

The requirement for hospital grade receptacles is found in 517.18(B) for the patient bed location in the general care area of a hospital, and for the patient bed location of a critical care area in 517.19(B)(2). The listing instructions for some cord and plug connected medical equipment does require the use of a "hospital grade receptacle".

5. A commercial building I am wiring has a small basement with only a sump pump and several lights. The inspector has indicated I need to GFCI protect the sump pump receptacle or install a GFCI protected receptacle within 3'. Is he correct?

Ans. No 210.8(B)

He may be thinking of dwelling unit basements where 210.8(A)(5) does require GFCI protection for all receptacles in an unfinished basement. Comm. 16.210(2)(b) allows a single receptacle for a sump pump where a GFCI protected receptacle is located within 3'. 210.8(B), for "Other Than Dwelling Units" lists 5 areas where GFCI protection is required. (1) bathrooms, (2) kitchens, (3) rooftops, (4) outdoors, and (5) within 6' of a sink. Basements are not listed.

6. Can I supply battery backup exit lights in an office building from an individual branch circuit?

Ans. Generally No 700.12(F)

Battery backup exit lights are called unit equipment. 700.12(F) indicates unit equipment is to be supplied from a branch circuit supplying the normal lighting in the area. The exception allows for a separate branch circuit in an uninterrupted area served by a minimum of 3 lighting circuits. The separate branch circuit must be supplied by the same panelboard as the supplies to the normal lighting.

7. The inspector is requiring us to AFCI protect the lighting in a common hallway of an apartment complex we are wiring. I feel he is wrong. What do you think?

Ans. He is incorrect on this one. 210.12

210.12 lists hallways as requiring AFCI protection however this would only apply for a hallway in the dwelling unit not the common hallway.

8. They are remodeling a small room in our city hall for the health department to use for administering vaccinations. I feel it should be wired to comply with

Article 517 as a patient care area however they don't want to spend the extra money. Am I wrong?

Ans. No 517.1, 517.2, 517.13(A) & (B)

The scope of Art. 517 indicates the provisions of the Article apply to electrical construction and installation in health care facilities that provide services to human beings. The definition of a patient care area in 517.2 indicates any portion of a health care facility wherein patients are intended to be examined or treated. 517.13 (A) requires branch circuits for receptacles and fixed equipment to be installed in a metal raceway or a cable having a metallic sheath or armor. The raceway or metallic sheath shall itself qualify as an equipment grounding conductor. 517.13(B) requires an insulated equipment grounding conductor, sized to Table 250.122 also be installed in the raceway or as part of a listed cable having a metallic armor or sheath.

9. I am installing a fire pump in an existing building. It will be located 50' inside the building so I am planning on installing a fused disconnecting means on the outside of the building, sized to the locked rotor current of the motor, and then bring a listed, 2 hr. fire rated assembly feeder to the fire pump room. My question is do the conductors need to be sized for the fuses in my disconnect?

Ans. No 695.6(C)

The fuse is providing only short-circuit and ground fault protection for the conductors. Overload protection is provided through the listed fire pump controller. The circuit conductors are sized at 125% of the fire pump motor and pressure maintenance pumps, and 100% of associated fire pump equipment.

10. We are bidding a 90-unit apartment building. Do we need to use tamper-resistant receptacles for the dishwasher and garbage disposal? The receptacle is located in a cabinet under the sink.

Ans. Yes 406.11

406.11 requires all 15&20 ampere 125 volt receptacles specified in 210.52 to be tamper-resistant. These are covered under 210.52-(1) through (4). NEC 2011 406.12 now has an exception indicating tamper-resistant receptacles are not required where

1. More the 5.5' above the floor, where part of a luminaire or appliance,
2. Where as part of a luminaire or appliance.
3. A single receptacle or duplex for 2 appliances located in a dedicated space.
4. Non-grounding receptacles used for replacements.

11. In a recent remodel project we installed several new raceways under roof decking to supply relocated light fixtures. We installed the new raceways 1 1/2" below the decking however they connect to existing junction boxes which are attached to the decking and to enter them we end up less than 1 1/2" from the decking. Do you feel this is a violation?

Ans. Yes 300.4(E)

The requirement for keeping raceways and cables 1-1/2" from the underside of roof-decking is to prevent long roofing screws from penetrating the raceways or cables. You could install box extensions or lower the boxes. NEC 2008, 300.4(E) only required raceways or cables on the underside of roof decks to maintain a distance of 1 1/2" below the decking. NEC 2011, 300.4(E) adds boxes as well as indicating cables, raceways, and boxes shall not be installed concealed in a metal corrugated sheet decking type roof.

12. I recently roughed-in a 12-unit condo complex. I used a 2" PVC raceway from the top of the panel to the basement ceiling and ran my homeruns down it. The owner has decided to finish the room in the basement where the panel is located and the end of the pipe will become inaccessible above the ceiling. Is this going to be a problem?

Ans. No Comm. 16.312 Exc.(2)

While 312.5(C) exc. (b) indicates the raceway cannot penetrate a structural ceiling Comm. 16.312 Exc. (2) omits this requirement. Also Comm. 16.312 allows the raceway to be a minimum of 12" rather than 18" as the NEC requires.

13. Does a transformer need to meet the working clearances required by 110.26(A)?

Ans. Generally, No 110.26

Small transformers do not normally have internal parts that require examination or maintenance while energized. Larger transformers may be checked for hot spots with thermo-graphic imaging. This may be performed with the doors or panels off or open. Working space would then apply to the area where access is made into the transformer. A safer solution is to specify glass "port-holes" installed by the manufacturer in the door or cover. Scanning or pictures may then be taken through the port-hole without removing the cover.

Working space requirements have to be provided about equipment to permit ready and safe operation and maintenance of electrical equipment. The states position has been transformers do not require servicing while energized. Equipment such as fusible switches, circuit breaker panels and other equipment that is normally serviced while energized do need to meet the requirements of 110.26(A).

14. By the time we were hired to wire a small manufacturing facility the footings were already poured. The plans indicate reinforcing steel was installed in the footings and it is attached to the J-bolts for the steel columns. As they did not bring a re-rod out of the footing do you think we could bond to the building steel and this would satisfy the concrete encased grounding electrode requirement?

Ans. Yes 250.52

While a concrete encased electrode is not required to be installed however if one is present it must be used. A concrete encased electrode is described as 20' or more of 1/2" or larger reinforcing steel encased by a minimum of 2" of concrete, 250.52(A)(3). Structural building steel that is connected to a concrete encased electrode is also considered a grounding electrode 250.52(A)(2). 250.50 indicates all grounding electrode present at the building is required to be bonded together and becomes the grounding electrode system.

15. We are having a problem at a newly constructed parking garage with some of the PVC lighting conduits pulling apart at couplings. Do you think the glue was defective or is it poor workmanship?

Ans. Check for expansion joints. 352.44

I assume this is an unheated garage. 352.44 indicates expansion joints shall be installed where Table 352.44 indicates thermal expansion may be more the 1/4". NEC 2011, 300.4(H) will also now require a listed expansion joint or other approved means to be installed where a raceway crosses a structural joint used for expansion, contraction, or deflection in buildings, bridges, parking garages, etc.

16. When using my new AFCI tester on required circuits in an apartment complex some of the circuits would not turn off. When I told the contractor about the problem he indicated he has an AFCI breaker installed and it trips when he uses the push to test button so he is done. What do I do now?

Ans. Nothing Comm. 16.110

The listing and manufacturing instructions indicate the use of the test button on the device is to be used for testing AFCI and GFCI devices.

17. I have been using 8/4 SER cable for 50 ampere circuits for years and now the inspector is telling me I can't do it anymore. Is he correct?

Ans. Yes 338.10(B)(4)(a)

338.10(B)(4)(a) indicates for interior installations use Art. 334 Part II. Prior to the 2008 code you did not need to use the 60 degree C temperature limitations in 334 where your cable was rated for 75 degrees C. NEC 2011 will now again allow the use of the 75 degree C rating when the cable is not installed in contact with thermal insulation.

18. I installed EMT conduit along the outside of a building to supply a new sign. Because NM cable was allowed in the building, I continued the new NM branch circuit through the conduit to the sign. The inspector indicated NM is not allowed to be used in a wet location, but I feel because it is in the conduit it is not in a wet location. Who is right?

Ans. The inspector. 300.9

The interior of raceways installed in a wet location above grade are considered to be a wet location and conductors installed are required to be rated for a wet location. Unless the raceway is protected such that it is not in a wet location replace the conductors.

19. Our local school is moving some vending machines as part of a cafeteria remodel. When the local inspector did his inspection he indicated we needed to GFCI protect the new branch circuits. I understand if they were located outside however these are in the cafeteria. Is he correct?

Ans. Yes 422.51

All new or remanufactured vending machines are required to include a ground-fault circuit interrupter as an integral part of the attachment plug or be located with 12" of the attachment plug. Older vending machines are required to be connected to a GFCI protected outlet, 422.51. Vending machines are described as (Read from NEC 422.51 page 283). Vending machines do not include ATM's, or lottery machines.

20. We have a lot of confusion about where the disconnect is required for a dishwasher in an apartment. The owner would rather not have them above the counter because of tenants turning them off and getting called because the dishwasher won't work. The inspector indicates they have to be within

sight of the dishwasher. I feel we could use 422.31(B) and put a lock on the circuit breaker. What would you like to see?

Ans. Cannot use a breaker lock. 422.32

422.32 indicates that for motor operated appliances if a switch or circuit breaker is used as the disconnecting means it must be within sight. A dishwasher is considered a motor operated appliance and 422.31(B) cannot be used to install a breaker lock. NEC 2011 422.31(B) has been rewritten to remove the language of more than 1/8 horsepower. 422.32 has been moved into a new 422.31(C) and clearly indicates if you have a motor operated appliance of more than 1/8 HP the disconnect must be located within sight of the motor controller. The switch could be located under an adjacent cabinet or if the receptacle is accessible you could cord and plug connect it.

21. I am doing a service upgrade on an older home that had SE cable on the existing service. I don't like SE cable so I will be using raceway, however I may need to use a 4' length of liquid-tight metallic raceway from the outside LB into the panel. Is there anything beyond the normal bonding requirements for service raceways I should be aware of?

Ans. Yes 230.43(15), 250.102(A)(B)(C)

230.43(15) allows metallic liquid-tight for service entrance conductors with an equipment bonding jumper routed with the conduit according to 250.102(A),(B), and (C).

(A) bonding jumper must be copper or other corrosion-resistant material.

(B) jumpers shall be attached as specified by 250.8.

(C) sized using table 250.66

22. I'm bidding a small assisted living facility. My question is can I use NM cable as a wiring method?

Ans. Probably 517.2, Comm. 334(1)

Check with the owner as to how the facility is being licensed. If a nursing home cannot use NM in patient care areas. If CBRF, or residential care apt. complex probably. 517.2 definition of patient care area, general care area, bedrooms, exam rooms, treatment rooms, clinics and similar areas where patients can come in contact with nurse calls, electric beds, exam lights etc. Comm. 16.334(1) indicates NM cable is allowed in buildings of Type III, IV, and V.

23. We are installing receptacles at a large trucking company to supply block heaters for their trucks. I plan on using a single receptacle for each parking space and not GFCI protect them. I don't want the problem of nuisance tripping. Will this be OK?

Ans. No 210.8(B)(4)

210.8(B)(4) indicates all 15 & 20 ampere 125 volt outdoor receptacles for other than dwelling units are required to be GFCI protected.

24. Do I need to use a bare grounding electrode conductor or mark it green in some way?

Ans. No. NEC 250.62

NEC 250.62 indicates the grounding electrode conductor shall be insulated, covered or bare, but makes no mention of color requirements.

25. We recently had flooding in our community. My question is if electrical equipment was underwater can we just clean and dry it, or does it require replacement?

Ans. Replace. Comm. 16.110-(1)

Most of the electrical equipment and wiring will require replacement if it has been submerged. The National Electrical Manufacturers Association or NEMA and UL have guidelines. Any NM cable, switches, and receptacles will need to be replaced. Circuit breakers and panelboards will also need to be replaced. Wiring methods approved for wet locations may be able to stay if the ends have not been submerged. Meggering should be done on these items. Some large equipment may be able to be reconditioned by the manufacturer depending on the length of submersion and contamination of the water.

26. 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

- i. 240.4(D) Small Conductors indicates that unless 240.4(E) or (G) allows it a #14 wire can only be used at 15 amperes.

- ii. 240.4(E) is for tap conductors and would not apply.
- iii. 240.4(G) includes air-conditioning equipment.
- iv. Table 310.16 allows a #14 AWG conductor to be used at 20 amperes at 60 or 75 degree C.
- v. 440.4 requires the minimum supply circuit ampacity and maximum protective device to be listed on the nameplate so all of the calculations have been done for you.

27. We are installing a 200 ampere feeder to an outbuilding on a farm. Because of the distance we determined we would need to increase the conductors from 3/0 copper to 300 kcmil copper to compensate for the voltage drop. Do we also need to increase the size of the equipment grounding conductor?

Ans. Yes 250.122(B)

The equipment grounding conductor is required to be increased proportionately to the ungrounded conductors by 250.122(B). Chapter 9 Table 8 indicates a 3/0 is 167800 cm. increased size to 300 kcmil. $300000/167800=1.7878$. A #6 AWG is 26240 cm. $26240 \times 1.7878=46911$ cm. Chapter 9 Table 8 #4 AWG 41740 cm this would require a #3 AWG copper.

28. The manufacturers of recessed light fixtures list the type of light bulbs that are approved to be installed within their fixtures. The newer type of medium base fluorescent light bulb is not listed for use in these recessed cans. Many people are buying them to conserve energy and are installing them in the recessed cans. Is this permissible?

Ans. Yes, UL White Book OOKH

This is permissible providing you install the lamp in accordance with it's markings UL and do not exceed the wattage rating on the luminaire.

The question is dealing with the proliferation of what the industry calls compact fluorescent lamps. UL Lists these as Self Ballasted Lamps and Lamp Adapters, (OOKH), located on page 262 in the 2010 White Book.

The Guide Information states these products have been investigated for use in the smaller of a 6- or 8-in. diameter recessed luminaire, if they will physically fit, and are intended for use in totally enclosed, recessed luminaires unless marked and stated not for such use.

29. A new commercial kitchen has a piece of kitchen equipment with a 20 amp, 125 volt twist lock connector. Is GFCI protection required?

Ans. Yes 210.8(B)(2)

210.8(B)(2) requires all 125-volt, single-phase, 15- and 20-ampere receptacles installed in kitchens to have ground-fault circuit-interrupter protection for personnel. There are no exceptions for a twist lock connector. Comm.16.20(2) has been deleted and all 15 and 20 ampere 125 volt receptacles in a commercial kitchen are now required to have GFCI protection

30. 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 225.31, 225.36, Comm. 16.110, 408.36(D)

225.31 requires a disconnecting means at the second building and 225.36 requires it to be suitable for use as service equipment. Comm. 16.110 tells us equipment needs to be installed following listing and labeling instructions. Most panelboard instructions indicate they are suitable for use as service equipment when a main breaker is installed. When breakers are back fed they are required to be secured to the panel with a "hold-down" device per 408.36(D).

31. The grounding electrode system for a new office building will be the underground metal water pipe and the rebar in the footing. The service is 1200-amperes and conductors are 3 sets of 600 kcmil THWN-2 per phase and neutral. Can I take a 3/0 grounding electrode conductor to the water, then bond the water to the rebar with a 4 AWG? Do I still need 2 ground rods?

Ans. Yes. 250.53(C) , 250.66, and 250.53(D)

Bonding jumpers used to interconnect electrodes together must be installed per 250.64(A),(B),and (E). The size is determined by 250.66. Since the maximum required size of an electrode conductor to a concrete electrode is 4 AWG copper, it follows that the bonding jumper would also be this size. Only underground water pipes need a supplemental electrode. The concrete encased electrode fulfills the requirement on this job.

32. I plan to run PVC conduit from an at-grade service to a new shop building. The feeder run is about 200-feet. Both structures are protected from frost. Do I need expansion fittings below grade? At the point where the PVC emerges above grade?

Ans. No-below grade. Yes-above grade. 352.44, 300.5(J)

The ground does not hold the PVC firmly in place. The PVC is free to expand and contract uniformly as the ground slowly cools down or slowly heats up. This is not the case above grade. The portion of conduit attached to the structure or enclosure mounted to the structure will not move. The portion below grade will. The expansion fitting is required above grade to help ensure the conduit does not pull apart.

This is also a common requirement of utility meter installation instructions. The expansion fitting may be required to help avoid damaging the underground conductors due to ground settling or other types of ground movement.

33. Does the electrical code require that openings in exterior walls be sealed in order to conserve energy? Or is this someone else's problem?

Ans. Yes. 300.7(A), IECC 502.4.3

34. I'm wiring pool equipment for a new hotel. Can I use a 2-pole, 50-ampere GFCI-Circuit breaker to protect the lights, receptacles, and pool equipment? The branch breakers would then be conventional circuit breakers.

Ans. Yes- 680.22(B)

The GFCI protective device must meet the requirements for personal protection. The trip setting must be 4 to 6 mille-amperes. You may experience "nuisance tripping, especially if the branch circuit's home runs are long. The GFCI device at the feeder level "sees" leakage current from the all downstream circuits.

35. Is it OK to use Table 310.15(B)(6) for sizing the conductors for a sub-feed panel in a residential dwelling? Is it OK to use the same table for sizing a 208/120-volt, single phase feeder to apartments?

Ans. No. 310.15(B)(6)

In the first case the feeder must carry the entire load of the dwelling in order to use the table. In the latter case, only 240/120-volt feeders carrying the entire load of the dwelling unit may utilize Table 310.15(B)(6).

36. Sometimes the inspector tells us that we have to prove that the emergency system is selectively coordinated. Is there a test? What is the minimum that we have to do?

Ans. 700.27

There is no test. Submit a one-line diagram of the emergency system. Include all overcurrent devices that are part of the normal and the emergency supply system. Submit time-current curves that show that all emergency system overcurrent devices are selectively coordinated with all upstream devices. There are two exceptions:

- 1) For overcurrent devices that are of the same ampere rating and are in series.
- 2) For the overcurrent device that is on the primary of transformers and the secondary device, where only one overcurrent device or set of overcurrent devices is on the secondary.

Submit proof that all ratings or settings required to achieve selective coordination have been completed prior to final inspection.

37. On a small office building I recently inspected they indicated there was reinforcing steel in the footing that was not brought out so they could make a connection to it for a grounding electrode. Is there anything they can do short of digging up the footing and chipping out the concrete to make a connection to the re-bar?

Ans. Yes 250.52(A)(3)

That would be one option. Another we have allowed is to pour another "footing" next to the first with the electrode being made available for connection. It would have to be long enough to accept the required 20' of re-bar or #4 AWG bare copper conductor.

38. Are there special rules for pole top services? What we have is a 400 ampere Ronk pole top disconnect set-up for generator backup with lever handle at grade. We had a lug burn off over 4th of July weekend and need to replace or even up size to 600 or 800 amps, There are 4-200a main breaker panels fed underground to this pole (these are spread out around camp grounds. Is there anything special we should be looking for?

Ans. Yes Comm. 16.230(4), 230.66, 230.91, 110.10

When using a pole-top switch on a farm we can use Art. 547 which does not require overcurrent protection to be installed for overhead distribution. However you have indicated this is being used at a campground and would need to meet the requirements of Chapters 1 thru 4.

Some of the things to consider would be:

Comm. 16.230(4) requires a disconnecting means be installed where utility wiring terminates and premises wiring extends overhead or underground to more than one building or structure. This could be the transfer switch if it meets the requirements of a service disconnect.

230.66 requires service disconnects to be marked to identify them as suitable for use as service equipment. I am not sure if Ronk makes a pole top switch that is SUSE rated.

230.91 requires the overcurrent device to be an integral part of the service disconnecting means or located immediately adjacent to it.

NEC 110.10 requires all equipment to be able to withstand the available short circuit fault current. The Ronk transfer switches I have seen are rated for 10,000 amperes at most. If the available fault current is more than 10K amperes some type of current limiting device will need to be installed ahead of the transfer switch. This could be the service disconnect if SUSE rated and in that case the transfer switch would not need to be SUSE rated but would need to be rated for fault current at its location.

39. I have a local township that is building a wash bay for their trucks. It is a wood building with metal siding inside and out. Can I use NM cable to wire this building? It will be installed inside the walls. For receptacles that will be weather proof (in use covers) and vapor tight lights. Would you call this a commercial garage? The architect called it a Type S-1 storage building.

Ans. Maybe 334.12(A)(4),511.3(A)

If they are not doing repair work on vehicles in which flammable liquid are used for fuel NM cable would be allowed. NEC 334.12(A)(4) indicates NM cable cannot be used in commercial garages having hazardous locations. 511.3(A) indicates parking garages shall be permitted to be unclassified.

A type S-1 building allows repair garages, while limiting quantities of hazardous materials. If they are only using the building for washing I would not consider it to have any classified locations.

40. Do the wire colors in fixture whips need to follow the requirements of 210.5 C or could a factory made whip with black, white and green be used on 277 volt lighting with brown orange and yellow phase conductors with a gray neutral? And does it matter if they are factory purchased or field made?

Ans. Stay consistent 210.5

The requirement in 210.5(C) would apply to all ungrounded conductors of the branch circuit including fixture whips that are not part of a listed fixture assembly. This could be done by color coding, marking tape, tagging or other approved means. Also the method used shall be documented and made readily available or posted at each branch circuit panelboard.

41. I have a town hall of the local township and the fire department for the same township has two building probably 20 ft apart. They have separate services for each building. Can I install one generator for emergency power to feed both buildings? What code articles should I be most aware of?

Ans. Yes Art, 700

Article 700 is the applicable article to look at for the installation. Some things to remember is the generator will have to be sized to carry the calculated load. You indicate you have a separate service in each building so you will need a transfer switch for each building or a means to monitor both normal supplies. It can only supply emergency lighting unless a separate "optional standby system transfer switch is installed, All emergency circuits would be required to be in listed raceways, MC or AC cable and normal electrical circuits cannot enter any raceways or junction boxes with the emergency circuits. You should also look at NFPA 110, Standard For Emergency And Standby Systems for additional requirements for emergency systems.

42. We need to install an electrical control cabinet approximately 38" wide by 5 feet high with 480 volt motor control inside. About the only installation location that works is in an area that will have occasional fork truck traffic. However, there is not enough physical space to provide for both the working space requirements of table 110.26(A)(1) and the fork truck. So my question is can a removable guardrail or a swing gate type guardrail be placed within the working space in front of the cabinet?

Ans. Swinging Gate-Yes. Removable Guardrail-No. NEC 110.26

110.26(A) indicates equipment which may need servicing or maintenance while energized is required to have clear working space as required by the following
(1) depth as indicated in Table 110.26(A)(1). 36"
(2) minimum of 30" or the width of the panel in this case 38"
(3) height of the equipment; as required in (E) 6.5' or height of equipment if greater the 6.5'.

Also overcurrent protective devices must be readily accessible per 240.24(A). A swinging guard that functions as a door would be allowed as long as the panel was still deemed readily accessible For example, a hinged or swinging guard could not be bolted shut or locked shut.

It could be located as close to the panel as you chose as long as it meets the clearance requirements when open.

43. I have an open office space in a commercial building where the installed 20A/120V branch circuit is drawing 23A. The load is linear fluorescent pendant fixtures and recessed cans, all fixed lighting units. To remedy the situation, I have specified a 30A/120V branch circuit breaker to accommodate the load. The circuit is to be fed with #10 wire. Is this a permissible installation?

The code section I am questioning is 210.23 (B). What constitutes a "heavy duty lampholder"?

Ans. Can't do it. 210.21(A)

210.21(A) indicates a heavy-duty lamp holder has a rating of not less than 600 watts if of the a medium type and not less than 750 watts if of any other type. I have not seen any fluorescent sockets that would meet these specifications thus you are limited to a maximum 20 ampere circuit to supply fluorescent or medium base fixtures.

44. Would it be permissible to install an F Bay fixture with a modular cord and plug from the manufacture in a major repair garage where the floor is classified? Or would the cord be considered as part of the fixed wiring as specified in 511-7(A)1? The fixtures would be mounted at a height exceeding 12'. The listed cord type from the manufacture is listed as type STW.

Ans. Yes. 511.7(A)(2)

I would allow it. 511.7(A)(2) allows flexible cord to be used for pendants above the Class 1 location. I don't have a good definition of a pendant and although this isn't what I would typically think of as a pendant it is similar and would be allowed. You indicate it is a Type STW which is listed for extra hard usage and It would be required to be installed to meet 410.62(C). The requirements found in 511.7(A)(1) would apply to the circuit supplying the cord.

45. I've got a new 200 amp service on a treated pedestal with a service disconnect. All rated for service and exterior use. I want to know if I have to provide a bonding terminal for other system. I don't believe so unless there will other systems. It's for my mother-in-law's trailer and she won't pay for phone or dish TV.

Ans. OK without installing terminal bar. 250.94

Good answer and explanation. If no other systems are present or planned for, you would not need to supply the intersystem bonding terminal at the service equipment.

If the mother-in-law wants cable, dish TV, high speed internet access, etc, the intersystem bonding termination would go on the trailer home anyway.

46. Could you please tell me the state code on how long (seconds) it should take a generator to transfer?

Ans. 10-seconds for emergency, 60-seconds for legally required and no time limit for optional systems. NEC 700.12, 701.11, 702

Emergency generators must transfer power within 10 seconds per 2008 NEC, Section 700.12. If the generator only supplies legally required loads, such as exhaust fans or fire pumps, it may take up to 60 seconds per Section 701.11.

There is no required transfer time for generators supplying optional loads Art. 702.

47. I am bidding on the wiring for a new CBRF. I spoke to the owner about the type of health care they provide. The residences are not sick but will get some basic care. This may include equipment such as oxygen generators and nebulizers. I need to know if this type of care will require the wiring to comply with Article 517.

A. No. 517.2

DHS Position Statement

Assisted living providers are designed to provide a balance of institutional and residential physical plant requirements. The Department of Health Services' position regarding the application of NEC Article 517 Health Care Facilities to Community-Based Residential Facility (CBRF) and Residential Care Apartment Complexes (RCAC) facilities do not provide "health care" in the traditional sense. Architecturally, the DHS continues to support the position that C-Class CBRF's are best suited for an IBC Use Group I-2. This is consistent with the International Building Code (IBC) formal interpretation 16-03, primarily due to the resident's inability to respond to a fire alarm notification and require help verbally and/or physically to exit the facility.

Plumbing requirements per Comm 82.50 are also supported by the DHS, primarily due to the age, infirmity, and scald potential of the CBRF residents. With respect to the electrical code, assisted living residents are provided nursing services and could fall under the definition of a Health Care Facility found in NEC Article 517. Yet the facilities are not well suited for application under the definition of Patient Care Areas. Given the limited amount of medical and personal equipment requiring double grounded circuitry, the DHS is not in favor of having CBRF's or RCAC's fall under the scope of NEC Article 517.

48. The project I'm working on has an 800-ampere service. The service equipment is an Eaton-Cutler Hammer PRL panelboard. It has factory installed Surge Protection (SPD). The issue is the circuit breaker ahead of the SPD. There is a dead front that is bolted to the frame with two side covers that bolt to the dead front and panel tub. The circuit breaker in question is located behind the dead front. Don't' circuit breakers have to be readily accessible?

A. 90.7 and 240.24(A)(3)

The key piece of information is that the SPD was factory installed, integrated into the panelboard construction, and the circuit breaker supplies only the SPD. NEC 90.7 indicates that it is the intent of the NEC that factory-installed internal wiring or construction need not be inspected at the time of inspection. This type of issue

is address by the listing standard which is used by the manufacturer to construct the equipment.

The construction appears to comply with the UL 67 standard and should be good to go. Since the switch/CB is only for the control of the SPD and not the main, feeder or a branch circuits that leave the panel, then it is permitted to not be accessible. The requirement in UL 67, the Standard for Panelboards states that: 12.1.5 A switch or circuit breaker provided to control a main, feeder, or branch circuit shall be capable of external manual operation under rated load conditions. Operating mechanisms of switches and circuit breakers located behind doors or covers shall be considered capable of external manual operation so long as the mechanism may be accessed without the use of a tool. Provisions for locking a cover are not to be considered as restricting access for external operation. An electrically operated switch or circuit breaker need not be capable of being externally operable by hand to the closed position.

Circuit breakers that provide overcurrent protection for feeders and branch circuits and overload protection for service conductors shall be readily accessible per NEC 240.24(A).

49. I know the rules are being enforced for Emergency Lighting Testing as of April 1-2009. Other contractors are not doing the testing. Why does my inspector force me to send her a report?

A: NEC 700.4(A), page 596,

NEC 700.4(A) requires that the AHJ conduct or witness a test of the entire emergency system. NEC 700.4(D) requires that a written record be kept of such testing. The requirements for the means of egress illumination are found in the Commercial Building Coder, IBC-1006. The minimum at any point along the means of egress in 0.1 foot-candle and the average is at least 1 foot candle. Don't forget to provide emergency illumination on the outside of required exterior exit doors.

50. I worked in a new C-store that opened two months ago and was surprised not to find any AFCI breakers installed in it. I was told by an inspector in SW Wisconsin that AFCI protection was now required and had to be used everywhere. What's the story?

A. NEC-210.12.

The requirements for AFCI protection for branch circuits did become effective on 1/1/10. However, the requirement is limited to branch circuits supplying lighting and receptacle outlets in certain areas of dwelling units. It is further limited to 15- and 20-ampere, 120-volt branch circuits. A store is not a dwelling unit so the requirements do not apply. There is no proposed change in the 2011 NEC that would extend the AFCI protection to non-dwelling occupancies.

51. I am installing a new service for machine shop. I am concerned that my power company would not give me the available fault current at the service point. They said they could provide it if I paid them \$500 for the calculation. Can they charge me?

A: NEC 110.10.

You must know the available fault current in order to select the service equipment. Overcurrent devices such as circuit breakers and fuses have a marked interrupting rating. Installing such a device on a system where the available fault current is higher than the rating is unacceptable and dangerous. Can the Co-op charge you to install the service? I guess then that they can charge you for the calculated fault current.

It is not a value you can calculate for yourself unless you have sufficient information about their system.

The 2011 NEC will require that the available fault current be field marked on service equipment serving non-dwelling occupancies.

52. My ex-brother-in-law bought an old black and brick supper club and is remodeling it into a boys-night-out club. The club will have a two laminated dance floors and finished brass pole in the center. He wants me to wire it in Romex. I think it is a Class II building and bid it in EMT. My competition is bidding it in Romex. Who is correct?

A: The competition. NEC 518.4(B), IBC Section 602.

Your competition has done their homework. The class of construction does have an impact on the type of wiring method. We will assume the capacity is 100 persons or more and customers are there to be entertained so that the building is meets the definition of "Assembly" occupancy.

NEC 518.4 sets the requirements for wiring methods. 518.4(B) does permit nonmetallic cables in "Non-rated" construction. "Non-rated" construction is defined for the purpose of applying the electrical Code in Comm 16.100-(1)(c). It includes building Types III, IV, or V. While there is not enough information for us to determine the type of construction, it is very likely that it is Type III, IV, or V. Essentially all of the walls, floors and structural framing in a type I or II building is non-combustible. Check with you brother-in-laws architect, general contractor or the local building inspector for additional information. Good luck with your bid!

53. Due to the new anti-smoking rules our church/meeting hall/social club is adding an enclosed fixed screen porch. The screen porch is 15-feet by 30-feet and has two exit doors to the outside. It gets really crowded on poker night. Does this space require exits signs and emergency lighting?

A. IBC 1011.1 and 1006.

Exit access doors shall be marked with an approved exit sign readily visible from any direction of egress travel. There are several exceptions including one for rooms or spaces requiring only one exit. This space has two exits.

IBC 1006.3 also requires an emergency source of power for means of egress illumination in rooms or spaces that require two or more exits. A minimum emergency lighting installation would illuminate the exit aisles within the space as well as the area on the stoop or landing on the exterior side of each exit door. If there are no defined aisles, the entire portion of the space where individuals could use to walk out of the space would have to be covered.

54. Why doesn't the State of Wisconsin require electrical plan review? Plan review is required for all of the other construction disciplines.

A: Comm 16.930-pg. 7-

There are several aspects of electrical construction that do require plan review. The state does require energy calculations, lighting control information, and emergency lighting plans for new buildings, building additions where the total building volume exceeds 50,000 cubic feet and first-time tenant space build-outs in such buildings. The state also does an electrical plan review for all new house construction that is performed by the state. The Department of Health Services requires short-circuit and coordination calculations for any hospital or nursing home construction that involves the essential electrical system. Local inspectors may perform this review if they so willing. The state ends up doing the review in all other cases.

In any case, the electrical plans can be submitted to the state for review upon request. There is a fee charged for this service.

Note: The state does plan to review electrical plans for fire pump installations. This rule has not gone into effect yet.

55. Can you update us on the Commerce Department, Safety and Buildings Division, Electric team goals and plans for the future?

A. State-wide Inspection Public Buildings and Places of Employment

The Safety and Buildings Division has proposed a plan to provide for state-wide inspection of public building and farms. This inspection program was mandated by Wisconsin Act 62, the same law that requires the department to license electricians. We anticipate that this program could be in place prior to 2013. In conjunction with the inspection program, the division plans to audit agent municipalities and private inspection agencies in order to ensure uniformity. The division will continue to support educational activities, in particular the yearly update program.

Staff will continue in 2011 to coordinate and provide exam preparation classes in the rural areas of the state.

Staff will also remain available for answering code questions, investigating complaints, and provided needed inspections.

56. We recently added a Solar PV array to the roof of an office building. The electricity generated by the array is sold back to the utility under a "buy-down" program. The owner's electric bill is essentially reduced by the amount of power they generate. There is a separate meter and service disconnect. We located the service disconnect for the PV unit on the exterior of the building at the utilities request. The building service is located inside. The local inspector thinks both disconnects have to be grouped. He indicated that he will OK the installation if we get approval from you. Is the exterior location for the PV disconnect OK?

A. Yes, 230.82(6) and 230.40 Exception No 5.

The general rule in 230.40 requires the service drop or lateral to supply only one set of service-entrance conductors. When you added the PV meter and service disconnect, you added the second set of service-entrance conductors. Therefore one of the exceptions must apply. Exception No 2 is the one that the inspector is thinking of. It allows up to six sets of service conductor supplying up to six service equipment enclosures grouped at one location. We think that Exception 5 fits your application. It permits an additional set of service-entrance conductors to supply each or several systems covered by 230.82(5) or 230.82(6). 230.82(6) permits solar photovoltaic systems to be connected to the supply side of the service disconnecting means.

57. I have wired a metal fabrication facility with a designated paint spray area. They only use water-based paints. The owner has installed an approved ventilation system. OSHA has written him up for having EMT race as a wiring method. Is OSHA correct?

A. No 516.1, pg 419.

The NEC is used by OSHA as the normative standard for electrical wiring. OSHA does not recognize local amendments to the NEC. 29 CFR Part 1910 draws heavily from the 2002 NEC.

Sec. 1910.307 (a) covers Hazardous (classified) locations.

"1910.307 (a) Scope--(1) Applicability. This section covers the requirements for electric equipment and wiring in locations that are classified depending on the properties of the flammable vapors, liquids or gases, or combustible dusts or fibers that may be present therein and the likelihood that a flammable or combustible concentration or quantity is present. Hazardous (classified) locations may be found in occupancies such as, but not limited to, the following: aircraft hangars, gasoline dispensing and service stations, bulk storage

plants for gasoline or other volatile flammable liquids, paint-finishing process plants, health care facilities, agricultural or other facilities where excessive combustible dusts may be present, marinas, boat yards, and petroleum and chemical processing plants. Each room, section or area shall be considered individually in determining its classification.”

“Note to paragraph (c)(3) of this section: The National Electrical Code, NFPA 70, contains guidelines for determining the type and design of equipment and installations that will meet this requirement. “

This is similar to the scope of Article 516 Spray Application, Dipping, and Coating Processes. “This article covers the regular or frequent application of flammable liquids, combustible liquids and combustible powders by spray operations”. The spray operation uses water based paints. Water is not a flammable or combustible liquid. If no combustible powders are used, the owner should appeal the determination.

58. I installed a NEMA-3R panelboard in a new free stall barn. The inspector said I have to move it outside and put in a NEMA. 4X or 6P panel. The wall panels open and there is a lot of air movement. Is she right?

A No. NEC 547.5 (C)(2) and 110.20.

Adequate ventilation must be present in order to protect electrical equipment from corrosive influences. If this is the case, a NEMA 3R enclosure is acceptable. NEC 547.5 (C)(2) pg 464, requires that enclosures in damp locations be placed or equipped so as to prevent moisture from entering or accumulating in the enclosure. Table 110.20 pg. 35 address enclosure types which provide a degree of protection against various environmental conditions. Type 3R enclosures provide protection against rain, snow, and sleet. 547.5(C)(3) covers corrosive areas on farms. Electrical enclosures rated for such areas are Types 3RX, 4X or 6P. An example of such a room or area is in the immediate vicinity of manure handling equipment.

59. My local co-op has installed a new service pedestal for my new mobile home that is 50 feet away. The inspector says I need to install another service-rated disconnect with 30 of the mobile home. If this is true, do I also need to tie the grounding electrode conductor into the concrete grade beam that supports the home?

A: 550.32 pg. 474

NEC 550.32(A) covers the mobile home service equipment. One option is to locate the service equipment within 30-feet and within sight of the home. A second option is to locate a disconnecting means that is suitable for use as service equipment to meet the same requirement. Grounding at this disconnecting means shall meet 250.32.

NEC 250.32(A) requires a grounding electrode system be installed. If the concrete grade beam contains rebar and meets 250.52(A)(3) requirements, the grade beam is an electrode and it must be used. No additional electrode, such as ground rods, are required if the disconnect is connected to the rebar in the grade beam.

60. I understand that in the new 2011 NEC that hotel and motel rooms will have to meet the AFCI requirements.

A: No, not a typical guest room 210.18, 210.12

Only guest rooms that have permanent provisions for cooking have to comply with the branch circuit rules for dwelling units. This is a current requirement of 210.18. However the 2011 NEC 406.13 will require the installation of tamper-resistant receptacles.

61. I have been asked many times as an inspector to help out a contractor or engineer/designer to solve a 110.26 (C) (2) (a) area problem by saying the site has an unobstructed egress path. What would be a good rule to work with on an explanation that I can use?

A: 110.26 (C) (2) (a) pg. 37/

Face gear turn around 180 degrees and leave area by not passing any obstructions.

62. I am wiring a 42 room motel. The plan shows a receptacle located on a wall where the bed is to be located. The inspector says the receptacle has to be "protected" and the inspector wants me to put a bubble cover on it. It looks really bad. Any other solution?

A: NEC 210.60 (B),

A protective cover is one possible solution. Finding another location is more practical.

63. I understand that the new energy code requires us to install a new master switch to kill all power to lights in a given area.

A: NEC 210.70 (B) and Comm. 63.1050.

Four types of controls 1) Area, 2) Reduce Lighting, Day lit Areas, 4) Shutoff

64. NEC 210.11 (B) talks about loads to be proportioned among the branch circuits. How close do they have to be?

A: NEC 210.11(B)

Depends on the inspector. Often an major objective in agricultural facilities, Minimizing the neutral current is the objective.

65. I know the rules for generator and power transformer locations. Do they apply to an NEC Article 702 optional system?

A: Comm. 16.700 and 16.701

The minimum 20 foot spacing is not required between transformers and generators that supply only optional loads. You could use it as a good rule of thumb.

66. I have a question on a proposed emergency system design. To meet NEC 110.9, the upstream feeder circuit breakers on both the normal and generator side provide the entire band of overcurrent and short circuit protection. I propose to use a molded case switch for isolation purposes on the line and load side of the transfer switch. Would this meet Exception 2 to NEC 700.27?

Ans. Yes, if of similar ampere rating. NEC 700.27

Based upon your response, I am assuming the switch has a short circuit current rating that equals or exceeds the available short circuit current. And that you have selected an instantaneous rating or setting that allows the load side device to clear first.

The NEC does not directly address the issue. For example you could put a 800-ampere fuse and 800-ampere circuit breaker in series. They could have very different time-current characteristics. The exception only refers to size determined by the ampere rating.

67. We will be doing a remodel of a Culvers restaurant. Kitchen equipment will be moving to different locations switching around circuits to newly built interior walls. Sinks will be located on same walls as appliances such as soup warmers, hot fudge warmers and refrigerated worktables. Do all receptacles for this equipment have to be GFI protected, or just receptacle near the sinks? If so what about refrigerated work tables if receptacle is low?

A. Yes. 210.8(B)(2)

Section 210.8(B)(2) of the 2008 NEC indicates all 125 volt 15 and 20 ampere receptacles in commercial type kitchens are required to be GFCI protected. Comm 16.20(2) which previously only required GFCI protection for receptacles serving the counter top surfaces has been deleted.

All receptacles meeting the amperage and voltage requirements indicated would require GFCI protection.

68. I have a couple of questions for you regarding the code requirements for a Maxifascial Surgery center in Madison Wisconsin that I am beginning the design work on. I will be using emergency power for my life safety branch and for my equipment branch. I will be staying under 100 kW for the 6 treatment rooms that will require emergency power.

Can I feed the life safety panel and equipment panel from one transfer switch?

Will I need all GFI receptacles in the treatment rooms?

A. Yes. Not enough information. 517(30)(B) and 517.20

I agree the use of a single transfer switch for the essential electrical system of the center may be allowed by 517.30(B)(4) which would allow the use of one transfer switch to serve one or more of branches of the essential system where the maximum demand is 150 KVA or less. When looking at the essential system it is important to determine what is going to be installed. The loads would be limited to the items addressed in Article 517 for the essential electrical system.

You could not supply loads that do not meet one of these requirements from the single transfer switch. If other loads were supplied they would be considered part of an optional standby system, Art. 702, and an additional transfer switch would be required for those loads.

517.20 requires GFCI protection for all receptacles installed within a wet procedure location. 210.8(B) requires GFCI protection for receptacles located in bathrooms if the treatment rooms would have their own bathroom.

69. We have a number of printing presses in our facilities and therefore rooms that are used for storage or mixing of inks and solvents. We rate our mixing rooms as Class 1 Div 1 and our storage rooms as Class 1 Div 2. Around our printing presses out on the production floors we follow the requirements of Article 516 (although we are not actually spraying or dipping). As shown in article 516, as you get further away from the hazardous material, the hazardous area is reduced in height to an area 3 feet above the floor.

I have been asked, why in our hazardous storage rooms do we need to rate the area above 3 feet as hazardous. The hazardous material is all heavier than air. Do you have any thoughts?

A. NEC 500.4

I would use NEC 500.4 to require documentation from a qualified engineering firm or individual who is experienced with the classification of flammable materials and their use. The classification of the storage area as Class I Div. 2 may be appropriate, assuming the criteria in 500.5(B)(2) is met, however without the proper documentation I would assume the entire area to be classified.

I do not know what type of testing equipment you are referring to however Part III of Article 501 does allow general purpose enclosures for some types of equipment in Class I Div. 2 locations.

70. Have you received the email that I sent to the emergency lighting email address for an interpretation request about how far we need to provide egress (and normal) lighting out an exit. I addressed it to you hoping it would make its way there. Please advise. This topic is becoming a hot one for us.

A. IBC 1006.3.5

IBC 1006.3.5 requires that the exterior landing for exit discharge doorways be automatically illuminated by the emergency electrical system. 1008.1.5 stipulates the minimum dimensions of the landing.

For example, the required width of the rear exit door for tenant space "A" is 36-inches. The minimum depth of the landing in the direction of travel is 44-inches. In this case the area requiring illumination from an emergency system is 36-inches by 44-inches regardless of the size of the concrete pad the masons have poured.

71. My question is in regards to Article 517.13(A) and (B). Here is the situation. We are looking at an MRI room witch I believe falls under a **patient care area**, when looking at page (70-426) Article 517.2 definitions. **Patient care vicinity** page (70-427) states a space within the room not less than six foot beyond the perimeter of the bed, in its normal location. In an MRI room patients are escorted in, placed on the table, receive the MRI, and are escorted out. If the outlets in the MRI room are outside of the six foot perimeter around the bed do they need to have a redundant ground?

A. NEC 517.2, 517.13

The starting point is the definition of patient care area. The requirement for metal raceways or cables and the additional equipment grounding conductor is in 517.13. This requirement applies to receptacles and fixed equipment in patient care areas.

There are areas within a MRI room where the definition fits. Any area where the patient may come in contact with ordinary electrical appliances. There may be other areas in the room where the patient is restricted from accessing this type of equipment due to barriers or the attendant.

The area designated for patient care is determined by the administrator of the facility. Without such a determination, I would generally classify the entire room as a "patient care area".

72. I am an electrical engineer working on a new rehabilitation facility. We would like to have a small natural gas generator for each building with this as the only fuel source. This generator will serve some receptacles, emergency lighting, and some HVAC equipment. This is allowable by code if the AHJ approves it, NEC 700.12(B)(3) exception, do you see this as a problem? What do we need to do to get this approved?

A. 700.12(B)(3)

This is an interesting question. Our position states that natural gas is considered to be a reliable fuel source. I have heard DHFS may disagree. They say that their adoption of NFPA 99 would support that an alternate fuel source would be required. Typically I only enforce what Comm. 16 and the NEC indicates, so I would agree that this is acceptable. I am also taking into account that you are a State of WI registered professional electrical engineer and this determination is also supported by a supervising professional for the project.

73. I am working on a project where we are installing two UPS modules in the data room. NEC Article 645.11 requires that both the input and output of the UPS be disconnected with the operation of the EPO switch. The UPS we are looking at has a contact within the cabinet on the input power. If this contact is opened with the activation of the EPO switch and input power is disconnected at this point, will this comply with 645.11 or does the breaker in the feeder panelboard have to be opened shutting off power to the feeder conductors?

A. NEC 645.11

NEC 645.11 tells us that if you do not meet (1) or (2) you need to comply with 645.10. In 645.10 we are required to disconnect the power to all electronic equipment in the room. This would require disconnecting the circuit to the UPS be it a feeder or branch circuit. Opening the contact in the unit would not disconnect the power to the unit. The units I have seen have a dry contact in the unit that is usually used to operate a shunt trip breaker feeding the unit.

74. Does an LED fixture that consists of multiple diodes and one driver satisfy the intent of the requirement in NEC 700.16 for multiple lamps? Specifically in regards to exterior egress illumination.

A. NEC 700.16

The electrical staff has discussed this issue and concur that a single driver is permitted. This is similar to our position on fluorescent luminaires and exit fixtures. We interpret NEC 700.16 as requiring two tubes but only one ballast in an area where the fluorescent fixture is the sole source of Emergency illumination.

75. We have a new grocery store being built here in Sun Prairie. There is a generator installed with one transfer switch to handle both Legally Required and the Optional loads in case of a power failure. However, if the main trips due to a ground fault the generator will not start, leaving the entire building in the dark. Is 701.18 Selective Coordination the only help in reducing the risk of this happening or is there something else I'm missing?

A. NEC 700.12 and 701.11

I am not sure what you are referring to as legally required loads. Legally required loads are items that Chapter 27 of the building code would require to be on standby power such as smoke control systems, accessible means of egress elevators, sliding doors etc and are required to be installed per Art. 701 of the NEC.

Emergency egress lighting is required to be installed using Art 700. NEC 700.9(B) requires emergency circuits to be kept entirely separate from other non emergency circuits. This would require the use of separate transfer switches if supplying non emergency circuits. If only one transfer switch is being installed,

and being used to supply loads other than emergency lighting, some other means of emergency egress lighting would need to be installed such as unit equipment.

You are correct 701.18 for a legally required system, and 700.27 for an emergency system, would require the systems to be selectively coordinated. In either case if the normal system fails the generator should start and automatically transfer. The emergency system would need to transfer within 10 seconds and for the legally required system within 60 seconds.

Loads not considered emergency or legally required are optional and installed per Art. 702.

76. I am currently working on a project that is using LED lighting as its lighting source. This is residential construction utilizing LED strip fixtures and recess cans. How they are being wired is with a remote power supply that has 120 volt input and RJ45 phone jacks for control to the switch/dimmer and power supply to the LED lights. Are the Category 5 cables suitable as a wiring method under the NEC as a supply conductor to LED fixtures? Are the fixtures permitted to be installed in a shower area (wet location) or over a spa/tub (damp location)? The LED fixtures are less than 8 ft above the water surface. This entire wiring configuration is UL listed and approved.

A. Maybe. Probably not. NEC 410.10 and 680.43

GFCI protection is not generally required for fixtures of any type that are installed in damp or wet locations. The fixture must be marked for the locations per 410.10. Fixtures in bathtub and shower areas must meet 410.10(D).

There are some locations, such as around swimming pools, spa, and hot tubs, where providing GFCI protection allows the fixtures to be closer to the water. The suitability of the Cat 5 cable as a wiring method for the LED fixtures must be addressed by the listing. The installation instructions for listed lighting system address the size and type of permitted cables. The type of cable permitted is often based on the output capability of the power supply. For example, the power supply may be listed as a Class 2 power supply. Cables shall meet the listing requirements from Article 725, including the permitted substitutions. For example, the Category 5 cable may be used with a Class 2 power source as long as it is listed as "Type CM" and is the proper wire gauge. NEC 680.43(B) addresses the installation of light fixtures over an indoor spa or hot tub.

680.43(B)(1)(c) indicates the requirements for lights that are located less than 7'6" above the water. 680.41(B)(c)(1)&(2) indicates the luminaires have a glass or plastic lens and non-metallic or electrically isolated metal trim and be suitable for use in damp locations. These rules apply for recessed luminaires as well as surface mounted lights.

Also 680.43(B)(1)(a) requires lights located less the 12' above the water to be GFCI protected. I agree a GFCI on the line side of the power supply would not protect the secondary side. I do not know how the secondary side could be protected. I would look for a listing of the unit that would have GFCI protection on the load side included as part of the listing.

It appears the installation you describe would not meet these requirements.

77. I am under the impression that illuminated EXIT Signs are required to be wired with a metal conduit/cable. Is this true? I believe it was required by the International Building Code.

A. No. IBC 1011.5 and Comm. 16.700-(1)

IBC 1011.5.3 and 2702.2.3 require exit lights to be supplied by an emergency source for a minimum of 90 minutes in the event of loss of normal power. This can be provided by storage batteries, unit equipment, or an emergency generator.

Comm. 16.700(1)(a) requires emergency circuit wiring to be installed in a listed raceway or Type AC or MC cable.

Remember when using unit equipment the emergency circuit begins at the battery and would not require a raceway to supply the unit equipment itself, however if you are supplying a remote head raceway would be required to the remote light.

78. I have a question for a fire alarm system wiring. In an open ceiling the owner would like to spray the lid and off white. The area already has red fire alarm cable in it. Will it be ok if the cable is painted?

A. No. Comm. 16.110-(1), 760.30, and 760.124.

Why can't the cable be masked prior to painting? Several potential Code issues to address prior to painting:

1) 760.30 How would this identification requirement be met if the cables were painted?

2) 760.124 How would this identification requirement specific to power limited circuits be met if the cables are painted?

3) Comm 16.110-(1) Does the manufacture and the listing requirement permit this cable to be painted? Check with the manufacturer to address viability.

Run your answers past the local fire inspector if you decide to proceed.

79. The Pick-N-Save store we are remodeling has a large transfer switch. Voltage is 480/277. Per NEC Table 110.26, the required working clearance from live parts under condition #2 is 42". The existing clearances are only 40". The questions we have are:

1. Can they install plywood on the wall behind the equipment to move it out of the condition 2 and into condition 1 category?
2. The area of the transfer switch that only has 40" of clearance is the back of the enclosure which only supplies access to the main lugs. All "serviceable" while live components are accessed from the front where there is proper clearance. The only time they would access the lugs when complete would be with the main disconnect opened. I think this may require interpretation.

A. Yes. Not enough information. NEC 110.26(A)

1. Yes, this will change the conditions.
2. I agree that some evaluation of the likelihood that the lugs may be examined while energized is required. For example, it is very common to do thermo graphic imagine of such connections while the system is under load. Since the lugs can only be accessed form the back, this type of testing would have to be done from the back with the cover removed. The proper working space would then be required.

80. My question pertains to a residential permanent swimming pool installation. NEC 680.21 (5) Cord and Plug Connections. The statement in this section that says pool associated motors shall be permitted to employ cord and plug connections, does this allow for a choice to hard wire the motor? In this example there is a motor rated snap switch for disconnecting means.

A. Yes. 680.21(A)(1)

Good question. Any of the wiring methods mentioned in 680.21(A)(1) could be used for the entire installation. Section 680.21(A)(5) acts as an exception to 680.21(A)(1). So cords would be an option only if installed to meet all of the conditions in 680.21(A)(5).

And the HP rated snap switch would be permitted as the disconnect as it is one of the types of motor disconnecting means listed in 430.109

81. Today I was involved in a discussion and was attempting to explain Article 250.122 (B). There seems to be some confusion relating Article 250.122 (F) to Article 250.122 (B).

I think that Article 250.122 (B) trumps Article 250.122 (F) in situations where Current Carrying Conductors are increased in size to compensate for Voltage Drop or other reasons.

I'm using the example given in the 2008 N.E.C. Handbook.

Ampacity of the Feeder: 250 Amps

Conductors proposed: Parallel 250 KCM in separate raceways.

Standard Conductor Size @ 75 C: is 1- 250 KCM Copper for a 250 Amp Feeder.

500,000 KCM/ 250,000 = Ratio of 2

Normally a # 4 Eq. Ground would be required. Per Chapter 9 Table 8, a number 4 AWG conductor has a Circular Mil of 41740.

$41740 \times 2 = 83690 \text{ CM}$

Per Chapter 9 Table 8, a 1AWG conductor (83690 CM) Equipment Grounding Conductors would be required in each raceway.

A. We agree. 250.122(B)

NEC 250.122(B) applies to circuits where the conductors are run in parallel. The equipment grounding conductor(s) are required to be increased in size proportionate to the increase in size of the ungrounded conductors.

82. Does 520.6 mean that the derating requirements of 310.15(B)(2)(a) do not apply to conduit fill in theaters

The conductors all originate from a dimming rack in 10AWG THHN and are not all on at same time and are dimmed to a level below full bright. Typically we run 30 circuits with separate neutrals in the same conduit to connector strips.

A. No, it does not. 520.6

520.6 is telling us to use Table 1 in Chapter 9 when calculating conduit fill. However the ampacity adjustment requirements in Table 310.15(B)(2)(a) would still apply.

The example you give would allow you to use that 10 AWG on a 20 ampere circuit where it is not supplying a multi-outlet branch circuit supplying receptacles for cord and plug connected portable loads. See 240.4(B)(1).

Table 310.16 indicates #10 THHN is rated at 40 amperes at 90 degrees C, which although you cannot typically size the overcurrent device to the 90 degree C you can use it for derating purposes.

Table 310.15(B)(2)(a) requires derating to 45% for 21 thru 30 conductors in a raceway.

$40 \times .45 = 18$ amperes

240.4(B)(1) allows you to use the next standard size overcurrent device which would be a 20 ampere device

Section 520.27 addresses feeders to stage switchboards and (B) indicates that the neutral conductor would not need to be considered for derating purposes if it is part of a feeder supplying a solid state sine wave 3 phase 4 wire dimming system only.

Section 310.15(B)(4)(a) indicates a neutral conductor that carries the unbalanced load of other conductors of the circuit does not need to be counted for derating purposes. This would be a multi-wire branch circuit such as a 3-wire circuit from a single phase system or a 4-wire circuit from a 3 phase Y system only.

Also keep in mind 310.15(B)(4)(c) indicates that where a 4-wire 3 phase Y circuit supplies nonlinear loads or electronic equipment, such as HID lighting, there may be harmonic currents present and the neutral conductor is required to be counted as a current carrying conductor.

You indicate you have a neutral conductor for each hot conductor. I assume these are your branch circuits to the stage lighting, not the feeders referred to in 520.27. This would require that unless you meet one of the conditions in 310.15(B)(4), which it appears you do not, you are required to count all neutrals as current carrying and they would have to be considered for derating purposes.

83. For code article 445.13, our interpretation is that the breaker in the generator is the first overcurrent device. Therefore, the line side conductors to the breaker must be 115% of nameplate rating not the load side. Do you concur?

A. In principal. 445.13.

I agree in principal. Let me answer your question a different way. NEC Section 445.12(A) requires overcurrent protection for the generator. It does not require a circuit breaker to be used. If a circuit breaker(s) is utilized to protect the generator, the conductors on the load side of the breaker(s) are considered feeder conductors. Feeder conductors and feeder overcurrent protection devices are sized per Article 215, not 445.

84. I have a client who produces display cases for AT+T phone stores. He needs to install a powered free standing display. Power will be supplied from a ceiling receptacle (installed in a drop ceiling). Can we install a 2" chase through the center of the kiosk, stopping it 6" from the ceiling. We would run a UL listed 15' power strip cord from the base, up thru the 2" chase and stub it out the side to plug into the ceiling receptacle. We would install grommets in the chase for cord protection and a round ball strain relief in the top of the pole so the cord end doesn't fall into the chase.

Do you see any code issues that I don't?

A. Yes. 400.8(6)

I don't feel this would be code compliant. 400.8(6) does not allow flexible cord to be installed in a raceway except for protection from damage in industrial establishments. You could use the cord as a pendant and cord and plug connect at the ceiling receptacle however it could not be installed concealed in a chase.

85. We have been getting more calls on wind and solar generation and how to hook them into the utility. Is there good web site that would help explain to the electrician? We know about PSC 119.

Is there person who would need to inspect these as they are not always covered under the new residential inspection requirement?

A. Yes. No. NEC Articles 690 and 705. (NEC 2011 Article 694)

You are correct they must comply with NEC Art. 690 for PV systems and Art. 705 for Interconnected Electric Power Production Sources.

The International Association of Electrical Inspector magazine has carried many fine articles over last few years on PV systems by John Wiles. You could check their web site at www.iaei.org for archived articles. Mr. Wiles also had some information free of charge at <http://www.mnsu.edu/-tdi/photovoltaics/codes-stds/codes-stds>.

At this time there is no requirement for inspections at other than new 1 & 2 family homes or other installations if required by the local municipality or if the utility requires inspection of services before energizing.

86. For the cross ventilated barns that we are doing the electrical- what is your opinion on how often we are going to have to install expansion sleeves? We have been putting them in every row and spacing them at about 40 feet on 3/4" PVC conduit. These cross vent barns are no longer see the extreme temps that the normal traditional barns are subject to. The low temp in there should be at 35 to 40 degrees and the top temperature should be maybe 90 degrees.

A. Required per NEC 352.44.

352.44 indicates you need to install an expansion joint when you have more than 1/4" expansion or contraction. Take a look at Table 352.44 for a 55 degree temperature change they indicate a change of 2.23" per 100'. If we divide 2.23 by 100=.0225" per foot. $40' \times .0225 = .9"$ for the 40 foot run. You should be good if the expansion joint will take up that much. Let's try $20' \times .0225 = .45"$. This tells me if you have 20' straight run between 2 boxes you would also need an expansion joint.

87. I'm wiring a new Pallet Heat Treater. The nameplate information indicates that it requires a 200 amp, 480 volt, and 3 phase supply. We amp-probed it and it draws 162 amps. I was asked to take a look at the control panel which has 3 zones of electric heat, each drawing 52.5 amps and are separately fused at 60amps. Must we use NEC 424.22 (B) and tell the customer that they must subdivide the heating circuits to be 48 amps or less??

A. Article 424 does not apply.

You would not have to use Art. 424. The scope in 424.1 indicates the article does not apply to process heating equipment, which I assume this is. Hopefully this is a piece of listed equipment and as such all of the calculations would have been done and you can supply it with the circuit rating indicated by the manufacturer.

Good question. I can tell you are using the code book.

88. In an existing dwelling a feeder panel is located in a clothes closet. The electrician wired a new heater in this dwelling and fed it from the existing feeder panel located in the clothes closet. They installed a 2 pole 20 ampere breaker and ran 1 1/2 NM to the heater. Is this code compliant?

A. No. Comm. 16.003-(3), the "grandfather" clause does not apply.

You indicated the original installation might be 40 or 50 years old.

I checked the 1944 State Electrical Code. The 1944 State Code, Order 13-2435 indicates

"Overcurrent devices shall be located where they will be:

C. Not in the vicinity of easily ignitable material."

If this is the case, the panel is not a legal installation. Comm 16.003-(3) does not apply. The panel must be moved to a location that complies with the current Electrical Code since the requirement has essentially remained the same.

89. Can you answer a question on NEC 517.80? Let's say we have various types of patient care areas. We are installing new fire alarm system in the units. The only devices in these areas will be horn / strobe that are mounted 6'8" above floor and detectors which are ceiling mounted. We also are pulling cat 5 cabling for computer & possibly phone. Do I need to install these systems in conduit ?

A. No. 517.80

I agree with your interpretation of 517.80. The cables do not have to be run in a raceway unless other conditions are present. Exposure to physical damage is one condition that would prompt additional protection. If the cables are run within the walls and above the ceilings in a Code complaint manner, damage is not likely.

90. We have a large electrical room. There are two required exit doors. We bid it using "panic hardware" on the doors. During the VE stage, lever handles were substituted. Is this OK?

A. NEC 110.26(C)

NEC Section 110.26(C)(3) applies to personnel doors that are required as exits from electrical rooms containing "Large Equipment". Large Equipment is defined in 110.26(C)(2) as equipment with a rating 1200-amperes or more and over 6 feet wide.

The requirement for the personnel doors used as exits from such rooms were extensively revised in the 2005 edition of the NEC. Wisconsin adopted the requirements effective 9/1/05. This requirement applies to all personnel doors intended for entrance to and egress from the workspace and located within 25-feet as measured from the nearest edge of the workspace.

Such doors shall open the direction of egress and be equipped with "panic bars, pressure plates, or other devices that are normally latched but open under simple pressure".

The intent of this section is expressed in the 2008 NEC handbook. "This requirement is new for the 2008 Code. The requirement is based only on equipment rated 1200-A or more, not on its width. The need to have panic hardware on the door is independent of the need for two exits from the working space."

Panic hardware that is that is listed to UL 305 or ANSI/BHMA A156.3 is approved for this application. Currently, UL 305 does not have any requirements for exterior trim. Besides the testing of the panic hardware in this standard, there are tests for exterior trim. The trim tests are done with specific panic hardware devices. These combinations are described in the UL Reports. There are some level handle trims approved for use with panic hardware. This type of lever trim is used on the outside of the door and does not replace the panic bar or push pad. Trims on the outside of the door can be a lever, thumb piece, knob, turn or key.

91. I have a question about the fans used to exhaust from the repair area of major repair garage. Are the exhaust fans that HVAC installs to vent this space required to be listed for use in this environment? What should I look for in the blades to make them suitable for this use?

A. Approved for the environment.

While the electrical code does require the electrical wiring to be an approved system for a classified area it does not address other equipment. The fan manufacturers do produce fans that are meant to exhaust atmospheres that would be considered hazardous and this type of equipment should be installed. While the code does not specifically require them to be listed this would certainly be one of the requirements I would be looking for. UL 705 is a standard used for approval of fans located in a hazardous location. You can also check this web address for more information of other standards used by some manufacturers. www.greenheck.com/library/articles/40.

Any of the fans that would be exhausting air from the classified areas would need to be approved for that use. This would include any areas that are not completely cut off from the classified area as described in 511.3.

511.3(E)(1) may allow the adjacent area to be unclassified if it meets the requirements of ventilation of 4 air changes per hour, or positive air pressure design of the space as noted.

1. Do I need to wire a diesel fuel pump to meet the requirements in Art. 514.

Ans. Yes 514.1, 514.3

Art. 514 applies to all motor fuel dispensing per 514.1. Diesel fuel is not considered a flammable liquid and the area would be considered unclassified 514.3. Any of the appropriate wiring methods of Chapter 3 could be used, however all requirements of Art. 514 shall be followed such as disconnecting means, grounding and bonding.

2. Do I need to install those cheap in-use covers on all receptacles in the barn?

Ans. No 406.8

406.8(B) requires all 15 and 20 ampere 125 and 250 volt receptacle receptacles located in a wet location to cover that remains weather proof whether or not a plug is installed. A wet location is described as underground, vehicle washing areas, or areas exposed to the weather. Damp is described as protected from the weather and not subject to saturation and would require a cover approved for damp locations. A cover that protects the receptacle when the cover is closed, no plug installed. Some would require wet location covers, milk parlor, or milk house. Some may require damp, open walled barns, areas protected from weather. Weather-resistant receptacles are required in wet and damp locations.

3. If I run a new 4-wire feeder to the house is there anything else I need to do in the house?

Ans. Maybe 250.140

If there is an electric range or dryer that has a 3-wire branch circuit supplying it they will have to be changed to 4-wire circuit. 250.140 indicated you need a 4-wire circuit. The exception allowed an

existing 3-wire if it originated in service equipment. With the old 3-wire feeder, while not exactly a service it was allowed because the neutral was bonded in the panel. It was never allowed if the feeder was a 4-wire. Check any other existing panels that they are 4-wired. This was never allowed.

4. The new free-stall barn we are wiring is supplied with a 277/480 volt system. We installed a 15 KVA 120/208 transformer at the opposite end of the barn and used the equipment grounding conductor run with the primary circuit for the grounding electrode conductor of the separately derived system. I don't see a problem because it is connected to the same terminal bar in the service equipment as the grounding electrode but, one of the state inspectors is saying this is a violation. I am hoping you will agree with me.

Ans. No NEC 2011 250.121

This has never been allowed and now the 2011 NEC 250.121 will make that clear. They serve 2 different purposes. The equipment grounding conductor should only have current on it in the case of a ground fault. It's not uncommon for the grounding electrode conductor to have a small amount of current flowing on it under normal conditions.

5. I installed a 1 HP and a 1½ HP motor on the same branch circuit. The branch circuit is 240 volt single phase and is protected by 20 ampere circuit breaker. My problem is at times when I try to start the second motor the circuit breaker trips. I would like to increase the circuit breaker to a 25 ampere breaker. The motors have thermal overload protection built into them so I don't think it will be a problem. What do you think?

Ans. Can't do it. 430.53(B)

You are required to meet the requirements of 430.53(B) for more than 1 motor on a branch circuit unless they are all 1 HP or less.

This requires the smallest motor to be protected not to exceed the requirements of 430.52. Table 430.248 indicates full load of 1HP motor is 8 amperes. Table 430.52 allows 250% increase for inverse time circuit breaker. $8 \times 2.5 = 20$ amperes max.

6. We installed a new 200 ampere 120/240 volt circuit breaker panel on the outside of a manure equipment room. The motor controllers are located adjacent to the panel board. When the state inspector performed the final inspection he indicated that we were required to install disconnects within-sight-from the motors located in the equipment room. Would I be allowed to install breaker locks instead?

Ans. Typically No 430.102

A disconnecting means is basically always required to be located within sight from a motor controller supplying a motor of 1/8HP or greater per 430.102(A). Per 430.102(B) requires a motor disconnect located within sight of any motor rated 1/8HP or greater. Exception (a) to 430.102(B)(1)&(2) permits the controller disconnect capable of being locked in the open position to act as the required motor disconnect where the AHJ determines that it is impracticable or creates a greater hazard to install the disconnect within sight from the motor.

7. My customer wants me to install a receptacle in her freestall barn for a tractor block heater. Past experience has me concerned with GFCI protecting it because of nuisance tripping. Would I be able to install a single receptacle and comply with the code?

Ans. Maybe 547.5(G)

A single receptacle is allowed for a dedicated load where a GFCI protected receptacle is located within 3' of the single receptacle. NEC 2011, 547.5(G) will no longer allow this. Listed equipment is evaluated to not have current leakage sufficient to trip a GFCI.

8. I installed a new 200 ampere 120/240 volt feeder to a new calf barn using 4 conductor 4/0 USE cable. The inspector said I cannot bring the USE cable into the building. Is he correct?

Ans. Yes 338.12(B)(1), 547.5(F)

USE cable cannot be used on the interior of a building 338.12(B)(1). Use a dual rated cable such as USE/RHW which would allow you to bring it into the building or splice to an approved building conductor on the outside. Also, 547.5(F) requires equipment grounding conductors for ag buildings to be copper and if installed underground they are required to be covered or insulated.

9. We are installing a new 800 ampere 277/480 volt 3 ph. service for a new dairy. What size equipment bonding jumper is required to ground the CT enclosure?

Ans. Depends on the size of the service conductors. 250.92(A), 250.102

Service conductor enclosures such as metering equipment, raceways, wireways, etc. are required to be bonded by 250.92(A). How to size them is found in 250.102(C). Supply side bonding jumpers are sized depending on the size of the service conductors using Table 250.66. Example; 2 paralleled 500 KCMIL copper cond. would require a min. 2/0 copper bonding jumper.

10. We used PVC conduit to wire our lighting in a new freestall barn. The inspector indicated we need to install expansion joints in the conduit runs between the boxes. I thought we only need expansion joints when installing PVC outside. What do you think?

Ans. May also need inside. 352.44

352.44 indicates expansion joints are required where expansion more than 1/4" can occur. Table 352.44 gives expansion characteristics. Example; 50 degree change 2.03"/100'. $2.03/100 = .0203$ per inch. $0.023 \times 20' = 0.406"$ expansion.

11. Our customer does not want to install an equipotential plane in his new freestall addition. Is there anything we have to watch for when installing the electrical system?

Ans. Yes 547.10

Comply with 547.10(A) & (B). Equipotential planes are required indoors in confinement areas with concrete floors where metallic equipment is located that may become energized and is accessible to livestock. Isolate lighting, fans or other equipment from any metal structure cattle could contact. Waterers would need to be non-metallic. Outdoors equipotential planes are required in concrete in the area livestock stands while accessing metallic equipment that may become energized.

12. We have a 400 ampere fusible service disconnect supplying a grade level Ronk transfer switch. The transfer switch then supplies 2-200 ampere panelboards. The feeders to the panelboards are 3/0 copper with a #6 AWG copper equipment grounding conductor. The inspector said the #6 equipment grounding conductor is too small. We always use a #6 for 200 ampere feeders. What do you think?

Ans. Inspector is right. 250.122

The equipment ground is required to be sized for the overcurrent device supplying the circuit 250.122. Table 250.122 indicates a minimum #3 AWG copper for a 400 ampere overcurrent device.

13. I don't like to use PVC conduit on the outside of building to supply equipment but am forced to because of cost. I install expansion joints where needed and support it at no

more the 10' intervals but over time it still starts looking like a snake. What else can I do?

Ans. Support it properly. 352.30

10' intervals of support apply only to metal conduit. PVC conduit is required to be supported at intervals indicated in Table 352.30. Example; ½" through 1" not more than 3'. 1 ¼" through 2" max. 5' between supports.

14. On a project we just finished the plumber installed some yellow flexible gas piping to the water heater and now the inspector wants us to install additional bonding to it. I think we already met our requirement by grounding the gas dryer. What do you think?

Ans. You are correct. 250.104(B)

The piping you refer to is CSST. The manufacturer's instructions require additional bonding in addition to what you have done. 250.104(B) requires bonding of other metal piping such as gas piping. It indicates the equipment grounding conductor for the circuit likely to energize the piping can serve as this bonding means. The installer of the CSST is responsible for installing it to mfg. instructions.

15. A new facility we are wiring will have a 277/480 volt service and 120/208 system for the lighting and receptacles. Is there anything special we need to do to identify the 2 systems?

Ans. Yes 210.5, 200.6 Comm. 16.210(1) Note

Identification of conductors when you have multiple voltage systems in a building is required by 210.5. It indicates the grounded conductors shall be identified by 200.6 which requires different identification of each systems grounded conductor if they share raceways, cables, or enclosures. 210.5(C) requires

identification of ungrounded conductors. They shall be identified by phase and system, by color coding or other means at all terminations, and splice points. Comm. 16.210(1) Note suggests colors to be used. 277/480 Br,O,Y – 120/208 Bla,R,Blu. Also the identification means used are required to be readily available or posted at each branch circuit panelboard.

16. Am I required to GFCI protect a cattle waterer? I am worried about them tripping allowing the waterer to freeze.

Ans. No 547.5(G)

GFCI protection is not always required for cattle waterers. 547.5(G) applies to all 125 volt 15 and 20 ampere general purpose receptacles located in areas having an equipotential plane, outdoors, damp or wet locations, or within dirt confinement areas for livestock. Where a livestock fountain receptacle is supplied from a general-purpose branch circuit it is required to be GFCI protected. An exception permits it to be a single receptacle with a GFCI protected receptacle located within 3”.

17. I recently lost a project to another contractor to install a generator and automatic transfer switch on a veal farm. I later found out the other contractor sold the farmer a smaller system than I had bid. I did a load calculation that showed the farmer my generator was the minimum size needed but he went with the other stating he would just turn off some of load if needed. Is this code compliant?

Ans. No 702.4(B)(2)

This is an optional standby system and must meet the requirements of Art. 702. Where an ATS is installed 702.4(B)(2)(a) indicates the source must be capable of supplying the full load transferred. (b) allows the use of automatic load management to limit the load transferred or 702.4(B)(1) allows the use of a manual

transfer switch being used with the owner deciding what he wants to supply.

18. I installed a new branch circuit and disconnect for the vacuum pump in the equipment room of a new parlor. I located it where the milk equipment people indicated and they installed the controller directly above the pump. I don't think this is correct. What do you think?

Ans. You are correct. 110.26(A)

Equipment that may require servicing or maintenance while energized is required to comply with Table 110.26A(1) for working clearance.

19. The plumber installed several water pipes above my panels in an equipment room. I told him they have to be moved or to install a drip pan below to protect my panels. Will this be OK?

Ans. Maybe 110.26(E)(1)

The dedicated equipment space is described as the space equal to the width and depth of the equipment and extend from the floor to 6' above the equipment or the structural ceiling whichever is lower by 110.26(E)(1). If the drip protection is over 6' OK.

20. I ran direct-buried conductors out to the new calf shed. The conductors are fed out of an at-grade distribution panel. The conductors were aluminum with USE-2/XLPE insulation. Can I also use an aluminum equipment ground with the same insulation? Does the equipment-grounding conductor have to be "full sized"?

A: No, NEC 547.9(B). No, NEC 250.32 and 250.122(B). Don't forget that the conductors can't go inside of the building per 338.12(B)(1)

547.9(B). Insulated or covered copper equipment grounding conductor required.

250.32 and 250.122(B). Size per rating of OCP at source of circuit. If UG better be protected conductors. Only OH conductors permitted w/O OCP at distribution point.

338.12(B) USE conductors can't go inside of the building.

Conductors with additional making such as XHHW OK in building in a raceway.

21. I'm bidding a free stall barn with 24 fans located throughout the barn. Can I use manual motor starters as the disconnect? The fans are turned on and off through a thermostatically controlled contactor.

A: Yes, Comply with NEC 430.102(A), 430.102(B) and 430.109(A)(6)

Definition of Within-sight: See it from the controller or motor location and 50-feet max.

430.102(A) Must have a disconnecting means within sight of the contactor.

430.102(B) Must have a disconnecting means within sight of each motor.

430.109(A)(6) Manual Motor controllers only permitted as the required disconnect if marked " Suitable as a Motor Disconnect" and located downstream of the branch circuit fuses of circuit breaker.

22. I'm running a new 200-amp four wire feeder to an existing barn. The phase and neutral conductors are 4/0 XHHW aluminum and I'm using a 6 AWG copper equipment grounding conductor. The water supply at the barn is plastic but there still is metal piping in the milk house and barn. Can I just use a couple of rods to ground the feeder? Do I have to bond the water?

A: Yes: NEC 250.32 and Exception. Yes, NEC 250.104(A)

250.32 requires all electrodes at the building served to be bonded together and used as the electrode. If there are no existing electrodes, adding two ground rods OK. If the feeder supplied a new building, rebar in footing would have to be used as the electrode. If there is no rebar in footing, there is no requirement to add it. Two rods are then OK.

250.104(A) requires "interior metal water piping systems" to be bonded. Bonding conductor sized per 250.66. Bonding permitted to water line at any point. Use 10-feet of metal piping as minimum length required to bond.

23. We're building a fan control panel with combination motor starters. Each starter has a "short-circuit protector", a contactor, and an overload block. Each starter supplies only one motor. The sales engineer told me we don't need a fuse block ahead of each starter if we order a "line side adaptor" with each one. Is this OK? Last time I did a control panel, the inspector made me add fuses and the customer was not happy.

A: Several issues to examine. Comm 16.012-(1), NEC 409.110, 430.109(A)(5)

Comm 16.012-(1) Are the starters marked "CE"? Or listed by UL, ETL or other NRTL.

409.110 requires control panels be marked with information including the short-circuit-current rating. What is the short-circuit current? Are the products listed for that available short-circuit current without upstream current limiting fuses?

430.109(A)(5) Is the product listed as a "self-protected combination controller" with the line side adaptor?

24. The farm has a diesel fuel tank. The pump sits on top and currently is wired with a orange extension cord. I know that's not right but do I need RMC, seal-offs, etc., just like a gas pump? Do I need a disconnect within sight?

A: No, NEC 501.1. Yes, 430.102(A) and 514.11(B)

501.1 Scope indicates the rules apply to flammable liquids, vapors and gases. Diesel fuel is a combustible liquid.

430.102(B) requires a disconnecting means within sight of a motor.

NEC 514.11(B) applies to fuel dispensing equipment. The requirements are similar to NFPA 30. The disconnecting means must be at least 20-feet from the dispensing equipment.

25. There is a room housing the manure pit at the end of the free stall barn. I can put the contactor for the pump outside. I know I need a disconnect within sight of the pump motor. Is a knife-switch in a 3R enclosure OK?

No, NEC Table 110.20. NEC 430.102(A) & 430.102(B) NEC Table 110.20 permits a NEMA 4X or 6P enclosure in corrosive locations.

NEC 430.102(A) requires a disconnecting means within sight of the controller. 430.102(B) requires a disconnecting means within sight of the motor. The exception does allow the controller disconnect to be used to meet this requirement if placing the disconnect near the motor creates an increased hazard. The controller disconnect must be capable of being locked-off if the Exception is used. Check with the inspector to ensure your interpretation of the exception is the same as theirs.

Another alternative is a horsepower-rated cord and attachment plug assembly. This permits the motor to be easily disconnected when the pump is pulled for maintenance or repair.

26. I'm installing a new service and motor controller for a well pump. The pump is ¼ of the way into the field and close to the pivot point and the service is by the road. We are using a 200-amp fused switch as the service disconnect. My apprentice went to the 18 hour class. He said I need to order "rejection clips". What are "rejection clips" and do I really need to use them?

A: Yes. NEC 110.9, Comm 16.110-(1)

Service equipment is intended to operate under fault conditions. It must have the proper interrupting rating. The minimum available fault current for agricultural services is usually 22,000-amperes. Current-limiting-type fuses are required for this application. The rejection clips are an accessory kit for the fused switch. When installed, they physically block the insertion of non-current limiting fuses. The 2011 NEC will require that service equipment be field marked with available fault current values.

27. We need to get the barn “four-wired”. Can we use the existing drop and add a insulated conductor?
Judgment of AHJ, Comm 16.012-(1)
There are several factors to consider:
1) Is the drop at the proper height? 18 feet above any driveway or yard that machinery can access is the minimum.
2) Is the messenger wire strong enough to carry the additional weight? You could compare the size of the messenger to the size required for a new four wire drop over the same distance.

28. The barn is wired with a three-wire drop from a pole-top transfer switch. The project involves a new 4-wire drop and isolating the neutrals and equipment grounding conductors within the barn panel. A metal water pipe runs from the well to the barn and another metal pipe runs from the well to the house. Do we have to four-wire the house?
Yes. NEC 250.32(B) Exception
NEC 250.32(B) Exception applies to existing buildings. It permits an existing bonded neutral to be used as the equipment grounding conductor with conditions. The second conditions applies to this situation. There can be no continuous metallic paths bonded to the grounding system in each building. Either the metallic water line must be isolated so that there is no continuous path between the buildings. Or the house must also be four-wired.

29. My customer has a pole-top disconnect that is failing. The pole also needs replacement. Can we replace the pole-top switch?

A: Maybe, Comm 16.110-(1) and NEC 110.9 and 110.10.
What is the short-circuit rating of the new switch? What is the available short-circuit current? The rating of the switch must equal or be greater than the available short-circuit current.
The state will permit of existing switches on single phase systems supplied by a 50kVA or less transformer. Even with 2/0 aluminum conductors as long as the drop is 20 feet or more, the available fault current is about 10,000-amperes.

30. I have 169' ft. of NM cable left over from my silo-room project. Can I install NM-B cable in the hay mow since it is a dry location?

A: NEC 547.5. pg. 463,

No it is not an accepted wiring method for that type of use.

31. I have a chicken plucking area that may be considered damp or wet location, we do hose it down when finishing up daily but, I would say it is not a corrosive environment like the inspector is calling it. Is she correct or just pulling my leg on another one of her ego trips?

A: NEC 547.1(B) (3)

She is correct and the wiring and devices must be suitable for that type of area and use. You could possibly pluck the chickens outside but it gets very cold during the winter months.

32. I have to run a new four wire 60 ampere single phase 120/240volt feeder over to a calf free stall barn area 300' ft. away from the farm distribution point; which has the OCP at that location. Due to voltage drop considerations, I increased the size of the phase conductors to # 1/0 aluminum USE-2, but I am not sure of the size I need for the equipment grounding conductor. I see per 250.122 (B) that I need to increase the equipment grounding conductor size as well. What does the term "sized proportionately" mean and how do I figure it? Per table 250-122, I only need a # 8 AWG, aluminum conductor.

A: 250.122(B)

You were wise to consider voltage drop. The answer lies in the use of Chapter 9, Table 8, Conductor Properties and some calculations. Step # 1, calculate the size ratio of the new conductors proposed to be used (#1/0 AWG) to the conductors allowed to be used for the OCP, normally # 4 AWG.

For the phase conductors and their respective circular mils area. Size Ratio= (# 1/0 AWG), @105,600 c-mil. Divided by (# 4 AWG) @ 41,740 c-mil; = 2.5 as a ratio. Now, take the allowed EGEC per 250-122 # 8 AWG aluminum @ 16,510 c-mil, times the ratio factor

(2.5), which equals 41,275 c-mil and find the conductor that meets or exceeds that size. Per Table 8, a 4 AWG conductor is 41,740 c-mil and 4 AWG would be the correct minimum size. Thus it is proportional per the code requirement.

33. Per the requirements of 547.9 (E) where identification is required, when a building is supplied by more than one service that is 150' ft. or greater apart and a permanent plaque or directory is required. What does it have to look like?

A: 547.9(E)

Normally it is a foot print diagram of the building and identifies where each of the service disconnects are located at. This has to be posted at both location. A crayon marking and cardboard box cover does not meet it.

34. Why is it that slatted floors that are supported by the structure are not required to be bonded? I thought everything had to be bonded.

A: 547.10(B)

You are correct per 547.10 (B) pg. 465, makes that statement. These are normally over manure pit areas and are in essence connected on the ends to the buildings equipotential plane system.

35. My brother-in-law lost his farm (I believe due to excessive drinking out of the cattle waters). Due to his belief that an on site isolation transformer would cure all of the sites poor wiring and equipment operating problems, he is on his third transformer and I think the electrician that installed it did not do a good job of system bonding. For one thing a yard service pole has a guy wire coming within 3' ft. of the transformer. The transformer is only up in the air 6' above grade so that the dog would not disturb or lick it (like the dog did before he died from when the transformer was located on the ground).

A: NEC 250.110-(1)

NEC 250.110 (1), pg. 113 address this type of installation,

As you have indicated it is not installed properly; no equipment grounding connection is required if the transformer is 8' ft. vertically and 5' ft. horizontally off of ground or away from other grounded metal objects and subject to contact by persons. Perhaps the old dog provided a good grounding path since the transformer was not properly separated.

36. Along my farms driveway I had a new grade level service 600 ampere single phase 120/240 volt service with a CT cabinet and a nonmetallic wireway going to (3) 200 ampere panelboards. The inspector said I needed to have posts installed to protect the panels from damage from wagons or equipment going by. The old pole with the pole top disconnect was only hit three times over the 20 years it was there; so what is the problem?

A: 547.5(E), 110.27(B)

547.5 (E) & 110.27 (B) provide the requirements for physical protection, "All electrical wiring and equipment subject to physical damage shall be protected. This does not mean a 2X4 or 4X4 post. It could be a green treated 6X6 by 8' ft long installed 4'ft. In the earth or a steel post 6" inches or larger in diameter and poured with concrete. I know the electrician needs work repairing it after you hit it but it can get pretty expensive.

37. I only have an existing three wire feeder going over to the machine shed and the power company is requiring that I four wire the existing panelboards as part of their funded program work. Can I plow in an equipment ground wire close to the old trench line and meet the requirement.

A: NEC 300.4 (B)

No. The requirement states all conductors of the same circuit and where used the grounded and equipment grounding conductor and bonding conductor shall be contained within the same raceway, cable, cord or trench with the other conductors. Remember when you bring in the fourth wire you have to install a new buss for the equipment grounding circuit connection and remove the box bonding screw or strap in the panel

38. Legally who can do inspection work on farms?

A: Wis. Comm. 16.940 indicates that the person doing the inspection work shall be performed by a certified inspector, (Commercial Electrical Inspector). However 16.920 Authority, states that the department is granted the authority and jurisdiction over the farm inspections. That Section (2) Municipal Authority does not mention farms or farming as a place where they can inspect. So the State Inspectors as of now are the only folks authorized to perform those inspections and subsequent enforcement of code violations found. Changes may be coming down the trail with the latest proposed version of Comm 16 but are not in place now.

39. I am a man of many talents and besides farming, I install electrical wiring and plumbing on the side for family and friends and it all works properly. I usually do not see eye to eye with some of the local inspectors and their lack of knowledge of farming wiring or plumbing and how to make things work. When ACT 63 goes into effect on April 2, 2013 can I still do my own wiring on the farm and will it have to be inspected?

A: No. WI Act 63

With your stated degree of electrical code knowledge and wiring ability, you should have no problem passing the Masters Electrician test and be State Licensed; however your plumbing work for other is now and has been illegal for many years. Making things work is not the same as code compliance and should an accident or fire occur you are open to liability law suits. If your brother-in-law happens to be an attorney I would not recommend using him to get you out of the situation involved.