

IOWA CHAPTER

INTERNATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS

1. An electric furnace has two -- 2 pole, 240 volt breakers installed in the face of the furnace control panel. The furnace is not within sight of the electrical panel. Do the 2 breakers satisfy the appliance disconnect rule?

Answer: No, see NEC 424.19(A), you would need to provide a disconnect in sight of the furnace control panels.

2. There are many places in the 2011 NEC that require labeling, such as 408.4. What is considered adequate for "permanent labels"? Would an adhesive label like the manufacture's label be OK?

Answer: A few of the labeling requirements in the NEC use the word "permanent" but all that I found also required them to be legibly marked and to have sufficient durability to withstand the environment involved. An adhesive label from the manufacturer would probably be fine for a normal interior installation but may not hold up in an interior or exterior installation subject to sunlight, wet or corrosive conditions. Therefore each installation will have its own considerations. I suggest that contractors look into products such handheld label printers or desktop label makers and laminate engravers.

3. Can receptacles in a kitchen be located in the top cupboards facing down instead of on the wall?

Answer: The key word in this question is "in". I cannot find any prohibition against mounting receptacles "in" cupboards, however, they would not count as the small appliance receptacle outlets required by 210.11(C)(1) and 210.52(B) if the AHJ considered them to be "within" the cupboards..

210.52 Dwelling Unit Receptacle Outlets. This section provides requirements for 125-volt, 15- and 20-ampere receptacle outlets. The receptacles required by this section shall be in addition to any receptacle that is:

- (3) Located within cabinets or cupboards**

However, 210.52(C)(5) would seem to allow receptacles to be mounted "on" the underside of cupboards, such as might be done with Wiremold, so long as they are not located more than 20 inches above the countertop.

4. Does a chase nipple provide bonding when fastening RMC to a box using a coupling on the outside of the box and a chase nipple on the inside? If the conduit has an equipment ground installed, is the bonding of the conduit to the box still required?

Answer: No. According to UL rep Tom Lichtenstein the chase nipple is designed to be attached to a box with a locknut. This requirement can be found in the installation instructions of the chase nipple. The coupling is part of the conduit and is not a fitting.

110.3(B) states that labeled and listed equipment shall be installed and used in accordance with any instructions included in the listing or labeling.

250.86 states that except as permitted by 250.112(I) metal enclosures and raceways shall be connected to the equipment grounding conductor.

250.96 states that metallic conduit as well as other non-current carrying metallic parts that are to serve as equipment grounding conductors, with or without the use of a supplementary equipment ground, shall be bonded to ensure electrical conductivity. Any non-conductive paint, enamel or similar coating shall be removed at threads contact points and contact surfaces or use fitting designed to make such removal unnecessary.

A locknut will provide these contact points as well as fittings such as a meyer's hubs, integral hubs or thread-less connectors.

300.6(A) requires that ferrous metal boxes need to be coated with an approved material both inside and out to protect it from corrosion.

250.97 states that for circuits over 250 volts to ground electrical continuity needs to be ensured. When locknuts are used to a threaded conduit they need to be installed to both the inside and outside of the box. A fitting that contains a locknut on the inside of the box or other listed fittings may be used.

Wet areas and classified areas will need to use fittings that seal out the gases, dust or moisture.

300.4(G) also requires that conductors over #6 to use an insulated bushing at the box.

In summary

The conduit needs to provide electrical continuity through all fittings, boxes, or conductors so that any fault current that may be imposed on them will be ensured to be of sufficient conductivity to open the over-current device. All boxes need to be painted or coated to protect them from corrosion accordingly for the location of the box. Looking at these code sections and the UL listing of equipment it does not appear that the chase nipple into a coupling will ensure this conductivity. The equipment ground installed in the conduit is supplementary to the required bonding of the metallic conduit.

5. With the new 6' rule in the 2011 NEC, does the garbage disposer now need to be GFCI protected?

Answer: No, 210.8(6) was revised to require GFCI's in kitchens — where the receptacles are installed to serve the countertop surfaces. It was worded this

way so as to not include receptacles under the sink for the disposer and dishwasher, etc.

6. Can an electric hand dryer be installed on an operable door that swings on hinges? This is not the door that enters the room.

Answer: Perhaps. First, consult manufacturer's instructions as to the required fire resistive composition and structural stability of the mounting surface. Secondly, an approved wiring method will have to be selected that will provide the flexibility and physical protection for the conductors. NEC Reference: 110.3, Article 422

7. What types of wiring methods should be used inside a walk-in cooler or freezer?

Answer: The NEC addresses the concern regarding the temperature differential:

300.7 Raceways Exposed to Different Temperatures.

(A) Sealing. Where portions of a raceway or sleeve are known to be subjected to different temperatures, and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air to a colder section of the raceway or sleeve

(B) Expansion Fittings. Raceways shall be provided with expansion fittings where necessary to compensate for thermal expansion and contraction. UL 427 Refrigeration Units and UL 471 Commercial Refrigerators And Freezers require the wiring and components be suitable for the environmental conditions and state that, "Wiring shall be arranged to prevent water caused by condensation, defrosting, or when intended for outdoor use, rain exposure, from entering wiring enclosures and electrical enclosures."

8. Can #14 pigtails be used to connect devices to a 20 Amp circuit? Isn't this covered in the "tap rule"?

Answer: No, this is not covered in the tap rule.

And yes, pigtails are allowed in certain circumstances but for most installations, including a device, the answer would be NO.

To start off with

Article 240.21 requires that overload protection shall be required where conductors receive supply.

In article 210.19(A)(4) a 14 conductor can be used as a tap on a branch circuit as long as it does not supply a load specified in table 210.2. The exceptions, (a) through (e) of this article, allows an individual luminaire and some other loads but not an individual receptacle.

This code section would also not allow a #14 conductor on a 20 amp circuit to a switch unless part of the luminaire.

Article 240.24 allows a #14 conductor to be used as a tap on a 20 amp circuit except for residential laundry, bathroom and small appliance (kitchen) receptacles.

Article 250.146 refers to table 250.122 and requires a #12 conductor on a 20 amp circuit for the equipment grounds to a device.

9. Can the furnace or a/c thermostat wire be run in the same raceway as power conductors if rated to highest voltage?

Answer: No if the thermostat wire is in a Class 2 or 3 circuit, see 725.136(A). If the circuit is treated as a Class 1 circuit then yes, see 725.48(A) and 725.48(B)(1).

10. A 1200 Amp feeder to a building on an industrial site consists of three paralleled runs of 500 kcmil copper conductors in PVC raceways. What size copper equipment grounding conductor is required in each conduit run?

Answer: Article 250.122(F) states that the equipment grounding conductor in a parallel installation shall be run in parallel in each raceway. Its size is to be based on the size of the over-current device protecting the circuit conductors. Based on Table 250.122, the copper equipment grounding conductor in each raceway would have to be at least a 3/0 CU or 250 kcmil Al conductor for the 1200 Amp feeder. The conductor would have to be rated for wet locations. NEC reference: 250.122(F), T250.122

Note: Three sets of 500kcmil CU conductors are only good for 1140 amps.

11. An office break room has range, refrigerator, sink with a disposal, and counter space. Do the receptacles require GFCI protection?

Answer: Yes. This room meets the definition of a kitchen, which is: Kitchen. An area with a sink and permanent provisions for food preparation and cooking. Further, there is a sink. 210.8(B) requires GFCI protection for receptacles in other than dwelling unit kitchens and within 6' of any sink.

12. An extended stay motel has small apartment type suites with a kitchen, living room, bathroom and one or two bedrooms. Are these units required to be wired as dwelling units?

Answer: YES

Article 210.18 requires that guest room and guest suites that are provided with permanent provisions for cooking shall have receptacles installed to meet the rules for dwelling units. The definition of a dwelling unit in article 100 is a living facility that includes permanent provisions for living, sleeping cooking, and sanitation.

Article 210.60 requires the location of the receptacles in a guest suite to be placed where conveniently located for permanent furniture as long as the minimum number is the number if using 210.52(A).

Article 210.60(B) requires that the kitchen and bathroom receptacles meet the requirements of a dwelling unit as found in article 210.52.

The arc fault requirements of a dwelling unit are found in article 210.12.

The GFCI requirements of a dwelling unit are found in article 210.8(A).

Article 406.11 requires that all receptacles installed in the areas as specified in article 210.52 shall be tamper resistant.

13. A home has a 200 Amp meter/main mounted on the exterior wall and the panel located in the center of the home in an equipment room where the metal water service entrance is also located. Can I bond the water pipe to the equipment grounding buss in the panel and use the equipment grounding conductor of the feeder cable as the grounding electrode conductor back to the meter/main?

Answer: No, 250.121(EGCs cannot be used as a GEC).

14. If refrigeration equipment for a commercial kitchen comes with a cord that has a 15-amp, 120 volt three wire twist lock connector does the receptacle need to be GFCI protected?

Answer: Yes, all 125-volt, single-phase, 15- and 20 ampere receptacles installed in commercial kitchens shall have ground-fault circuit-interrupter protection for personnel. NEC reference: 210.8(B)

15. Can a television be installed over a bath tub?

Answer: The Code does not restrict where the TV may be installed, but it does state in 406.9(C) that the receptacle may not be installed directly over the tub.

16. Does the NEC allow any receptacles in a bathroom to be on a 15-ampere circuit? The homeowner wants a lighting receptacle to plug in rope lights as a night-light. The 15-ampere receptacle would be GFCI protected and in addition to the required 20-ampere receptacle circuit.

Answer: YES

Article 210.11(C)(3) requires that there be at least one 20 amp circuit installed in a bathroom to supply the receptacle circuits.

Article 210.52(D) tells you the required location of the bathroom receptacle near the basin. The requirement of the receptacle in the basin location does not say that receptacles in other locations are not allowed. The required receptacle will need to be on the 20 amp circuit. Additional receptacles can be installed in the bathroom on other circuits with either a 20 amp or a 15 amp rating.

Wording is the key.

In article 210.11(C)(1) the requirements of a kitchen counter small appliance branch circuit is that 2 or more 20 amp circuits be provided. The or more means that all the circuits for the kitchen counter need to be 20 amp circuits with no other outlets on this circuit.

17. My house has a vaulted ceiling with a lot of can lights installed. The insulation process was to install a spray foam product over the joist area. This process pretty much enveloped all the can lights. The inspector said this was not allowed as the foam would not allow heat to dissipate and the foam material was not “evaluated for what it might do to the can assembly. I pointed out that these can lights are all energy qualified and IC rated assemblies. Isn’t this OK?

Answer: I would say no. See Section 314.29, requires boxes Boxes, conduit bodies, and hand hole enclosures shall be installed so that the wiring contained in them can be rendered accessible without removing any part of the building. UL 1598 the Standard for Luminaires requires the wiring boxes on recessed luminaires to be accessible from the room side of the luminaire. When you spray in the expanding foam that would restrict the access from the room side of the luminaire in addition, there are holes in the wiring box on the luminaire as well as any gap on the thermal protector mounted on the outside of the can may experience ingress of the foam when it is expanding and may adversely affect the performance of the thermal protector and may cause overheating of the conductors in the wiring box. It is best to place a box over these luminaires before spraying the foam.

18. The central vacuum system installer installed a suction outlet in a kitchen at an existing house. The vacuum outlet was adjacent to a kitchen wall receptacle. The circuit he tapped his five foot whip to was one of the 20 amp small appliance branch circuits. When he was told that he can’t tap off of this circuit, he said that the 30 foot vacuum cleaner hose is also serving the kitchen, so is this OK?

Answer: Since a vacuum cleaner is commonly used on floors of carpet, hardwood, ceramic, etc., I would have no concern about the vacuum outlet being connected the kitchen area receptacle as long as the whip conductors were rated for the 20 amp circuit. No GFCI protection is necessary as long as the receptacle does not serve the countertop or within 6’ of any sink. NEC reference: 210.8(A)(6&7), 422.15

However, Article 100 defines a receptacle as “a contact device installed at the outlet for the connection of an attachment plug”. Therefore, the contact device in the vacuum outlet for the 120V beater qualifies as a receptacle and is being installed in an area where AFCI requirements exist elsewhere in the code. This is also an extension of an existing circuit so the changes in the 2011 NEC would now require this receptacle to have AFCI protection. Tamper Resistant protection

would not be required because of the exception for appliances. NEC reference: Article 100 Definitions, 210.12(B), 406.4(D)(4&5)

19. A local electrician says where he uses a Square D feeder panel with a 100 amp main breaker installed (because it's cheaper to buy them that way) and it's okay if he protects the panel with a 60 amp breaker back at the main provided that all wiring is correct. I say incorrect because a home owner buying this house is under the impression there is a 100 amp supply at the detached garage, in addition to a code violation. Who is correct?

Answer: The electrician is correct in using a Square D panel! And, so long as the 60 amp feeder can supply the anticipated load in the garage, the installation complies with 408.30 and 408.36.

20. I was told that a back-fed breaker needs to be to the panel. Is this correct?

Answer: YES for most instances.

Article 408.36(D) requires that a plug-in type overcurrent device that is back-fed shall be secured with an additional fastener to secure the overcurrent device to the panel. This is for plug-in type overcurrent devices only.

An exception to this rule in the 2008 NEC is that no fastener is required for a back-fed breaker installed in a panel for a fuel cell (692.65(B)(6) or a photovoltaic system (690.65(B)(6) that is supplied through an inverter that meets the requirements of an identified interactive equipment.

In 2011 code these same exceptions are now found only in 705.12(D)(6) and also will pertain to the new code section small wind turbines

21. I had the range hood fed from one of the kitchen GFCI circuits. Please give me the article in the NEC that prohibits this installation?

Answer: See 210.52(B)(2) and 422.16(B)(4).

22. Can I use a 3-wire w/ground NM cable for temporary wiring on a construction site as a multi-wire branch circuit if I feed temporary receptacles on one circuit and lighting on the other circuit?

Answer: NO. It states in Article 590 that receptacles on construction sites shall not be installed on any branch circuit that supplies temporary lighting. The intent of this provision is to assure that the activation of a fuse, circuit breaker, or GFCI, due to a fault or equipment overload, does not de-energize the lighting circuit, putting the construction workers in the dark. Since any multi-wire branch circuit is required to be on a breaker that simultaneously disconnects both ungrounded conductors, this would not satisfy the intent of the requirement.

However, multi-wire circuits are permitted to be considered as multiple circuits, in which case this could be seen to be allowed. But 590 also states that when installed in a wiring method that does not qualify as an equipment grounding conductor in accordance with 250.118 all branch circuits shall include a separate equipment grounding conductor. Since the NM cable only contains one equipment grounding conductor, the answer is still NO. NEC reference: 590.4(D)(10), 210.4

23. Do I have to adjust (derate) NM cable where three cables are run through the same hole in the upper plate?

Answer: It depends on whether or not the hole is sealed.

334.80 Ampacity

Where more than two NM cables containing two or more current-carrying conductors are installed, without maintaining spacing between the cables, through the same opening in wood framing that is to be sealed with thermal insulation, caulk, or sealing foam, the allowable ampacity of each conductor shall be adjusted in accordance with Table 310.15(B)(3)(a) and the provisions of 310.15(A)(2), Exception, shall not apply.

24. Can I use a 400-ampere breaker to protect paralleled 4/0 aluminum XHHW-2 conductors?

Answer: YES

In table 310.16 two parallel 4/0 XHHW-2 90°C rated aluminum conductors have a combined ampacity of 410 amps, but the circuit breaker terminals are rated for 75°C conductors.

Two parallel 4/0 aluminum 75°C rated conductors have a combined ampacity of 360 amps.

240.4(B) allows a 400 amp circuit breaker to protect 360 amp conductors, but the rated current carrying capacity of the conductors and circuit breaker is 360 amps non-continuous, 288 amps continuous per 210.20 and 215.3.

This assumes the use of a standard rated circuit breaker. If a 100% rated circuit breaker is used, the continuous current capacity of the XHHW-2 and circuit breaker combination would be 360 amps. So the answer is maybe, depending on the ampacity of the load to be served.

240.21(B)(1) states that if these conductors are used are part of a feeder tap then the next standard over-current device will not be able to be use and the conductors will need to be increased to meet the ampacity requirements of the 75 c column of table 310.16

25. Can I install conductors from different panels in the same raceway?

Answer: Yes, As long as ungrounded conductors are identified in accordance with 200.6(D)

26. A commercial freezer unit requires a disconnect switch for its lights and fan coil units. Does the door heater/defroster also require a disconnect switch?

Answer: Perhaps. In the UL White Book under "Walk-In Units, Commercial" it states that the accessories for walk-in units will be provided with instructions for installation. UL White Book page 351, Category SQTV, and NEC 422.61

27. Is type NM-B cable allowed in a barn where animals are housed if it is a dry location?

Answer: No. 547.5(A) requires the use of NMC because such a location will have a corrosive atmosphere as stated in 547.1(B).

28. Is a conduit seal required within 18" of an explosion-proof motor, listed for use in a Class 1 Division 1 location and installed in a Class 1 Division 2 location, if the motor leads are factory sealed?

Answer: NO

This is assuming that the 18 inches of conduit is still in the class 1 div 2 area. If the 18 inches leaves the class 1 area to an unclassified area or a class 2 area then a seal will be required.

In a class 2 area a seal is required for all splices.

In a class 1 area a seal is required for arcing devices or for apparatus that may have an operating temperature that is more than 80 percent of the ignition temperature of the gases present but not for splices 501.15(A)(1) and (2).

All wiring methods allowed in a class 1 div 1 location are allowed in a class 1 div 2 location (501.10(B)(1)(1)).

In article 501.15(B)(1) the requirement in a class 1 div 2 area for installing a seal to enclosures that are required to be explosion proof are the same for the requirements of a class 1 div 1 area.

The requirements for a seal for a motor will be the same in the div 2 location as it was in the class 1 location

29. How deep does the transition fitting need to be when converting from underground PVC to GRC emerging from the earth from a gas pump location to an emergency switch located in a non-classified area?

Answer: I don't know what GRC is but I assume he is talking about the galvanized rigid metal conduit. I think his answer is in 514.8, Exception No. 2. The metal conduit needs to be used on the last 2 ft so it would seem that the fitting needs to be at least 2 ft deep.

Exception No. 2: Type PVC conduit and Type RTRC conduit shall be permitted where buried under not less than 600 mm (2 ft) of cover. Where Type PVC conduit

or Type RTRC conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 600 mm (2 ft) of the underground run to emergence or to the point of connection to the aboveground raceway, and an equipment grounding conductor shall be included to provide electrical continuity of the raceway system and for grounding of non-current-carrying metal parts.

30. Can a standard residential-grade light switch installed in a handy box be used as a furnace disconnect in place of the SSU-type device?

Answer: 422.32 states that the appliance motor disconnects must comply with Part IX of Article 430. Assuming the motor is 2 HP or less, 430.109(C)(2) would allow a general use snap switch rated "AC ONLY" to be used where the motor FLC is not more than 80% of the switch rating. Many of the furnace motors also have internal thermal protection. NEC references: 422.32, 430.109(C)(2)

31. Can I use the structural metal frame of a metal structure or building as a grounding electrode conductor?

Answer: Maybe. 2008 NEC 250.52 (A)(2) allows the metal frame of a building or structure to be used as the grounding electrode if it is connected to the earth by any of the following methods:

250.52 Grounding Electrodes.

(A) Electrodes Permitted for Grounding.

(2) Metal Frame of the Building or Structure. The metal frame of the building or structure that is connected to the earth by any of the following methods:

- (1)** 3.0 m (10 ft) or more of a single structural metal member in direct contact with the earth or encased in concrete that is in direct contact with the earth
- (2)** Connecting the structural metal frame to the reinforcing bars of a concrete-encased electrode as provided in 250.52(A)(3) or ground ring as provided in 250.52(A)(4)
- (3)** Bonding the structural metal frame to one or more of the grounding electrodes as defined in 250.52(A)(5) or (A)(7) that comply with 250.56
- (4)** Other approved means of establishing a connection to earth

This section was revised in the 2011 Code to read as follows:

250.52 Grounding Electrodes.

(A) Electrodes Permitted for Grounding.

(2) Metal Frame of the Building or Structure. The metal frame of the building or structure that is connected to the earth by one or more of the following methods:

- (1)** At least one structural metal member that is in direct contact with the earth for 3.0 m (10 ft) or more, with or without concrete encasement.
- (2)** Hold-down bolts securing the structural steel column that are connected to a concrete-encased electrode that complies with 250.52(A)(3) and is located in the support footing or foundation. The hold-

down bolts shall be connected to the concrete-encased electrode by welding, exothermic welding, the usual steel tie wires, or other approved means.

The requirements in 250.68 were also revised in the 2011 Code:

250.68 Grounding Electrode Conductor and Bonding Jumper Connection to Grounding Electrodes.

(C) Metallic Water Pipe and Structural Metal.

(2) The structural frame of a building that is directly connected to a grounding electrode as specified in 250.52(A)(2) or 250.68(C)(2)(a), (b), or (c) shall be permitted as a bonding conductor to interconnect electrodes that are part of the grounding electrode system, or as a grounding electrode conductor.

a. By connecting the structural metal frame to the reinforcing bars of a concrete-encased electrode, as provided in 250.52(A)(3), or ground ring as provided in 250.52(A)(4)

b. By bonding the structural metal frame to one or more of the grounding electrodes, as specified in 250.52(A)(5) or (A)(7), that comply with (2)

c. By other approved means of establishing a connection to earth

32. I have an A/C condensing unit with a maximum fuse or breaker rating of 35 amps. I don't have a 35-amp breaker. Can I go to the next size breaker of 40 amps?

Answer: NO Article 440.52 would seem to allow the increase in the size of the protection to 140 percent of the rated load current for the motor/compressor.

In article 240.6(A) the 35 amp breaker is a standard breaker size.

In the UL Whitebook under (SCER) for "REFRIGERATION EQUIPMENT" the branch circuit protective device cannot exceed the value marked on the data plate or attached wiring diagram.

33. I have a building with a service consisting of five 200 amp service disconnecting means in separate enclosures. Each disconnecting means is supplied by four 3/0 THWN cu conductors. If I decide to run one common Grounding Electrode Conductor and tap to each 200 amp service disconnect, what are the sizes of the GEC and the taps?

Answer: See 250.64(D)(1) which requires that: the GEC would be sized out of Table 250.66 based on the based on the sum of the circular mil area of the largest ungrounded service-entrance conductor(s) Which are not given in the question. GEC Taps would be #4 cu based on Table 250.66.

34. Is the wiring to an x-ray machine in a chiropractor's office to have redundant grounding?

Answer: Yes. Fixed and stationary X-ray equipment shall be connected to the power supply by means of a wiring method complying with applicable requirements of Chapters 1 through 4 of this Code, as modified by this article.

This refers you to 517.13, which requires the redundant grounding in the feeder or branch circuit that feeds the fixed and stationary equipment in patient care areas. The exception allows the equipment to be cord and plug connected from the outlet if supplied by a branch circuit rated at not over 30 amperes.
NEC reference: 517.2 Definitions – Health Care Facilities & Patient Care Areas, 517.71, 517.13

35. In a remodel, addition, or retrofit of an existing dwelling, is AFCI protection required on new circuits or outlets? If so, what if there is only a fuse panel available?

Answer: There are no requirements for AFCI protection in such instances in the 2008 Code, but there are in the 2011 Code in two places.

210.12 Arc-Fault Circuit-Interrupter Protection.

(B) Branch Circuit Extensions or Modifications — Dwelling Units. In any of the areas specified in 210.12(A), where branch-circuit wiring is modified, replaced, or extended, the branch circuit shall be protected by one of the following:

- (1) A listed combination-type AFCI located at the origin of the branch circuit
- (2) A listed outlet branch-circuit type AFCI located at the first receptacle outlet of the existing branch circuit

406 Receptacles, Cord Connectors, and Attachment Plugs (Caps)

406.4 General Installation Requirements.

(D) Replacements.

(4) Arc-Fault Circuit-Interrupter Protection. Where a receptacle outlet is supplied by a branch circuit that requires arc-fault circuit interrupter protection as specified elsewhere in this Code, a replacement receptacle at this outlet shall be one of the following:

- (1) A listed outlet branch circuit type arc-fault circuit interrupter Receptacle
- (2) A receptacle protected by a listed outlet branch circuit type arc-fault circuit interrupter type receptacle
- (3) A receptacle protected by a listed combination type arc-fault circuit interrupter type circuit breaker This requirement becomes effective January 1, 2014.

If there is only a fuse panel available, you have three options:

1. Replace the fuse panel with a circuit breaker panel
2. Install a sub panel using one of the wiring methods described in 210.12(B) Exception No. 1
3. Install an outlet branch circuit AFCI receptacle if and when one becomes available

36. Can a 10.5A 120V rated fan-light-heat unit be installed in a bathroom and be supplied from the same 20 Amp circuit supplying the bathroom receptacle?

Answer: NO

Article 210.11(C)(3) requires that the 20 amp circuit for the bathroom receptacles shall have no other outlets. The exception to this code section allows the same 20 amp circuit to provide outlets for other equipment within the same bathroom in accordance with 210.23(A)(1) and (2).

Article 210.21A)(2) is for utilization equipment fastened in place and states that the rating of the equipment cannot be more than 50 percent of the branch circuit ampere rating. The load of 10.5 amps is more than 50 percent of the branch circuit ampere rating and is not allowed on the bathroom circuit.

Most product specifications for a heater/exhaust fan in a bathroom will require that the unit be installed on a separate circuit and will state the size of the circuit required.

There are some units that require that the circuit fan-light-heater be a 15 amp circuit and this would require a separate circuit from the 20 amp circuit required in the bathroom regardless of the load of the exhaust fan.

37. When installing a temporary service pole would any or all of the following be an acceptable method for the installation of a grounding electrode system?
- a) 20' (min.) #4 bare copper wire wrapped tightly and not overlapped around the bottom of the pole so when it is buried the complete 20' is in contact with earth.
 - b) 1 - 8' ground 5/8" ground rod connected to the temporary panel with a minimum #6 copper conductor.
 - c) 2 - 8' grounds 5/8" ground rods spaced 6' apart connected to the temporary panel with a minimum #6 copper conductor.
 - d) Or is there an electrode system required at all?

Answer: 590.2 (A) requires that except as specifically modified in this article, all other requirements of this Code for permanent wiring shall apply to temporary wiring installations. So you would have to comply with Article 250. Assuming there are no other electrodes available at this service and a grounding electrode system has to be created, then you need to comply with 250.52 and 250.53 for which a) would not be permitted, b) would be ok if the resistance was less than 25 ohms, c) would be permitted and for d) yes and electrode system is required.

38. When a fire pump is installed, is one of the items listed allowed to be connected ahead of the main disconnection means?
- a) Can this connection take place on the "Line Side" of the breaker lugs if the breaker is equipped with the correct number lug openings?
 - b) Can the taps be made just before the main disconnect with an irreversible type crimp and then properly insulated?
 - c) Or must the feed for the fire pump controller come directly from the utility XFMR and be treated like a service when entering the fire pump controller located in the fire pump room?

Answer: A fire pump shall be permitted to be supplied by a separate service, or from a connection located ahead of the building service. The connection cannot be made within the same cabinet, enclosure, or vertical switchboard section as the service disconnecting means. A tap ahead of the service disconnecting means shall comply with 230.82(5). NEC reference: 230.82(5), 695.3(A)(1)

39. When and where can NM cable (Romex) be used in a "Commercial Building" and under what circumstances or special conditions must it follow for the installation?

Answer: 334.10 permits NM to be used in:

(3) Other structures permitted to be of Types III, IV, and V construction except as prohibited in 334.12.

The definitions of these construction types are:

- An ordinary constructed (type III) building is also called a brick-and joist structure. It has masonry-bearing walls but the floors, structural framework and roof are made of wood or other combustible material.
- Heavy-timber (type IV) construction is sometimes called "mill construction" because it was the type of structure used at the turn of the century to house textile mills. These buildings have masonry walls like type III buildings but the interior wood consists of large timbers. The floor and roof are plank board. In a heavy-timber building a wood column cannot be less than eight inches thick in any dimension and a wood girder cannot be less than six inches thick. A heavy-timber building does not have plaster walls and ceilings covering the interior wood framework.
- In wood-frame (type V) construction, the interior framing and exterior walls may be wood.

334.12(A) states where NM is not permitted:

- (1) In any dwelling or structure not specifically permitted in 334.10(1), (2), and (3)
- (2) Exposed in dropped or suspended ceilings in other than one- and two-family and multifamily dwellings
- (3) As service-entrance cable
- (4) In commercial garages having hazardous (classified) locations as defined in 511.3
- (5) In theaters and similar locations, except where permitted in 518.4(B)
- (6) In motion picture studios
- (7) In storage battery rooms
- (8) In hoist ways or on elevators or escalators
- (9) Embedded in poured cement, concrete, or aggregate
- (10) In hazardous (classified) locations, except where specifically permitted by other articles in this Code.

334.12(B) also restricts the use of NM in the following conditions or locations:

- (1) Where exposed to corrosive fumes or vapors

- (2) Where embedded in masonry, concrete, adobe, fill, or plaster
- (3) In a shallow chase in masonry, concrete, or adobe and covered with plaster, adobe, or similar finish
- (4) In wet or damp locations

40. According to the 2008 NEC, a 100' x 200' Pole building located on a large property is used for storage of private/personal repair of tractors, boats, RV's lawnmowers, etc. Would the receptacles installed in this building be required to be GFCI protected?

Answer: **YES**

First off let's define a garage.

In article 100 in the 2008 NEC the definition of a garage is "a building or portion of a building in which one or more self-propelled vehicles can be kept for sale, use, storage, rental, exhibition or demonstration purposes.

Article 21.8(A)(2) requires that if the garage is part of a dwelling unit; either attached or detached; then all 110 volt receptacles in the garage or accessory building will be required to be gfci protected.

In article 511.1 the scope of the article is defined as locations used for service and repair operations in connection with self-propelled vehicles in which volatile flammable liquids or flammable gases are stored. This code section is for commercial use.

So if this area is part of a residence article 210 will apply and if the area meets the scope of article 511 then this article will apply.

In article 511.12 GFCI protection is required for all 125 volt 15 and 20 amp receptacles in areas where electrical diagnostic equipment, electrical hand tools, or portable hand tools are to be used.

NEW for 2011 code

In article 210.8(B)(8) of the 2011 NEC this is addressed and now non-dwelling unit garages will need GFCI protection to all 110 volt receptacles.

41. When establishing a grounding electrode for a separately derived system, do I need to band back to the main grounding electrode system? If so, How?

Answer: **250.30(A)(4) Grounding Electrode.** The grounding electrode shall be as near as practicable to, and preferably in the same area as, the grounding electrode conductor connection to the system. The grounding electrode shall be the nearest of one of the following:

- (1) Metal water pipe grounding electrode as specified in 250.52(A)(1)
- (2) Structural metal grounding electrode as specified in 250.52(A)(2)

42. On a 3-phase, 4-wire, 400 amp service, do you use table 310.20 or 310.21 in fresh air?

Answer: I assume that this question concerns overhead conductor cable of the tri-plex or quad-plex type which is a utility wire and not addressed in the NEC. Since it's out there we have to deal with it the best we can so I would use Table 310.15(B)(20) since it is the closest we can get to the cable type.

Since this is not a branch circuit or feeder, the conductor covering requirement for the grounded conductor in 225.4 would not apply.

43. Is the use of insulated mats or blankets required for servicing 480 volt motor control centers when they are energized?

Answer: No, but the real question is, what type of PPE is required? That is a far too complex question to answer here. You need to read and understand NFPA 70E.

44. Since the NEC does not wish to define "finished" basement, how will we define this for IOWA?

Answer: Not easily. In the dictionary the definition for a basement is the "lowest story of a structure that is partially or wholly below ground level".

The definition of finished is "ended or completed".

In my opinion the "finished basement" is not something that is the same in all applications. The bare concrete floor does not mean the floor is not finished as a lot of concrete floors are painted or textured to give the flooring a 'finished' look. The bare concrete walls would need a surface over them to be called a finished wall but not in all cases since a painted wall could be considered a finished wall. The ceiling would need to be finished also but in some cases the ceiling can be painted to give it a finished look.

The best way to define a finished basement might be that this area needs to be a living area and the wall and ceiling surfaces need to be such that they will be finished to look like a living area and the area will need wired as a living area. In my opinion open studs would not be considered finished but a concrete floor, open joists or a painted concrete wall could be the finished surface.

45. NM Cable that has been immersed in flood water should be replaced. Does this apply to building conductors in raceway or to MC Cable?

Answer: I would say yes, most likely they are not wet rated conductors and you don't know what was in the flood water, there may be other contaminants in the water that may have an effect of the conductors and cable. I would refer to the NEMA guidelines on Flood Damaged Equipment which can be found at NEMA.org. UL also has flood brochure with recommendations that are consistent with the NEMA guidelines which can be accessed at www.ul.com/codeauthorities.

46. On a 3 phase 400 amp. overhead service, do you use Table 310.20 or 310.21 for free air when sizing the conductors? The utility company says it doesn't have to be that large?
Same service, but an underground installation. What table?

Answer: For the overhead conductors, I would use Table 310.15(B)(20) for the same reasons as in question #42. As to the utility's comments, they have a point – it's called the service point. On the customer side of the service point, the installation shall comply with the NEC regardless of the utility standards. Since this is not a branch circuit or feeder, the conductor covering requirement for the grounded conductor in 225.4 would not apply.

For the underground installation use Table 310.15(B)(16) for the conductor ampacity. If the neutral is found to be a current carrying conductor and the circuit is installed in a raceway or cable, the ampacity shall be adjusted according to table 310.15(B)(30), which in this case would be an adjustment factor of 80%. If the four conductors are direct buried, there would be no ampacity adjustment.

Tom Lichtenstein— 1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45

Dwight Kramer—2, 6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46

Ed Larsen—3, 7, 11, 15, 19, 23, 27, 31, 35, 39, 43

Tony Servante—4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44