

**International Association of Electrical Inspectors
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Code Questions

The answers to the code questions are given as they were submitted by the Code Panelist. They do not necessarily reflect the official position or interpretation of the IAEI nor should they be considered as an official interpretation of the Code. An “Editor’s Note” shown in brackets has been provided when additional clarification was necessary, which also is not an official interpretation. An interpretation is only official when expressed from the applicable Authority Having Jurisdiction (AHJ).

Jim Pauley

1. An A/C unit is installed outside in a wet location. Can Type NM cable installed in flexible metal conduit be employed as the wiring method from the disconnecting means to the unit? How about Type NM cable installed inside EMT conduit?

References: 334.10(A), Article 100, 348.12(1) for use of FMC

No. 334.10(A)(1) permits NM cable to be used in a dry location. Article 100 defines “wet location” to include areas subject to weather.

Since the application is in a wet location, NM cable is not permitted. The fact that the NM cable is in a flexible metal conduit or in EMT does not change the location of the installation. The EMT or FMC is in the wet location and does not create a “dry location” for the NM cable.

George Flach

2. Section 680-12 of the 1999 *NEC* required the disconnecting means for pools, spas, and hot tub equipment to be located a minimum of 1.5 m (5 ft) from the inside wall of same. This 1.5 m (5 ft) distance was dropped from Article 680.12 of the 2002 *NEC*. Is the disconnecting means now allowed inside the wiring compartment of a hot tub? Can the disconnecting means now be installed within 1.5 m (5 ft) of the pool, spa or hot tub?

The answer is NO. Although there is no minimum distance mentioned in 680.12, 680.22(C) requires a distance of at least 5 feet from the inside walls of a pool unless the switch is listed as being suitable for use within 5 feet of the pool. Also, 680.41 requires an emergency switch to be located 5 feet or more, readily accessible, and within sight of a spa or hot tub. The switch must be marked emergency shutoff. This requirement does not apply to single-family dwellings.

There are requirements for disconnecting means in 430.102 that also must be satisfied. With a little advance planning, one disconnect properly placed and marked, if necessary, should satisfy all of these requirements. However, it is possible that the manufacturer's installation instructions specify a disconnect switch behind the skirt of the spa or hot tub. If such a switch is specified, it must be installed to comply with 110.3(8) of the *NEC*.

Gaylen Rogers / Jim Hinrichs

3. Can any part of the allowed 1.8 m (6 ft) length of Type MC cable that is unsupported, touch, lie on, or otherwise come in contact with the suspended ceiling grid or liftout panels?

2002 NEC 330.30 (B) Unsupported Cables. Type MC cable shall be permitted to be unsupported where the cable:

(2) Is not more than 1.8 m (6 ft) from the last point of support for connections within an accessible ceiling to luminaire(s) [lighting fixture(s)] or equipment

(C) At Terminations. Cables containing four or fewer conductors, sized no larger than 10 AWG, shall be secured within 300 mm (12 in.) of every box, cabinet, fitting, or other cable termination

In the Draft of Proposed NFPA 70 2005 edition, there is a change in the language as follows: **330.30 (B) Unsupported Cables.** Type MC cable shall be permitted to be unsupported where the cable:

(2) Is not more than 1.8 m (6 ft) in length from the last point of cable support to the point of connection to a luminaire (lighting fixture) or other piece of electrical equipment and the cable and point of connection are within an accessible ceiling. For the purpose of this section, Type MC cable fittings shall be permitted as a means of support. [ROP 6-73]

In summation: There does not seem to be a concern as suggested by this question in the current 2002 edition of the NEC or the proposed 2005 NEC, as to whether or not Type MC cable coming into contact with the suspended ceiling grid or lift-out panels is a problem.

Mark Earley

4. In a residence we have a sub-panel being fed with a feeder from the main panel. The water line coming into the house is plastic then turns to copper after the meter. There are no copper water lines in contact with the earth for more than 3.0 m (10 ft) Is it acceptable to bond the copper water line in the residence from the feeder panel since we are only bonding the copper lines and not grounding?

Section 250.52(A)(1) deals with the metal underground water pipe as a grounding electrode issue. Since the water pipe is plastic, it is not covered by this section.

Section 250.104 (A)(1) requires Metal water piping system(s) installed in or attached to a building or structure to be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. (Single family dwelling)

In a building of multiple occupancy, the water pipe is permitted to be bonded to the panelboard that serves only that particular occupancy. (Section 250.104(A)(2))

Richard Loyd

5. A master bedroom has a fireplace with an electronic starter. Is this electronic starter required to be AFCI protected? If so, will the AFCI sense the arching of the electronic starter as a fault and nuisance trip?

Yes, It should not nuisance trip. The manufacturers looked at as many arc signatures as they could think of that may occur in a residence. Fireplaces are fairly common in residential bedrooms and I have not heard of a problem. I guess if it is a problem use a match to light your fireplace.

Arkady Tsisserev

6. Why are we limited on the number of overcurrent protection devices on the supply side of a lighting and appliance branch circuit panel board to not more than two main circuit breakers or fuses?

“FPN on Article 230.71(B) references Article 408.16(A) for overcurrent protection devices of a lighting and appliance branch circuit panelboard. This, latter Article restricts the number of circuit breakers or the number of fuses to two, based on the fact, that use of single pole units is permitted on a multi-wire circuits. Lighting and appliance branch circuit panelboards are intended to supply 3 wire, single phase power to individual lighting and appliance branch circuits.

Mike Forister / Tom Garvey

7. An information monitor requires an isolated ground receptacle and is installed in a commercial kitchen 2.5 m (8 ft) above the floor. Is this 120-volt, 15-amp receptacle required to be GFCI protected? Do manufactures make a GFCI-IG receptacle?

Response: Article 210.8(B) requires all 125-volt, single phase, 15 and 20 ampere receptacles installed in Commercial Kitchens to have ground-fault circuit-interrupter protection for personnel. This would mean that this receptacle, if it is 125-volt, 15 or 20 ampere, must have GFCI protection. At this time, there are no known isolated ground GFCI receptacles manufactured. Protection may be accomplished by a GFCI Circuit Breaker, or a feed through Receptacle GFCI. The Isolated Ground would not affect the operation of the GFCI.

Dave Mercier

8. In recent years, we have been seeing more and more Type NM cable with color-coated sheathing jackets (yellow for 12 AWG, orange for 10 AWG, etc.). Is this colored sheathing a code requirement? Is this an industry standard or what? Can a 12/2 Type NM cable be colored another color than yellow?

Is this colored sheathing a code requirement?

The color code is neither a NEC requirement nor a UL requirement.

Is this an industry standard or what?

This is what is referred to as a *de facto* industry standard. This color code scheme is now what the industry expects to be able to easily identify the wire size.

Can a 12/2 Type NM cable be colored another color than yellow?

Yes it can be colored another color. I have not seen any other color code use for size identification for NM-B cables. Industry guides, such as NEMA, are working on including the present color code system in new guides. These guides will most likely not require color-coding. The intent of the guides will be to provide the colors to use if color-coding is used.

This is a convenience item therefore if the conductor size is in question; the print should be used to confirm wire size.

Chuck Mello

9. When skeleton neon is installed through a metal frame and behind a metal valence (not a sign enclosure), to provide indirect lighting, is the frame and valence required to be grounded or bonded? If so, is an additional ground or bond connection required at each metal piece or do the self-tapping screws that hold the valence to the frame provide suitable bonding?

The metal frame would have to be bonded by the metal raceway enclosing the secondary conductor or by a separate bonding conductor that goes to a bonding termination plate or similar device at the electrode penetration of the metal frame. The bonding conductor would also have to be bonded in the transformer enclosure and the supply circuit equipment-grounding conductor. Any metal raceway enclosing secondary conductor between sections of tubing would also have to be bonded by a wire. The metal frame of the building cannot be used as the equipment ground or the return path, so the means of attaching the metal framing together is not relevant. The supports for the tubing would not be required to be bonded and the valence would not have to be bonded unless it was less than 1 1/2 or 1 3/4 inches depending on operating frequency. Reference Sections 600.7 and 600.32.

John Hudak / Mark Hilbert

10. A gas station/convenience store includes two gas tanks with a pump in each tank and 16 gas dispensers. The electrical system has a panelboard (located in an equipment room in the back of the store) that is supplied from the service equipment through a contactor. The contactor includes contacts for the grounded and ungrounded conductors supplying the panel. The coil for the contactor is controlled through an emergency switch located at the cash register for the store. The panelboard supplies the pump motors in the gas tanks, the circuits for each dispenser and the circuit that supplies power to the source for the dispenser data circuits. Does this arrangement, with no other disconnects, meet the requirements in *NEC* 514.11(A) & (B) and also 514.13?

It is common today for the emergency control to be installed as described in the inquiry (e.g. a shunt trip arrangement or a contactor that is opened by a single switch usually located next to the cash register). Individual branch circuit disconnects are still required by Section 514.11 (A) for each circuit leading to or passing through a dispenser. In accordance with Section 514.11 (B) both the emergency control and the individual circuits disconnect must be located where acceptable to the AHJ and not more than 100 feet from the dispensers.

The circuits supplying the two pumps are supplying remote pumping equipment and therefore are required to be disconnected by 514.11 (A). The control circuits that run out to the dispensers in this type pressurized system are typically intrinsically safe circuits but still need to be disconnected. Although they are a protection technique recognized for use in hazardous locations they may present a shock hazard. It was already noted in the inquiry that the panelboard disconnects the source of power to the circuits that provide the emergency control.

2nd part of question:

In my opinion, the disconnecting means required by 514.11 (A), located in accordance with 514.11 (B), can also serve as the disconnecting means required by 514.13. This was noted in proposal number 14-467a for the 2002 NEC. This proposal would have required a disconnecting means to be located within or adjacent to the dispensing equipment. Here the panel statement indicates that a disconnecting means within or next to the dispensing equipment is not mandated as the panel wants the flexibility in the location of this disconnecting means to remain. The panel clarified this by adding the last sentence in 514.13 which reads “this means shall be permitted to be located other than within or adjacent to the dispensing device”.

Consideration should be given to the proposals submitted to Panel 14 for the 2005 cycle regarding the location of this disconnecting means. There is merit to locating the disconnecting means outside of the hazardous location around the dispenser islands. However, I think it would be in the best interest of electrical safety to consider locating the disconnecting means “with in site from the equipment”.

Rick Maddox

11. A set of plans calls for a facility where drug testing will be administered and people sometimes sleep overnight for evaluation. On the prints, some rooms are labeled “Exam Rooms”. The facility is not licensed as a healthcare facility. Do the requirements of Article 517 need to be addressed in these exam rooms?

If the only service that is being provided by this facility is the observation and testing of the occupants where no medical care being rendered, then compliance with Article 517 would not be required. As the Authority Having Jurisdiction you would need to clarify the intent and extent of the occupancy. If there is detoxification or other medical services being provided then the exam rooms would be required to comply with Part II of Article 517.

Dave Clements

12. When spacing the wall receptacles in a dwelling unit, is the wall space located behind the door counted as wall space or do we start our measurement at where the door stops against the wall when open?

CEC Rule 26-712 (c) notes that the usable wall space for measurement for wall receptacles does not include areas occupied by a door when fully open.

[Editors Note: Section 210.52(A)(1) requires receptacles to be spaced so that no point measured horizontally along the floor line in any wall space be more than 1.8 m (6 ft) from a receptacle outlet. The wall space located behind a door is considered wall space for measuring the floor line per NEC[®] requirements.]

Jim Pauley

13. Is all of the metal gas piping in a residence considered bonded by the fact that the piping is connected to a gas appliance (water heater, etc.) that is grounded by an equipment grounding conductor of the appliance branch circuit?

Reference: 250.104(B).

The answer is “maybe”. The catch is in the use of the words “all gas piping” in the question. If the equipment grounding conductor is grounding the metal frame of the appliance and the gas pipe is bonded to that frame, then the bonding is complete for that section of piping. If a section of pipe is isolated by an insulated or similar coupling, then not ALL of the piping would be bonded by the connection at a single appliance. However, keep in mind that the requirement in 250.104(B) is to bond piping that is likely to become energized. If you do the bonding at appliances that are likely to energize the piping, the bonding would be complete.

George Flach

14. An article in the summer edition of *NEC Digest*, titled “Vested Interest” indicates that an AHJ could choose to enforce the requirements of either the *NEC* or the *NESC* at an industrial or institutional property that accepts service from the utility at a voltage above 600 volts. It indicates that the *NESC* could be used up to a point where the voltage is stepped down to less than 600 volts. It certainly is not easy to apply the *NEC* to a 35 KV system, installed on wood poles, across large areas. However *NEC* 90.2(A) (2) & (3) and 90.2(B) (5) seem to indicate that electrical installations on the load side of the service point are under the scope of the *NEC* regardless of voltage levels. Please address this issue.

You are correct in your interpretation of 90.2 of the *NEC*. All wiring and equipment (regardless of voltage) on the load side of the service point is subject to the requirements of the National Electrical Code. There are numerous Fine Print Notes that refer to the National Electrical Safety Code. Some of these may be found in 90.2(A)(2), 215.1, and 230.200.

You should contact the distribution engineer in the Department of Utilities for your jurisdiction or the State Fire Marshall, or the State Public Service Commission, or the State Utilities Commission for information on pole line construction.

A distribution engineer for the serving utility should be willing to help make the inspection of the overhead distribution of electricity on private property. After all, the utility company is not going to energize the privately owned distribution system unless it is safe and does not jeopardize the reliability of their system.

Gaylen Rogers / Jim Hinrichs

15. What is the difference between a separate branch circuit, a dedicated circuit, and an individual branch circuit? All three terms are used in the *NEC*, but only one seems to be defined in the *NEC*.

ARTICLE 100 DEFINITIONS SCOPE. *In general, only those terms that are used in two or more article are defined in Article 100. Other definitions are included in the article in which they are used but may be referenced in Article 100.*

Branch Circuit, Individual. *A branch circuit that supplies only one utilization equipment. (Only definition noted in NEC)*

ONE DEFINITION THAT WEBSTER’S IDENTIFIES FOR DEDICATED IS: “to set apart seriously for a special purpose; devote to some work, duty, etc.”

Dedicated Branch Circuit is identified in the following 2002 NEC Articles and meet the criteria of Webster’s definition: 210.8 (A) (3) exception, 210.8 (B) exception,

220.31 (A) (4), & (B) (4), 620.22 (B), 690.64 (B) (1), 692.65 (B) (1) & (6), 695.6 (B) (2), and 695.14 (F).

One DEFINITION IN WEBSTER'S FOR SEPARATE IS: "to set apart for a special purpose." *Separate Branch Circuit is identified in the following 2002 NEC Articles and meets the criteria of Webster's definition: 220.40 (B), 620.22 (A), 620.23 (A), 700.12 (E) exception, & 701.11 (F) exception.*

Mark Earley

16. Per the 2002 *NEC*, what is the minimum distance from a permanently installed fountain that I must locate a receptacle that provides power for a water-pump motor directly related to the circulation and sanitation system said fountain. Per the 1999 *NEC*, it was clear as to the required distance of between 1.5 m (5 ft) and 3.0 m (10 ft) from the inside walls of the fountain, and, where so located, the receptacle had to be a single, locking and grounding type and had to be protected by a GFCI. Is this still true for the 2002 *NEC* and if so, where do I find the requirements for this receptacle location?

The proximity requirement of 680-6(a)(1) in the 1999 *NEC* did cover circulating pump motors for permanently installed fountains and the reorganization of 680 for 2002 did not carry it over for fountains.

The 1999 requirement for receptacle location and protection was in Part A-General and now the proximity requirement is in Part II-Permanently Installed Pools. We had the same problem with the lack of correlation between Part III for storable pools and the requirements in Part II for Permanently Installed Pools that resulted in a TIA. The 2002 Code does require GFCI protection for all fountain associated electrical equipment operating over 15 volts (680.51(A)), but a receptacle for supplying a pump motor or for that matter any other fountain equipment does not have to be located a minimum of 5 feet from the fountain. Along with the proximity rule, the requirement for a locking type receptacle was also lost in the shuffle. CMP-17 has accepted the following text for 2005: 680.58 GFCI Protection for Adjacent Receptacle Outlets. All 15- or 20-ampere single-phase 125-volts through 250-volts receptacles located within 6.0 m (20 ft) of a fountain edge shall be provided with GFCI protection.

Richard Loyd

17. In determining if a swimming pool is a storable or permanent pool, where is the 1.0 m (42 in.) measurement taken from? Various inspectors are saying that the 1.0 m (42 in.) measurement in the *Code* is to the skimmer; therefore a 1.2 m (48 in.) pool can be wired as a storable pool. My interpretation of the code is that a manufactured 1.2 m (48 in.) pool shall be wired as a permanent pool and that the measurement in the *NEC* is not to the skimmer but the actual depth of the pool measured from the bottom of the pool wall to the top of the pool wall. Who is correct?

In my opinion you are correct. Most water going in a skimmer is recirculating water only and not draining the pool or limiting the depth. So my answer is how deep will the water get if you leave the hose running in it. If it exceeds 42 inches then you have a permanent pool.

Arkady Tsisserev

18. An inspector has told me to seal the openings around conduits that I drilled through a fire-rated wall. Is it the electrical contractor or the general contractor's job to seal these openings?

It is a general contractor's responsibility to hire a qualified sub-trade – to adequately seal all openings through a fire wall or a fire separation. Although this requirement is mandated by Rule 2-124 of the CE Code, Part I, a reference is made from this Rule to the National Building Code of Canada (NBCC), as specific provisions for fire stopping in fire separations and fire rated assemblies are regulated by Article 3.1.9.1. of the NBCC. Appendix B and Appendix G of the CE Code, Part I further refer the Code users to the appropriate requirements of the NBCC.

Mike Forister / Tom Garvey

19. I am using a two-pole switch and want to switch a 277-volt light and a 120-volt fan with the same device. Is this acceptable?

Response: Article 404.8(B) does not allow switches to be ganged or grouped with other switches if the voltage between adjacent devices exceeds 300 volts. If the voltage between adjacent devices exceeds 300 volts, a barrier must be installed. According to the UL "White Book" under "Snap Switches" category WJQR, multi-pole general use snap switches have not been investigated for more than single-circuit operation unless marked "2-circuit" or "3-circuit."

Dave Mercier

20. I recently heard that several wire manufacturers had come out with a new 4-wire NM cable. If this is so, what's the purpose and intended use for this 4-wire NM cable?

The purpose of the 4-wire cable that includes two grounded conductors (white and white with red stripe) is to provide an alternate to using a shared neutral in a 3-wire cable. This product was introduced when AFCI's were first required and would not work with shared neutrals. It became known in many areas as "AFCI cable". It allows an installer to pull two circuits in a single pull. Also available is a 4-wire cable with a black, blue, red, and white color scheme. This has limited uses such as using for three function bathroom fans. The two-neutral cable can also be used for this application also if one of the grounded conductors is re-identified as an ungrounded conductor.

Chuck Mello

21. An underground feeder installed in rigid nonmetallic conduit penetrates a floor slab and enters a metal pull box. The conductors pass through this box into grounded EMT conduit. Does the *NEC* require the circuit equipment grounding conductor to be bonded to the metal box or is it bonded by the grounded EMT conduit connection?

Section 250.148 would allow the equipment grounding conductor to pass through without bonding provided the EMT, indicated as "grounded", provided a suitable permanent low impedance path for any ground fault current that could exist from a ground fault in the metal box or farther in the circuit. If the only low impedance path back to the source for the ground fault current is through the equipment grounding

conductor installed in the nonmetallic rigid conduit, then it would have to be bonded to the metal box. References 250.148 and 250.4(A)(3) and (A)(5).

John Hudak / Mark Hilbert

22. A 15 or 20 ampere, 125-volt receptacle is required within 7.5 m (25 ft) of all HVAC equipment. If a receptacle is installed in a crawl space, within 7.5 m (25 ft) of an attic fan-coil unit, is that receptacle permitted to also serve the outside air conditioner unit, if it is within the 7.5 m (25 ft) limit, or does an additional receptacle have to be provided on the outside of the building?

In most cases an additional receptacle would have to be installed. If the crawl space was an accessible location the heating, air conditioning or refrigeration equipment, Section 210.63 requires the receptacle to be on the same level as the equipment. In order for the receptacle to qualify for the heating, air conditioning or refrigeration equipment it would have to be accessible, (e.g. admitting close approach; not guarded by locked doors, elevation, or effective means) and located within 25' of the equipment and on the same level.

Rick Maddox

23. The electrical contractor on a large commercial jobsite placed several signs at all the temporary construction receptacles that states, "All workers shall provide their own personal portable GFCI devices". Does this meet the requirements of Section 527.6(A)?

Section 527.6 permits the use of portable cord sets or devices incorporating listed ground-fault circuit interrupter protection for personnel identified for portable use. As the AHJ you have to make the determination of how to enforce this section. In this case the contractor has gone a step beyond that required by 527.6 of the NEC.

Dave Clements

24. How many equipment grounding conductors can I put under one terminal in a service panel? What about the grounded conductors? Can I put more than one grounded conductor under one terminal in a service panel?

Canada, the CEC, Part I identifies equipment grounding conductors as bonding conductors. The system grounded conductors (neutrals) are permitted to be used as bonding to ground means for service equipment only, including metal meter mounting devices. (See Rule 10-516(2) of the CEC). No more than one grounded conductor (one neutral) is permitted to be terminated under one terminal. Article 7.4.5.1 of the CSA Standard C22.2 no. 29 "Panelboards and enclosed panelboards" requires a special neutral assembly in the service compartment of the service panel.

This neutral assembly is intended to incorporate listed connectors for termination of each grounded conductor. (for each neutral). Branch circuit grounded conductors are required to be terminated in the additional assembly installed in the branch circuit compartment of the service panel and provided with a separate terminal for each grounded conductor. (See Article 7.4.5.2 of the CSA Standard C22.2 No. 29)". NEC has similar provisions in Article 250.24.

Jim Pauley

25. Non-dwelling kitchens now require GFCI protection of all 125-volt, single-phase, 15- and 20-ampere receptacles with no exceptions. Would the deli, bakery, meat market, seafood market, produce market in a grocery store; employee break rooms or employee lounges in offices; concession stands at ball fields or arenas; the food service area of a convenience store; the bar area in a night club be considered non-dwelling kitchens? Does the GFCI requirement apply to receptacles in dedicated appliance spaces, non-countertop receptacles, receptacles for refrigeration equipment and receptacles that are not readily accessible?

Reference: 210.8(B)(3)

Each installation must be looked at individually. The substantiation that led to the requirement was associated with “commercial kitchens” and the panel did not anticipate the wide variation in interpretations. The issue is in the definition of what creates a kitchen. I would recommend that inspectors look to the 2005 NEC ROP and consider the CMP 2 proposed that clarifies the language. The new language says “Commercial and institutional kitchens — for the purposes of this section a kitchen is defined as an area with a sink and permanent facilities for food preparation and cooking”

Areas from the question that would be covered under this definition would be all of those that have a sink and permanent facilities for food preparation and cooking.

The requirement applies to all receptacles, even those in dedicated appliance spaces, those not necessarily on counter top spaces and those that are not readily accessible. There is no basis to exempt those receptacles as the connected equipment is required to be compatible with a GFCI.

George Flach

26. A contractor installed conduit below the slab in a commercial garage. If he runs the conduit up the walls beyond the 450 mm (18 in.), does he have to install seal-offs? The garage floor tapers to a drain in the center of the floor. Is the lowest elevation of the floor used for the 450 mm (18 in.) height rule or is it measured at the walls?

In a Class I Division 2 location, a seal fitting is generally required where the rigid metal conduit or threaded intermediate metal conduit leaves the Division 2 location and enters an area that is not classified. Since the question mentions a commercial garage, Article 511 of the NEC applies and 511-3(B)(1) classifies the area up to 18 inches above the floor as a Class I Division 2 location unless adequate mechanical ventilation is provided. This is the only reason why a seal fitting is not required in a commercial garage. However, Exception No.1 to 501.5(B)(2) does not require a seal fitting if the metal conduit contains no unions, couplings, boxes or fittings within 12 inches of the boundary of the Class I Division 2 location.

The 18-inch dimension should be measured at the wall.

Gaylen Rogers / Jim Hinrichs

27. AFCI protection is required for dwelling unit bedrooms but what about walk-in closets that are connected to these bedrooms?

The 2002 edition of the NEC, **Article 210.12 (B) Dwelling Unit Bedrooms**. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter listed to provide protection of the entire branch circuit.

The reason for Arc-Fault Protection in **Bedrooms**, which could also be identified as a "Sleeping Room" is for Life-Safety. The "Sleeping Room" Closet would normally only be accessible from the "Sleeping Room". The intent of the NEC Article 210.12 (B) is to protect life and property and it would be reasonable to expect arc-fault protection for outlets in the Bedroom Closet.

Mark Earley

28. A master bedroom has a wet bar with a small sink. What would apply to this receptacle outlet, GFCI, AFCI, or both?

GFCI protection required:

210.8(A)(7) Wet bar sinks — where the receptacles are installed to serve the countertop surfaces and are located within 1.8 m (6 ft) of the outside edge of the wet bar sink.

AFCI Protection required:

210.12 (B) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter listed to provide protection of the entire branch circuit.

Therefore, both would be required.

Richard Loyd

29. Does Article 680 apply to a fountain that is installed in a community lake or pond?

Yes, the scope of article 680 seems to cover these installations which are very common in every town in the country. 680.2 also supports this. It is my understanding that a task committee has been appointed to investigate electrical installations in other bodies of water such as Catfish ponds Sewer ponds etc. which are not presently covered by Article 680.

[Editor's Note: The scope of Article 680 provides information relative to applicability of the article.]

Arkady Tsisserev

30. When two separate circuits are run into a two-gang box such as for a switch for a kitchen sink luminaire (light fixture) and a kitchen countertop receptacle outlet, do both circuit equipment grounding conductors need to be commonly tied together or just the equipment grounding conductors of each circuit?

Article 250.148 of the NEC mandates that "any separate equipment grounding conductors associated with those circuit conductors shall be spliced or joined within the box". Only the equipment grounding conductors that are used for isolated receptacles described in Article 240.146(D), are not required to be connected to the other equipment grounding conductors or to the box.

Mike Forister / Tom Garvey

31. What is the reason for requiring abandoned fire alarm and communication cables to be removed above a removable grid ceiling?

Response: There are two reasons, one is increased fire fuel load and the second reason is additional weight.

Dave Mercier

32. The NEC requires one receptacle for the laundry; however, the laundry space is a small closet. The laundry equipment is stacked washer-dryer supplied by a 30-ampere branch circuit. Are we still required to provide a receptacle on a separate 20-ampere branch circuit to this small place?

How do you define the laundry area? Notice the Code says area and not room. If it were likely that an iron could be used immediately outside of this laundry closet, I would extend the "area" to include an outlet immediately outside of this laundry closet. If the laundry "area" is confined to this closet then yes, the separate 20-ampere branch circuit is required in the closet.

A definition for laundry area can be found in 550.2 for Mobile and Manufactured Homes

Chuck Mello

33. Can I install a three-phase overcurrent device on a single-phase service installation and still be code compliant? Assume that the three-phase equipment comes with an approved neutral kit. Everything being the same between the two except for the extra phase.

Generally no unless the 3-pole breaker been specifically marked as suitable for use on single phase circuits. The reference is the UL General Directory under guide code DIVQ and located under "special uses". This is a case where the breaker may work fine but it is really unknown unless it has been tested. The difference relates mostly to the short circuit testing where the power factor phase angles are specified and controlled. These phase angles for a three phase test would be very different from a single phase test, therefore the unknown results. Reference 110.3(B) and UL General Directory guide DIVQ.

John Hudak / Mark Hilbert

34. Service equipment installed for a retail lease space has spaces available for eight circuit breakers. The electrical contractor installed only six overcurrent devices and blanked off the other two available spaces within the switchgear. Is this type installation acceptable by code for the maximum number of disconnects?

Yes, this would be an acceptable installation without an individual main provided there were no more than six disconnecting means installed at the time of inspection. There is no restriction on the actual number of spaces only the number of disconnecting means.

[Editor's Note: Per Section 230.66, the service equipment would be required to be marked to identify it as being suitable for use as service equipment.]

Rick Maddox

35. Currently Section 517.30(C)(3) requires the wiring methods for the emergency system to be non-flexible metal raceway. Exception No. 5 permits flexible metal raceways and cables in a couple of applications. Where the exception speaks to “where flexible is necessary”, is this intended to be for convenience, such as from an outlet to the luminaires within a normal suspended ceiling application or is it meant for when it is physically impossible to install the equipment unless you use a flexible connection?

The intent of Exception 5 to Section 517.30 (C) (3) is to permit the use of flexible metal raceways in some very limited conditions for special conditions on emergency systems that enter medical headwalls, office furnishings or medical equipment where physical protection is provided. The exception does reference the connection to equipment and the definition of equipment is a general term that does also apply to luminaires, but is intended to be limited to equipment within medical headwalls or listed furnishings. This exception is intended for necessity only, not convenience and intended to provide a higher level of physical protection of wiring methods used for these circuits. Wiring above a suspended ceiling is accessible and because of that accessibility it is subject to physical damage from workers accessing systems above the ceiling for installation of new systems and maintenance of existing systems. Use of flexible wiring methods in these areas do not provide the level of protection required on these systems and non-flexible wiring methods would be required.

Dave Clements

36. In a residential occupancy where a lighting system of 30 volts or less is installed, is it permissible to use 12 AWG, two-conductor Type TC cable assembly concealed within the walls from the transformer to the luminaire (light fixture)?

Section 30 of the CEC defines cable lighting system as a complete extra-low-voltage lighting assembly. Rule 30-1206 of the CEC does not allow conductors of these systems to be installed in contact with combustible materials and not run through walls, ceilings, floors, or partitions.

[Editor's Note: Section 411.4 of the NEC[®] states that lighting systems operating at 30 volts or less shall not be installed where concealed or extended through a building wall, unless using a wiring method specified in Chapter 3. Type TC (Power and Control Tray Cable) is the wiring method mentioned in the question. Section 336.10 limits the use of Type TC cable to cable trays or raceways when installed indoors. Section 411.3 requires these systems to be listed and Section 110.3(B) indicates that the manufacturer's instructions must be followed.]

Jim Pauley

37. A new repair garage is being built and the owner is not sure if he will be working on vehicles powered by CNG, LNG or LPG. Does the area within 450 mm (18 in.) of the ceiling need to be considered a Class 1, Division 2 location?

Reference: 511.3(B)(2)

This revision was made to the 2002 NEC because unlike gasoline vapors that collect at the lower points of a space, CNG collects at the ceiling. If the owner is unsure of what they will be working on, the most conservative view should be taken and the

area treated as a Class 1, Div 2 location. If the owner provides assurance to the inspector that the facility will not be used for CNG vehicle repair, the AHJ could make the judgment that the space next to the ceiling is not classified. Note that the requirement applies only to CNG vehicles, not LNG or LPG.

George Flach

38. Recently, on an inspection of a dwelling unit, I noticed several 3-gang switch boxes located in the entry hall near the front door area. These switches controlled several lighting outlets throughout the house. The homeowner wanted to be able to turn on all these lights as he entered his dwelling unit at the front door. One of these switches controlled a floodlight at the back patio area. This floodlight illuminates the exterior area at the exit door to the patio area. This switch, located at the front door is the only switch for this backyard patio light fixture. The switch is approximately 15 m (50 ft) and 3 rooms away from the exit door to the patio. Is this a code compliant installation?

Although this arrangement of wall switches may not be convenient to the occupant, and may not comply with the intent of 210.70(A)(2)(b), it satisfies the language in the 2002 edition of the NEC.

Gaylen Rogers / Jim Hinrichs

39. Section 110.26(A)(1) requires the depth of the working space to be in accordance with Table 110.26(A)(1), when the equipment is likely to require servicing, maintenance, etc, while energized. If a 480-volt panel board was located on a wall on the one side of the room and a 208-volt panel board was located directly across the room, at a distance of 1.5 m (5 ft) measured from the removable fronts of both enclosures, would this be a Condition 1 or a Condition 3 application? It seems that either panel board would actually be located out of the maximum space that could be required by the table for the other.

The worst case scenario that could occur given the described situation would be: Condition 3—Exposed live parts on both sides of the work space (not guarded as provided in Condition 1) with the operator between. The voltage to ground would fall into the 151-600 category; therefore the Minimum Clear Distance would be 1.2 m (4 ft).

NEC 110.26(1)(c) Existing buildings. In existing buildings where electrical equipment is being replaced, Condition 2 working clearance shall be permitted between dead-front switch-boards, panel-boards, or motor control centers located across the aisle from each other where conditions of maintenance and supervision ensure that written procedures have been adopted to prohibit equipment on both sides of the aisle from being open at the same time and qualified persons who are authorized will service the installation.

Mark Earley

40. Is a doublewide mobile home mounted on a permanent foundation, considered a permanent installation and must it be wired like a dwelling?

The definitions of the terms are found in 550.2:

Manufactured Home. A structure, transportable in one or more sections, that is 25 m (8 body ft) or more in width or 12 m (40 body ft) or more in length in the traveling mode or, when erected on site, is 30 m² (320 ft²) or more; which is built on a chassis and designed to be used as a dwelling, with or without a permanent foundation, when connected to the required utilities, including the plumbing, heating, air conditioning, and electrical systems contained therein. Calculations used to determine the number of square meters (square feet) in a structure will be based on the structure's exterior dimensions, measured at the largest horizontal projections when erected on site. These dimensions include all expandable rooms, cabinets, and other projections containing interior space, but do not include inside bay windows.

For the purpose of this Code and unless otherwise indicated, the term mobile home includes manufactured homes.

Mobile Home. A factory-assembled structure or structures transportable in one or more sections that is built on a permanent chassis and designed to be used as a dwelling without a permanent foundation where connected to the required utilities and that includes the plumbing, heating, air-conditioning, and electric systems contained therein.

For the purpose of this Code and unless otherwise indicated, the term mobile home includes manufactured homes.

550.10 Power Supply.

(A) **Feeder.** The power supply to the mobile home shall be a feeder assembly consisting of not more than one listed 50-ampere mobile home power-supply cord with an integrally molded or securely attached plug cap or a permanently installed feeder.

Exception No. 1: A mobile home that is factory equipped with gas or oil-fired central heating equipment and cooking appliances shall be permitted to be provided with a listed mobile home power-supply cord rated 40 amperes.

Exception No. 2: Manufactured homes constructed in accordance with 550.32(B).

(B) **Manufactured Home Service Equipment.** The manufactured home service equipment shall be permitted to be installed in or on a manufactured home, provided that all of the following conditions are met:

(1) The manufacturer shall include in its written installation instructions information indicating that the home shall be secured in place by an anchoring system or installed on and secured to a permanent foundation.

(2) The installation of the service equipment shall comply with Article 230.

(3) Means shall be provided for the connection of a grounding electrode conductor to the service equipment and routing it outside the structure.

(4) Bonding and grounding of the service shall be in accordance with Article 250.

(5) The manufacturer shall include in its written installation instructions one method of grounding the service equipment at the installation site. The instructions shall clearly state that other methods of grounding are found in Article 250.

(6) The minimum size grounding electrode conductor shall be specified in the instructions.

(7) A red warning label shall be mounted on or adjacent to the service equipment. The label shall state the following:

WARNING DO NOT PROVIDE ELECTRICAL POWER UNTIL THE GROUNDING ELECTRODE(S) IS INSTALLED AND CONNECTED (SEE INSTALLATION INSTRUCTIONS).

Where the service equipment is not installed in or on the unit, the installation shall comply with the other provisions of this section.

The provisions of 550.32(B) specify the conditions required in order to install the service equipment in or on a manufactured home. The concern over the unit being moved off-site (intentionally or unintentionally) without the ability to disconnect the electrical supply is addressed in condition (1). A manufactured home with a service in or on the unit must be anchored in place or secured to a permanent foundation.

Article 550 governs the wiring of manufactured homes. It does not require a manufactured home mounted on a permanent foundation be wired like a stick-built home. In addition, the rule in 550.32(B) that deal with service equipment is a permissive rule.

Richard Loyd

41. Would the working space requirements of Section 110.26(A) apply to a non-fused disconnect switch such as might be found at an outside AC condensing unit?

110.26 definitely applies 110.26(A) could be subject to interpretation. In my opinion Yes; I believe the first thing the HVAC guy will do is open the disconnect and check for voltage.

Arkady Tsisserev

42. Does communication wiring installed in a residence have to meet the same requirements as Type NM cable regarding notched or drilled holes plate protection and installations for protection from nails or screws?

No. In Canada, wiring methods are mandated by Rules of Section 12 of the CEC. Scope of Section 12 does not cover installation of communication wiring which is done under provision of Section 60 "Electrical communication systems".

[Editor's Note: Section 800.6 states the communication circuits shall conform with Section 300.4(D) for cables ran parallel to framing members in notched and bored holes.]

Mike Forister / Tom Garvey

43. What is the difference between a cellular metal floor raceway and an underfloor raceway? How can you identify which wiring method and article apply when you see them installed? Which wiring method is shown in the example on the screen?



Response: Cellular Metal Floor Raceway is a metal floor, which has cells formed as large corrugations in the sheet metal of the structural floor. It provides wiring access on periodic intervals and is connected and fed by cross header ducts or trench duct. Underfloor duct is a rectangular duct designed to be used embedded in a concrete or other floor. The Underfloor Duct is a stand-alone raceway system, with inserts for accessing the duct and mounting fittings for outlets. The pictures are of Underfloor duct.

Both types have fittings such as junction boxes gain access to the conductors after the finish floor is installed. Both types have “inserts” or “presets”. The insert allows the installed to add receptacles, cable connections or supply equipment from the floor duct. You find the insert, clean out the concrete, remove the cap, clean out the threads, mount a hub to the insert and mount the floor box or dog house to the hub with a fitting that works like a “chase” nipple.

Differences: Cellular metal raceway has “header” ducts or “feeder” ducts to permit conductors or cables to be pulled from one cell into an adjacent cell. Cellular metal raceways come with instructions that are “for the use of the general contractor, erector, electrical contractor, inspector, and others concerned with the installation” (UL Whitebook, (RHZX), page 96.

Dave Mercier

44. Can a medium base screw-in fluorescent bulb replace an incandescent bulb in a keyless luminaire for a clothes closet and count as a fluorescent fixture for the 150 mm (6 in.) clearance to a shelf?

No, I do not see how adding a fluorescent bulb keeps 410.8(C) from applying. It is still an incandescent lamp holder (or luminaire fixture) being used with a fluorescent lamp. 410.8(D)(2) refers only to fluorescent fixtures.

Chuck Mello

45. What is the correct method for making taps to the grounding electrode conductor when applying the requirements of Section 250.64(D)? This Section seems silent as to the tap method to be used, but if I’m making taps to a grounding electrode conductor for something such as multiple separately derived systems, this would require irreversible compression connectors or exothermic welds.

Under the 2002 and previous editions of the NEC, any approved method is allowed. This could be irreversible crimp connectors, exothermic welding, lugs, split bolts or other means. When the panel developed the rules for multiple separately derived systems there was a great concern that the “common grounding electrode conductor” remain unspliced and therefore the very restrictive wording. The intent had been to allow the taps from the various separately derived systems to be spliced by any of the means allowed by 250.64(D) but the final wording did not reflect that. There are proposals for the 2005 NEC to align 250.30 and 250.64(D) requirements exactly including the provisions for a common busbar to be used for services and the less restrictive wording for the separately derived system taps connections to the common grounding electrode conductor. Reference 250.64(D) and 250.30(A)(3).

John Hudak / Mark Hilbert

46. Does the disconnecting means for the emergency generator described in Section 700.12(B)(6) have to be located on the outside of the generator housing to be considered “within sight from” the building or structure?

Yes, Section 700.12 (B) (6) requires an outdoor housed generator set to be equipped with a readily accessible disconnecting means that is located within site from the building or structure the generator is supplying. This was verified in Proposal No. 13-123 (log# 1017) for the 2005 NEC. In this proposal, the panel statement was clear that the disconnecting means was the subject of the “in site from” requirement.

Consideration must be given to Section 225.36 as these requirements have not been amended by Section 700.12 (B) (6)

Rick Maddox

47. A dwelling has a 200-ampere service. A feeder runs to a sub-panel in a detached garage protected by a 100-ampere overcurrent device in the main panelboard. If the wiring method used for the feeder is copper THWN conductors, what is the minimum wire size conductors permitted for this feeder? The feeder load, as determined by the provisions of Article 220, is 36 amperes.

A feeder protected by a 100-ampere overcurrent device on a residential 120/240-volt 3-wire feeder would be required to be a minimum of number 4 copper in a THWN based on Table 310.15.(B) (6) of the 2002 NEC.

Dave Clements

48. Are 3-wire dryer cords and receptacles allowed as the disconnecting means for electric water heater when the cord is sized properly for the load?

Rule 26-746(2)(a) of the CEC, Part I allows use of an attachment plug and a receptacle instead of a switch, provide that the rating of the appliance does not exceed 30 A. Note: The CEC does not require a separate disconnect for electric hot water heaters.

[Editor's Note: Per the NEC[®] requirements of Section 422.16, the answer would be NO unless the cord was listed and identified for the use and the appliance (water heater) itself would need to be listed and identified for use with a cord and plug connection.]

Jim Pauley

49. Sentinel Lighting makes a listed Chan-L-Wire system that consist of a unistrut looking channel with a flat cable that is used for lighting in large grocery or department store. Although this looks like a branch circuit wiring, it seems to be listed as a lighting system. How does the NEC and product standards separate lighting products and wiring systems? What NEC requirements apply to this system?

Reference: Article 322 of the NEC

It would appear that the system being discussed is a “Flat Conductor” – Type FC cable installation. Article 322 of the NEC covers this type of installation.

NEC 322.10(1) allows FC cable to be used for lighting, small appliances and small power loads. The branch circuit cannot exceed 30 amperes.

NEC 322.10(4) allows the installation of FC cable in surface metal raceways identified for the use.

Other requirements such as those in Article 210, etc. would apply as well.

There is not always a clear distinction between a “manufactured wiring system” and a field installed system of various components. If the product were a manufactured wiring system, it would likely have been listed to UL 183 and Article 604 would apply. For the product in question, Article 322 for FC cable is the driving set of requirements.

George Flach

50. An existing building has the entrance door to the equipment room swing into the equipment room. The service equipment is being changed from 800 ampere to 1600 ampere. The new service equipment is 2.5 m (8 ft) long. Is it required to change the hardware on the door to panic hardware and have the door swing out to be code compliant?

Yes, the service equipment room must comply with 110.26 of the 2002 NEC. This is a new service installation with an ampere rating over 1200 amperes and switch gear that is more than 6 feet wide; therefore, the clearances, doors, door swing, and pressure plate or panic hardware for the door(s) must be provided. There is some relief for working clearance in existing buildings (See 110.26(A)(1)(c)).

Gaylen Rogers / Jim Hinrichs

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

Yes. The 2002 NEC Article **210.8 Ground-Fault Circuit-Interrupter Protection for Personnel**

(B) Other Than Dwelling Units. All 125-volt, single-phase, 15- and 20 ampere receptacles installed in the locations specified in (1), (2), and (3) shall have ground-fault circuit-interrupter protection for personnel:

- (1) Bathrooms
- (2) Rooftops
- (3) Kitchens

Mark Earley

52. Many builders and designers are using rope lights for accent lighting in residential kitchens and bathrooms. Can this rope lighting be installed through holes in cabinets? Can it be installed through the ceiling or wall to get from one cabinet to another? Where are the installation requirements for rope lighting; support requirements, termination requirements, separation requirements from combustibles, etc? Can receptacles be installed inside kitchen cabinets and supplied from a 15-ampere, 120-volt general lighting circuit (non-GFCI protected) to supply this rope lighting?

What is it? Is it flexible cord? The product is listed by UL under their standard UL2388. Section 21 Of the standard does not permit permanent mounting of this type of lighting. It is required to be secured with clips that allow its removal. Running the strings of lighting through cabinets or through ceilings or walls would tend to make it more of a permanent installation. Therefore, it would not be allowed. There would not be a prohibition of the installation of a 15 ampere 120 volt receptacle in a cabinet that is not GFCI protected. Section 210.8(A)(6) applies to receptacles that are installed to serve the countertop surfaces.

Richard Loyd

53. If a peninsula island separates the kitchen from another room (nook or living room, etc.), is the backside of this peninsula island opposite the kitchen treated as general wall space for placement of receptacles or is this space treated as part of the kitchen countertop?

It is a judgment call. If the back side of the peninsular is clearly not intended for serving a over hang for bar stools then the answer is YES but in my new home the back side of the peninsular there is an overhang so it is used as a table or bar and the great room side is not usable as wall space. However; the electrical contractor that wired my home was able to provide me with one receptacle below in accordance with 210.52(C) exception and two receptacles above in accordance with 210.52(C) they were also able to install one receptacle on the great room side so interpretation was not necessary.

Arkady Tsisserev

54. When using the exception for an individual 15 ampere branch circuit for refrigeration equipment in a dwelling unit kitchen, can this 15 ampere branch circuit supply other refrigeration equipment such as a wet bar regenerator in the living room.

NO, it can not. Exception No. 2 to Article 210.52(B) (1) states that the receptacle outlet for refrigeration equipment is permitted to be supplied only from an individual branch circuit. Individual branch circuit is defined in the NEC. It is a branch circuit that supplies only one utilization equipment. Rule 26-720(a) of the CEC mandates a separate branch circuit for a refrigerator receptacle only – with one exception – a receptacle intended for use with an electric clock is also permitted to be supplied from this branch circuit

Mike Forister / Tom Garvey

55. Does the *NEC* permit Type MC and/or Type AC cable to be installed in a raceway? If so, are the support and securing requirements omitted since the cable would be within the raceway? What types of fittings are available to effectively ground the cable armor?

Response: Most raceway articles in the NEC allow installation of cables if the respective cable articles allow such an installation. MC Cable is specifically allowed in raceways, according to Article 330.10(A)(7). AC Cable does not have the same permission in Article 320. Therefore the answer is MC Cable may be installed in a raceway, while AC Cable may not. There are many fittings listed for AC and MC cable which are approved for grounding. Information may be found in the UL “white” book, Category AWSX for Armored Cable and Category PJOX for MC Cable.

Dave Mercier

56. NEC 450.21 states that dry type transformers must be separated from combustibles by a fire resistant, heat insulated barrier. Does a standard gypsum sheetrock wall meet the barrier requirement?

No. Although gypsum drywall board is not considered a combustible material by the NEC (see Section 314.20) and it does offer some fire resistance, it does not meet the requirements in this section as a “fire resistant, heat insulated barrier.” In order for a dry-type transformer installed indoors (rated not over 112½ kVA), it would have to have 12 in. clearance from combustible materials unless the transformer is the completely enclosed type, with or without ventilating openings (Section 450.21(A) and Exception).

This is a fire resistant and heat insulated “barrier” which is not the same as fire-resistant “construction”.

Chuck Mello

57. An 800-amp 120/208-volt feeder consists of two sets of 500 kcmil copper conductors per phase in non-metallic conduits. Is it necessary to install equipment grounding conductors in each conduit? What size equipment grounding conductors are required?

Yes, an equipment grounding conductor is required in each conduit per Section 250.122(F). The size would be full size based on the 800 amp overcurrent protective device ahead of the circuit which by Table 250.122 is 1/0 copper or 3/0 aluminum. The alternate method provided in 250.122(F)(2) would not apply here since that is for cable assemblies only. Reference 250.122(F) and 250.122(F)(1).

John Hudak / Mark Hilbert

58. What does the term "open neutral" mean when it appears in the NEC?

Typically this would be a condition where the continuity of the neutral has been interrupted or “opened” while the system or circuit is energized.

(Handbook commentary to 250.142) One way this term is used is associated with not grounding the grounded conductor on the load side of the main. One major reason the grounded circuit conductor is not permitted to be grounded on the load side of the service (except as allowed in 250.140) is that, should the grounded service conductor become disconnected at any point on the line side of the ground, the equipment grounding conductor and all conductive parts connected to it will carry the neutral current, raising the potential to ground of exposed metal parts not normally intended to carry current. This could result in arcing in concealed spaces and could pose a severe shock hazard, particularly if the path is inadvertently opened by a person servicing or repairing piping or ductwork.

Even without an open grounded conductor (usually referred to as an open neutral), the equipment grounding conductor path will become a parallel path with the grounded conductor, and there will be some potential drop on exposed and concealed dead metal parts. The magnitude of this potential difference will be determined by the relative impedances of the equipment grounding path and the grounded conductor circuits. Not only would the equipment grounding conductor

path be affected, but all parallel paths not intended as equipment grounding conductors would be affected as well. This could involve current flowing through metal building structures, piping, and ducts.

Rick Maddox

59. Are seal offs required in a Class 1 Division 1 location on raceways that contain service laterals that are installed by the utility? The location of the CT compartment is located less than 450 mm (18 in.) off the floor. The utility refuses to let the electrician install these seals claiming they are exempt from the requirements of the NEC. All of the above equipment is owned by the owner of the property but initially is being installed by the utility. The equipment is located within the footprint of the building.

This answer to this question will very depending on state law and regulation of the utility in the state in which you live. Irregardless, the hazard involved is the same for service laterals as it is for the premises wiring located within or under a Class 1 Division 1 location. Utilities in most locations have there own regulations and standards. It is important that you build a good working relationship with the serving utility or utilities within the jurisdiction, a good relationship with the serving utilities will aid in resolving these types of disputes. Many of those utilities utilize the National Electrical Safety Code, that document references compliance with the NEC for electrical installations in hazardous locations. The best solution in this case would be to relocate the service lateral out of the Class 1 Division 1 location entirely. If this cannot be accomplished as the Authority Having Jurisdiction you would need to exercise your authority over the Class 1 Division 1 location and require strict compliance with Article 501 of the National Electrical Code.

Dave Clements

60. Is the crawl space of a pier-and-beam dwelling unit considered to be a damp or dry location? If this is a damp location, can Type NM cable be used in this crawl space?

The CEC defines “damp location”. Table 19 of the CEC permits use of NMD90 for exposed wiring in damp locations. NMWU is allowed to be used for exposed wiring in wet locations

[Editor's Note: The determination of whether a specific location is to be considered wet, damp, or dry for the purposes of applying the NEC is the responsibility of the authority having jurisdiction (AHJ). The NEC defines a “damp” location as locations protected from weather and not subject to saturation with water but subject to moderate degrees of moisture. “Dry” locations are defined as those locations not normally subject to dampness or wetness. There are many crawl spaces under dwelling units considered by the AHJ as a dry location and the use of Type NM cable is permitted by the NEC. Typically the Type NM cable is secured to the underside of the floor joist and not subject to direct contact to the ground under the dwelling in the event of some unforeseen moisture entering the crawl space.]

Jim Pauley

61. Why is there no requirement for GFCI protection for a hard-wired 240-volt motor on a swimming pool in the 2002 NEC? This was a requirement in the 1999 NEC and I

could find no substantiation for this requirement to be dropped in the 2002 *NEC* ROP or the ROC reports.

There was no substantiation for the deletion of the requirement. During the 2002 *NEC* processing, CMP 20 reworded the requirement to apply only to cord- and plug-connected motors during the rewrite of Article 680. They simply stated that “there was insufficient substantiation to keep the rule for hard wired motors.” There is a proposal (17-80) that was submitted to reinstate the rule in the 2005 *NEC*. So far, CMP 17 has resisted (with a vote of 9 to 2) with the statement “There is no substantiation to require hard wired motors to be GFCI protected.”

George Flach

62. From time to time, I have seen cement dyed red being placed over buried electrical lines. Obviously this is a warning to future diggers that electrical lines are nearby. Is this an *NEC* requirement or just an industry practice? If it is in the code where can I find it?

This is an industry practice, not a National Electrical Code requirement. There are rules for concrete cover and concrete encasement in 230.6(1) and (2), but no color is specified. There is also a requirement for a warning ribbon to be placed above direct buried service conductors in 300.5(D)(3). Here again, no color is specified.

Gaylen Rogers / Jim Hinrichs

63. In a typical computer room, under a raised floor, do the electrical branch circuits (such is liquidtight flexible metal conduit) need to be secured to the concrete floor?

The answer to this question begins with the 2002 *NEC* Article 645 Information Technology Equipment. 645.5 Supply Circuits and Interconnecting cables. Section (D) Under Raised Floors In the last sentence of sub-section (2) which includes “liquidtight flexible metal conduit”, States: These supply conductors shall be installed in accordance with the requirements of 300-11.

ARTICLE 300 WIRING METHODS.

NEC 300.11 Securing and Supporting. (A) Secured in Place. Raceways, cable assemblies, boxes, cabinets, and fittings shall be securely fastened in place.

NEC Article 350.30 Securing and supporting, LFMC shall be securely fastened in place and supported in accordance with 350.30 (A) and (B).

(A) Securely Fastened. LFMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4 ½ ft).

Mark Earley

64. Does a portable or vehicle mounted generator, where the neutral is bonded to the frame and provided with receptacles for supplying external equipment/ installations, require GFCI protection?

The relevant code section is 527.6(A)

Receptacle Outlets. All 125-volt, single-phase, 15-, 20-, and 30-ampere receptacle outlets that are not a part of the permanent wiring of the building or structure and that are in use by personnel shall have ground-fault circuit interrupter protection for personnel. If a receptacle(s) is installed or exists as part of the permanent wiring of the building or structure and is used for temporary electric power, ground-fault circuit-interrupter protection for personnel shall be provided. For the purposes of this section, cord sets or devices incorporating listed ground-fault circuit interrupter protection for personnel identified for portable use shall be permitted.

This was formerly Section 305.6. In the 99 code, there was an exception for receptacles on 2-wire single-phase portable or vehicle-mounted generators rated not more than 5 kw, where the neutral was not bonded to the frame, but this exception was deleted for the 2002 code.

Richard Loyd

65. Can non-plenum rated data/communications wiring be installed in return air plenums running through a large office building? This wiring will be used for installed smoke detectors on the returns to detect smoke and shut down all the returns in case of a fire.

Yes, but these circuits are covered by Article 760 and non-power-limited must comply with 760.30; 300.22 steel raceways, and power-limited must comply with 760.60 either plenum rated or steel raceways.

Arkady Tsisserev

66. If a 2-gang box contains a 277-volt switch and a 120-volt receptacle, a permanently installed barrier must be provided because the voltage between adjacent devices exceeds 300 volts. If the switch has connection terminals of the screw-type and the receptacle has push-in type connections, would this arrangement satisfy the Code and eliminate the need for a barrier?

NO, it would not. Article 404.8(B) of the NEC does not provide any exceptions for elimination of the required barrier solely on a type of connection terminals for devices installed in the enclosure. This is a change in the 2002 NEC where the 1999 Code simply stated "between adjacent switches" and did not include receptacles and other devices

Mike Forister / Tom Garvey

67. Can a ventilated opening transformer be located in an environmental air-space? Section 450.13(B) allows a transformer in hollow spaces provided they are fire-resistant and ventilated and they are less than 600 volts and 50 kVA but does not say they may be located in an environmental air-space or plenum. If yes, why and are there any transformers listed for this use?

Another way to state the question is to ask if a typical metal enclosed, 50kVA, dry type transformer, with ventilation openings, can be installed in the cavity above a drop ceiling where the cavity is used as a return air plenum". The answer is "yes". The applicable sections are 450.13(B) and 300.22(C). Section 300.22(C) covers equipment located in "other spaces used for environmental air". Section 300.22(C)(2) permits "electrical equipment with metal enclosures" in spaces such as

“plenum ceilings”. Remember that the transformer must be accessible and must be properly ventilated.

Transformer not required to be “listed for this particular use”. 1996 NEC code cycle, proposal 3-124, submitted by Jim Pauley. Substantiation was that code language was incorrectly interpreted as requiring that metal enclosures must be listed for the purpose and must have low smoke producing characteristics. CMP-3 agreed with Mr. Pauley that only non-metallic enclosures must be listed for the purpose. However, CMP-3 rejected his proposal and said that the code language, which is the same as the current language, is as clear as a bell and did not need to be changed.

Dave Mercier

68. What is the voltage limitation that can be applied to a network-powered broadband communications systems conductor?

Article 830 of the NEC covers the requirements for network-powered broadband communications system cables. Cable types generally referred to as BHU, BH, BHR, BMU, BM, BMR, BLU, BLX, and BLP. The "H" is for high power, "M" is for medium power, and "L" is for low power. Low power circuits are limited to 100 volt-amperes and Medium power circuits are limited to 150 volts (Section 830.4). High-power network-powered broadband communications circuits are not covered by the NEC.

Chuck Mello

69. Is an aluminum grounding electrode conductor permitted to be encased in concrete to a concrete encased electrode at the bottom of a footing in a building? The conductor is insulated and does not touch the earth where it is connected to the reinforcement steel.

No, Section 250.64(A) would not allow aluminum in a corrosive location such as direct contact with masonry. Even though the conductor would be insulated, the attachment would be exposed to some degree to connect to the electrode that is embedded in the concrete. This bare electrode embedded in the concrete that is in direct contact with the earth, as would be required to qualify the concrete encased electrode, would be considered a corrosive environment for the aluminum. This section also prohibits termination within 18 inches of the earth so either the concrete would have to be more than 18 inches thick on all sides or you would be in violation of this provision also. Section 250.66(B) addressing the size of the grounding electrode conductor to a concrete encased electrode specifies copper only and does not reference a size for aluminum. Reference 250.64(A) and 250.66(B).

John Hudak / Mark Hilbert

70. In an industrial warehouse area we have a room where paint is stored. There are provisions to shake the paint cans but not mixed. The room next to this room is where the paint is mixed. The room is classified as Class I, Division 1. What provisions would need to be done to change the room classification to Class I, Division 2?

Through the exercise of ingenuity in the layout of the system, engineering supervision and history of operation it may be possible to reduce the classification of a Class 1 Division 1 location to a Class 1 Division 2 location. Much of this is

discussed in the FPN to Section 500.5 (A). Ventilation, positive pressure applications and often times locating certain equipment outside the area are just a couple of examples of how a classification can be changed. For example; it is common in effluent pumping applications, covered in NFPA 820, to reduce the classification of the area based on ventilation.

However, it may be possible that this area could already be classified as Class 1 Division 2. Section 500.5 provides information on classifying Class 1 areas. Section 500.5 (B) (2), (1) notes that a Class 1 Division 2 location is one where volatile flammable liquids, gasses or vapors are handled, processed or used but where the liquids, vapors or gasses are normally confined to closed containers or systems where they will escape only under abnormal conditions such as a rupture or breakdown of the container or system. However, If the company had a history of mishaps or there are other abnormal factors it could be necessary to classify the area as Class 1, Division 1.

Rick Maddox

71. Does the *NEC* permit the installation of a 15-ampere rated duplex receptacle on a 20-ampere separate circuit for a microwave oven with a nameplate rating of 13 amperes? The microwave oven is factory equipped with a 15-ampere cord cap.

The receptacle in this question would be required to be a 20-ampere receptacle based on Table 210.21(B) (2) due to the connected load of 13 amperes. If the duplex receptacle in this question served a load of 12 amperes or less than the receptacle would be permitted to be a 15 ampere receptacle per table 210.21(B)(3).

Dave Clements

72. Can the legally required emergency stand-by generator with a single transfer switch supply non required loads such as food freezers, computer outlets and gas furnace controls or is this emergency generator limited to only such things as artificial illumination for safe exiting of a building?

The NBCC and the CEC do not restrict use of other (non-emergency and non-essential) loads, as long as all loads required to be provided with the emergency power are sufficiently supplied by the mandated emergency power supply. Article 701.6 of the *NEC* appears to apply a similar principle