

Commercial Electrical Questions

1. I have a contractor who will be replacing master-satellite style florescent lay-in type fixtures with LED lay-in fixtures. The new fixtures will be part of a listed lighting assembly. Are the cables associated with manufactured wiring systems required to comply with Chapter 3 of the NEC? What about the cables that connect the master to the satellites?

Answer: Yes. No.

Code Reference: NEC 406.7, 410.36

Branch circuit wiring associated with the manufactured wiring system shall be secured and supported in accordance with the applicable cable article for the cable type used with the system.

If the satellite (slave) cables were included as part of the overall manufactured assembly they are covered by the listing of the luminaire and not the NEC. We would not consider it to be branch circuit wiring. NEC 410.36 requires the slave cable(s) to be supported. We permit the framing members of the ceiling to be used to provide that support' In short, the slave cables must be adequately supported but without referring to the prescriptive requirements for Chapter 3 wiring methods.

2. I have a question in regards to the installation of power-limited fire alarm circuits. The occupancy is a Hospice Center. I have been asked if the power limited circuits can be installed in listed fire alarm cable. I was told that this type of low voltage circuit was considered an emergency circuit in hospitals and therefore 517.30(C)(3) would require these circuits be mechanically protected by one of the methods in 517.30(C)(3)(1)-(5). Is conduit required?

Answer: No.

Code Reference: 517.40 through 517.44, 517.80

NEC Section 517.80 can also be added to your list.

There are instances where the IBC is more restrictive for certain types of specialized signaling systems. IBC 909.12.1 as applied to required smoke control systems is one example.

There are the pathway survivability requirements in NFPA 72. Such requirements would typically apply to hospitals and nursing homes as they frequently have a plan for partial evacuation or relocation during a fire or similar emergency. Pathway survivability only applies to cables or cables in conduit that pass through one fire zone in order to provide protection or notification to another.

3. The inspection report states that I need to provide a label that indicates the maximum available short circuit current. What should say? Where do I find this information? Can I put this label on the inside of the door?

Answer: Date and ASSC. Utility. Yes.

Code Reference: NEC 110.24

The available short circuit current is normally obtained from the utility. For example, Page 9 of the "Alliant Energy Electric Service Rules" indicates a 400-A, 120/240 single phase service has a minimum short-circuit current rating of 22,000 A.

The location of the label is not specified by the NEC. On the outside or inside of a hinged cover is acceptable.

4. Do we need a LED emergency light with multiple LED "disks"? What about the driver?

Answer: It depends on the fixture location. No.

Code Reference: 700.16

NEC 700.16, paragraph 2 states "Emergency lighting systems shall be designed and installed such that the failure of any individual lighting element, such as the burning out of a lamp, cannot leave in total darkness any space that requires emergency lighting". The LED is the "lighting element". The battery and LED driver are part of the fixture but are not "lighting elements".

Our response follows the concept expressed in the Code. As long as the failure of an individual LED disk does not leave the space in darkness, the fixture is permitted to have only one disk.

5. We are tapping the busbars in an existing MCC to power a new 200A fused disconnect approximately 20 feet from the MCC. The manufacturer of the MCC is no longer in business. Does the State Code permit this?

Answer: Yes, with conditions.

Code Reference: 240.21(B)(2), SPS 316.110

The tap has to be made in conjunction with the equipment listings and manufacturer's instructions. This type of information or equipment is not often available in the case of older equipment. SPS 316.012 (1) would generally require an engineer to design the connection to the MCC bus. Field evaluation by a NRTL is an acceptable alternative.

240.21(B)(2) limits the tap conductor length to 25 feet. The ampacity of the conductors cannot be less than 1/3 of the rating of the overcurrent device that is protecting the feeder (buss).

6. We recently replaced the light fixtures in an automotive repair garage with cord and plug connected linear high bay light fixtures. Our City electrical inspector said that cord and plug light fixtures can not be above a Class 1 location. Is the State of WI approving installations like this?

Answer: No, with conditions.

Code reference: NEC 511.7(A)(1) SPS 316.511

There are two potential issues. The first is the cord-and-plug connection. NEC 511.7(A)(1) prohibits flexible cords and cables from being used above Class I locations. The floor area of a major repair garage is a Class I location.

The second issue is the repair of CNG vehicles. For this reason, the NEC classifies the area from the ceiling or roof deck above the repair area as Class I Division 2. Ordinary types of high-bay luminaires cannot be used in this zone. SPS 316.511 does amend the requirements in NEC 511.3(C)(1)(a) & 511.3(C)(2) . This amendment provides a means to treat the ceiling area above the repair floor as “unclassified”. Ventilation must be provided from a point not more than 18" from the highest point in the ceiling. The ventilation shall conform to the IMC 502.16.

7. We plan to install 2 transformers above a suspended ceiling. The primary voltage is 480 and the secondary 208Y/120-volts. Each transformer will supply a 200 amp main breaker panel. The secondary conductors are going to be about 20 feet long. Is this ok?

Answer: Probably not.

Code reference: 240.21

NEC 240.21 “Location in Circuit” requires an overcurrent protective device “at the point where the conductors receive their supply”. NEC 240.21(C) allows the omission of overcurrent protection at the secondary of the transformer if the rules in 240.21(C)(1) through (C)(6) are followed. In your case 240.21(C)(6) allows the secondary conductors to be up to 25 ft. long if the conditions in 240.21(C)(6)(1) through (C)(6)(3) are met.

However, NEC 450.13(B) limits a dry-type transformer to 50kVA when installed above of suspended ceiling. At the voltages you are using, the secondary current from a 50 kVA transformer would only be 138 amperes.

8. Can I connect loads to the Life Safety, Critical, and Equipment Branch in a hospital if they are not specifically called out in the Code?

Answer: Generally No

Code Reference: NEC 517.32(A)

NEC 517.32(A) Life Safety Branch, Page 447, “No function other than those listed in 517.32(A) through (H) shall be connected to the life safety branch.”

NEC 517.33(A) Critical Branch, Page 448, "The critical branch of the emergency system shall supply power for task illumination, fixed equipment, selected receptacles, and special power circuits serving the following areas and functions related to patient care: "(9) Additional task illumination, receptacles, and selected power circuits needed for effective hospital operation."

NEC 517.34 Equipment System Connection to Alternate Power Source, page 448. "...such that the equipment described in 517.34 (A) is automatically restored to operation...also provide for the subsequent connection of equipment described in 517.34(B)

Meet most restrictive requirement. For LS and CB, follow 517.30(A) and Article 700. For Equipment branch, follow Article 701.

9. We currently use the 2005 Edition of NFPA 110 for our Emergency and Standby Systems. I thought in the past if a contractor wanted to use the most recent document they could make a request to the Department with their installation meeting such requirements for approval. Is that still the case and if so which edition could they use? There question is with regard to the location and separation of the transfer switches.

Answer: Correct

Code reference: SPS 316.005

The Petition for Variance process provides a means for an owner provide an alternative to a currently rule either in SPS 316 or the standard it adopts through SPS 316.014. The basis for approval is always to establish equivalency to the rule. With a new standard such as the 2014 NEC, often the publically presented reasons for adopting or modifying a NFPA standard form the basis of equivalency.

10. Does 517.30 (C) (3) allow the use of hospital grade MC cable inside walls for critical care circuits? None of the cable is exposed.

Answer: No

Code Reference: NEC 517.30(C)(3)(1)

The critical care circuits are part of the emergency system in a hospital. 517.30(C)(3)(1) only allows nonflexible metal raceways, or type MI cable for emergency branch circuits. 517.30(C)(3)(3)(C) allows listed flexible metal raceways only to be used if fished into existing walls or ceilings not otherwise accessible and not subject to physical damage.

11. Does NEC have any explicit requirements for the location of the overcurrent protection for transformer primaries? The 2500 KVA transformer is fed from switchgear that is located on the other side of a wastewater treatment plant.

Answer: Yes.

Code Reference: 450.14, 450.3

Yes the OCPD can be located remotely from the transformer and used as the disconnecting means. 450.14 permits the disconnecting means to be in sight from the transformer or in a remote location. When the disconnecting means is in a remote location, the disconnecting means shall be capable of being locked in the open (off) position. And the location of the disconnect needs to be marked on the transformer. There is no distance limitation for a remotely located disconnect. In your case, if the OCP for the transformer is lockable, and the location was marked on the transformer, the OCP device would qualify as the required disconnect means.

12. Are tamper-resistant receptacles required throughout a new elementary school? What about on a remodel project in the same type of school?

Answer: Yes, required in most areas of a typical school.

Code Reference: 406.2, 406.14

The new definition is in 406.2, page 270 "Child Care Facility: A building or structure, or portion thereof, for educational, supervisory, or personal care services for more than four children 7 years old or less." The requirement would then apply to any portions of an elementary school used for education or care of children 7 years of age or younger. And yes, it is retroactive but on replacement of the receptacle per 404.4(D)(5).

13. I am installing a service on a commercial building. The utility required a pull box above the main gear. The utility crew told me to cut out the area between the pull box and the main gear and eliminate the nipples I installed between the two enclosures. I told them I didn't think my inspector would allow that. Their response was "don't worry about it, it is our wires going in there and it is our hands that get cut when we pull the wires in. The inspector only inspects after the main. " Is this true?

Answer: No.

Code Reference: SPS 316.002 (1) Scope, 250.92

The pull box is part of the customer owned equipment. The PSC Codes and the NESC also may apply.

Such modifications must be done in conjunction with the manufacturer's instructions and the listing. For example, protection of the wire insulation from sharp edges is important.

The pull box containing the service conductors needs to be bonded per 250.92(A). And one of the methods described in 250.92(B)(1) through (4) shall be used.

14. Can you clarify the process for sizing a wireway?

Answer: Yes

Code Reference: NEC 376.22

The sum of the area of all the conductors, at any point, in a metal wireway may not exceed 20 percent of the area of the wireway. Derating of conductors in a metal wireway starts when there are more than 30 conductors in the wireway.

15. An office building is supplied with a 2000A, 480Y/277-volt service. Can one grounding electrode conductor be used to bond the secondary neutral of the 120/208Y transformers to the steel frame of the building and the water service?

Answer: Yes

Code Reference: 250.30(A)(6)

250.30(A)(6) permits the use of a common grounding electrode conductor for multiple separately derived systems. The GEC would have to meet the requirements of 250.30(A)(6)(a). 3/0 is the required size for a common grounding electrode. The taps get sized per secondary conductor size.

16. Can you review the calculations for derating conductors within raceways located on rooftops?

Answer: Yes

Code Reference: 310.15(A)(2) Exception

Example A: I am planning on installing 4-3/0 copper THWN conductors in a conduit above a roof. I plan on installing the conduit 4" above the roof. Are these 4- 3/0 conductors adequate to carry the calculated load of 180 amperes? I am planning on installing a 200 ampere breaker for these conductors.

Answer: No

Code Reference: NEC 310.15(B)16, NEC 310.15(B)(3)(c), NEC 310.15(B)(2)(a)

Table 310.15(B)(16) gives an ampacity of 200 amps for 3/0 THWN. Table 310.15(B)(3)(c) requires a temperature adder of 30 degrees F for conduit that is 3.5 inches to 12 inches above a roof. Add 30 degrees to the ambient temp of 87 = 117 degrees F. Table 310.15(B)(2)(a) requires a temperature correction factor of .75. $.75 \times 200 = 150$. A 150 amp OCPD device or a larger conductor would have to be used.

Example B: A rooftop AHU is supplied from a panel by 90 total feet of raceway. There is 8 ft of conductor in a circular raceway on the roof before it enters the AHU. Since there is less than 10 percent of the total raceway on the roof, the requirements for derating of rooftop conductors found in 310.15(B)(3)(b) would not apply.

Note: **2014** NEC 310.15(B)(3)(c) has a new exception for Type XHHW-2 insulated conductors. Such conductors are exempt from this additional derating requirement. An approved petition from DSPS would be required to use this exception. .

17. I have a 400 amp 480/277-volt 3-phase service. The main has multiple lugs on the load side of the fused switch. I ran tap consisting of parallel 3/0 Aluminum THHN/THWN to feed a 300 amp fused disconnect to serve house loads. I ran a second tap consisting of #1 Aluminum THHN/THWN to feed a 100 amp commercial tenant space. The length of each tap is over ten but less than 25-feet. The inspector said I had to use a minimum 2/0 Aluminum THHN/THWN for the 100 amp load. What gives?

Answer: 2/0 may be required
Code Reference: 240.21(B)

NEC 240.21(B)(2)(1) requires the tap conductors to have an ampacity of not less than one third of the overcurrent device protecting the feeders. 1 awg aluminum has an ampacity of 100 amperes, so it would not meet this condition. 2/0 aluminum has an ampacity of 135 amperes, and would meet the one third ampacity requirement.

18. Can MC be used to supply a fire alarm panel?

Answer: Yes
Code Reference: 760.41(A), 760.127, SPS 316.700

The supply to a fire alarm panel is not normally an emergency circuit. These sections permit any wiring methods in chapter 1 through 4, if the wiring method is suitable for the location.

NEC 760.121(B), page 655, has some additional requirements:

1. Individual branch circuit

2. FACP OCP permanently identified "Fire Alarm Circuit".
3. FACP OCP accessible only to qualified personnel
4. FACP OCP has red identification.
5. Branch circuit not supplied through GFCI or AFCI

19. We are installing a 480-volt, 3-phase service with a rating of 1200-amps. Ground fault protection was installed; I conducted a test by pressing the test button on the breaker. The inspector said 230.95(C) requires additional tests. What do I need to do, push the test button fast, five times in a row while standing on my head or what? I need this energized ASAP.

Answer: Follow manufacturers instructions

Code Reference: 230.95(C)

230.95(C) requires the test to be conducted in accordance with the manufacturer's instructions. This test is more extensive than pressing the test button on the breaker. Typical instruction stipulate:

1. Testing for Neutral to Grounds connections downstream of the sensor
2. Testing neutral insulation resistance
3. Primary injection testing
4. Testing reduced control voltage tripping capabilities

Reference: Manufacturer's instructions. Good overview of the topic in EC&M <http://ecmweb.com/ops-amp-maintenance/performance-testing-ground-fault-protective-devices?eid=forward>

20. The State Code requires emergency lighting in hospitals, nursing facilities and CBRF's. Are these required to have electrical inspection? Who is requiring this?

Answer: Yes. DHS.

Code Reference: SPS 316.002(1)

The DSPS does not require inspections of electrical installations in other than new one and two family dwelling. Local municipalities can require permits for, and inspections of, this type of work.

DHS does require electrical plan review and inspection and prior to licensing. Approval of the selective coordination study is also required for most facilities of this type. Contact DSPS electrical staff for inspection if there is no local electrical inspector. The absence of requirements for permitting and inspection does not relieve the installer of their obligation to follow all applicable codes, including SPS 316 and the NEC.

21. Do VAV controllers require working clearance and dedicated space as they are serviced while energized? Does this mean we need a light installed?

Answer: Working clearance-Yes. Dedicated space-No. Light-no.

Code Reference: 110.26(D)

Working clearance is required based on troubleshooting instructions. Illumination is required for working spaces about service equipment, switchboards, panelboards, or motor control centers installed indoors. The VAV is not considered a motor control center, and illumination would not be required.

22. I have a roof top unit (RTU) which has a short-circuit current rating of 5000A. The plans indicate the electrical service has 28,000 amps of available fault current. The available fault current has been calculated at 11,000 amps at the RTU by the design Engineer. What are my options to reduce this available fault current to 5000 amps at the RTU?

Answer: Engineered solution.

Code Reference: 110.9

You need an engineered solution. A lower fault current at the RTU can be achieved by adding impedance to the circuit. A transformer can be added in the circuit to add impedance, resulting in a lower fault current at the RTU.

Manufacturers of OCP devices may also be able to assist by specifying current limiting fuses or breakers that may be able to provide proper protection.

23. Are their requirements for separating EPSS equipment from normal power equipment?

Answer: Yes

Code Reference: SPS 316.700 and NFPA 110 7.2.2 & NEC 700

SPS 316.700 has requirements for separation of a generator from a building. NFPA 110, 2005 Edition, is adopted in Wisconsin by the Commercial Building Code. A separation of level 1 emergency power supply system (EPSS) from the source of power is required by NFPA 110, 7.2.2 when the source of power is over 150 volts to ground and 1000 amperes or more. A level 1 EPSS can be compared to an NEC Article 700 Emergency System. An EPSS is defined as a complete functioning source of electric (emergency) power of the required capacity and quality, coupled to a system of conductors, disconnecting means and overcurrent protective devices, transfer switches, and all control, supervisory, and support devices up to and including the load terminals of the transfer equipment.

24. I have two panels mounted side-by-side. A nipple connects the two. Can I run branch circuits that originate in one panel board through the gutter space in the other panelboard? I don't ever recall this being an issue in the past.

Answer: Yes.

Code Reference: NEC 312.8

NEC 312.8 allows the cabinet for a panelboard to be used as a raceway, junction box, pull box or auxiliary gutter.

25. Would you please advise me of whether or not the 50A circuit breaker on the primary of a delta-wye transformer is sufficient protection for the wiring between the transformer secondary and a power panel located in a motor control center? The MCC also houses the 50A breaker in a different section.

Answer: No

Code Reference: NEC 240.21(C)

The 50-ampere breaker on the primary cannot also be considered to protect the secondary conductors or the secondary panel. The Code does not consider the primary protective device of a delta-wye transformer as protecting the secondary conductors. Correct the design by following one of the options in 240.21(C).

Two common options are 240.21(C)(1) and 240.21(C)(6). They are often referred to as the "10-foot" and "25-foot" tap rules. The 25-foot rule limits the secondary conductor length to 25-feet and requires the secondary conductors terminate in a "main" circuit breaker or set of fuses.

26. We have been red tagged by an inspector for working clearances in front of an air conditioner disconnect. We have mounted a pull-out disconnect for each AC unit in between the two units. The local inspector has stated that the minimum working clearance of 30" x 36" applies to air conditioner disconnects. Is this correct?

Answer: No.

Code Reference: NEC 110.26(A)

NEC 110.26(A) applies to equipment containing overloads or overcurrent devices. Typical examples are fused switches or circuit breakers. It is generally not applied to a disconnect switch or pull-out type disconnect for a typical AC compressor unit.

27. We have a completed 600,000 SF dry storage warehouse. The specifications call for hook-cord-and-plug connection. The AHJ said the installation did not pass the outlet was

not directly above the fixture. We have literally millions of square feet of warehouse utilizing this installation method. May we please get your input on the situation?

Answer: Yes

Code Reference: NEC 410.62(C)(1)(1)

The NEC 410.30(C)(1)(1) requires the fixture to be located directly below the outlet. The intent is to allow the individual servicing the fixture to unplug it without moving their lift. Then the entire assembly can be serviced at floor level. It is acceptable for any receptacle to be located within a 3-foot radius of the chain supporting the fixture as meeting the intent of this requirement.

28. We have a project with an electrical room with large electrical equipment. The room will have a double door. One leaf of the double door is designed to be a fixed door. Do both leaves of the door have to have panic hardware?

Answer: No.

Code Reference: NEC 110.26(C)(2)

NEC 110.26(C) (3) requires personnel door intended for egress from and with 25-feet from the working space to have "panic hardware". Based upon your description, the operable leaf of the double door must meet this requirement. The fixed portion is exempt as long as it is fixed in place and is not equipped with a knob, lever, or similar hardware.

29. We need to run a 24-volt AC circuit through a wood wall using regular old zip cord. Since it is low voltage can we need to put the cord in conduit?

Answer: No. No.

Code Reference: NEC 400.8(1)&(2)

A zip cord is a nickname for a type of flexible cord. NEC 400.8 (1) does not allow flexible cord to be used as a substitute for fixed wiring of a structure. 400.8 (2) also does not allow flexible cord to be run through holes in walls. With the information you provided this is not a proper wiring method for the installation.

30. We would like to supply fixed-type office partitions with multi-wire branch circuits. Do the phase legs have to be opened simultaneously? Can that be done by a handle tie instead of a multi-pole breaker?

Answer: Yes. Yes.

Code Reference: NEC 605.NEC 210.4(B), 310.4

NEC 210.4 (B) requires a means to disconnect all ungrounded conductors simultaneously from a multi-wire branch circuit. An approved handle tie would be acceptable to accomplish this.

Note: Freestanding-type partitions are not permitted to be supplied by multi-wire branch circuits per 605.8(D).

31. Does NEC 680.41 apply to treadmill-type therapy pools?

Answer: Yes

Code Reference: NEC 680.10, NEC 680.26 (B)(5)

The NEC applies to all type of therapy pools. NEC 680.41 requires an emergency shut-off control for hot tubs and spas.

Generally, a spa or hot tub is not designed or intended to have its contents drained or discharged after each use."

The emergency shut-off control is required to shut off the motor(s) that provide power to the recirculation and system and jet system.

32. The electrician is pulling a redundant ground in the examining room of an optometrist. She asked if she would have to use hospital grade receptacles and switches in those areas. Are they required?

Answer: No with conditions.

Code Reference: NEC 517.19

This is a tricky issue. You are correct that NEC 517 does not require hospital grade receptacle for exam rooms in clinics. However, listed medical equipment is often used in clinics and other non-hospital facilities. Cord-and-plug connected equipment will require connection to a listed hospital grade receptacle. The equipment has a tag on the cord cap to indicate this requirement.

33. Is there a minimum or maximum height off the floor for a panelboard?

Answer: Panel-No. Breakers-Yes

Code Reference: NEC 404.8(A), SPS 316.009

According to NEC 404.8(A) switches and circuit breakers in a service panel should be readily accessible. "They shall be installed such that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 6' 7" above the floor or working platform."

If required to be accessible, then 48-inches is the maximum height and 15-inches is the minimum.

34. Are we permitted to circuit televisions in patient rooms connect to critical branch power? This frees up the nursing staff from having to address trivial questions on the outage and permits them to concentrate on patient care.

Answer: Yes if permitted by health care administrator.

Code Reference: NEC 517.33(A)(9) Loads on Critical Branch

NEC 517.33(A)(9) allows for additional loads such as task illumination, receptacles, and selected power circuits needed for effective hospital operation. It is the right as well as the obligation of the health care administrator to determine what loads are required for "effective hospital operation".

35. Can you use blue plastic nail-on boxes in a fire wall, or do they need to be metal?

Answer: Both may be acceptable.

Code Reference: NEC 300.21

A non-metallic box has to be marked with the hourly rating if used in a fire-rated wall or ceiling assembly. Many non metallic boxes are approved for use in up to 2 HR rated walls. Look for the "2HR" and "W" as evidence that the box is approved for this use. It may have a "C" marked in the box to indicate it can be used in fire-rated ceilings.

36. When selecting rooftop units for a big building (60,000 square feet) is there a code requirement for each individual rooftop unit to be provided with a service outlet?

Answer: No.

Code Reference: NEC 210.63

The NEC requirement is 210.63. The 125-volt receptacle for use in servicing the equipment must be located within 25-feet of the unit and on the same roof level. The receptacle outlet must be GFCI protected. The enclosure and "nonattended-use" cover must be suitable for use in a wet location.

37. The inspector is requiring that we put bushings on all ENT that is installed in the steel studded walls. Are they required?

Answer: No

Code Reference: NEC 300.4(B)(1)

Bushings are not required where ENT is pulled through metal studs. Article NEC 300.4(B)(1) applies only to NM cable. Article 300.4(B)(2) does apply to ENT and NM cable. This section requires steel plates where nails or screws are judged likely to penetrate the ENT or NM cable.

38. Is it permissible to run a grounding electrode conductor to a grounding electrode through raceways that contain branch or feeder conductors?

Answer: Yes

Code Reference: NEC 250.64(E)

It is permissible to run the grounding electrode conductor through the same raceway as other conductors. Metal raceways and boxes that contain a grounding electrode conductor have to be bonded to meet NEC 250.64(E).

39. Some municipality previously enacted electrical code ordinances that are more restrictive than the NEC. One example is the prohibition of Type-MC cable as a wiring method for commercial buildings. Are such local rules still permitted?

Answer: Yes

Code Reference: Ss 101.02(7r); 2013 WI Act 270

Municipalities may enact or enforce an ordinance for "commercial" occupancies that is more restrictive than the applicable state rules.

40. We are required to provide 2 hour protection for a feeder to a fire pump. The product is called "Lifeline" cable. Is it permitted to be installed in EMT? Can only Allied Tube and Raco brands EMT and fittings be used? Can an AHJ permit another manufacturer's EMT?

Answer: Yes. Yes. No.

Code Reference: SPS 316.110.

You cannot use another manufacturer's products with Lifeline Cable at this time. This topic has generated a lot of national discussion. The product was "delisted" by UL on 9/12/13 for several reasons. When the new listing appeared, it was specific to the manufacturer of the EMT and fittings. That was the way the product was tested and approved and that is the only way it can be installed under SPS 316.110.

41. I have a situation with an existing fire pump. The fire pump was installed sometime around 1994-1996. The fire pump disconnect is tapped ahead of the main. The tap box and disconnect are in the same electrical room. The wiring method is not 2 hour rated. There is no alternate power source for the pump. Is the pump supply "grandfathered"?

Answer: Unlikely

Code Reference: 1996 NEC & NFPA 20

Specific electrical requirements for fire pumps first appeared in the NEC in the 1996 edition. The requirements were not new though. Prior to the 1996 NEC, the installation requirements were incorporated into NFPA 20. The requirements have essentially remained the same. A tap ahead of the main was permitted by 1996 NEC Section 695-3(b). Multiple power sources were not mandated by the NEC. NEC 695-4(a) permitted a utility service to supply power as long as the source was "reliable".

The requirements and exceptions for power wiring were similar in that a 1 HR system was required for conductors on the "load side of the disconnecting means". And 695-8 Exception No 2 exempted that portion of the fire pump supply conductors located in the pump room or the electrical "switchgear room in which they originate."

42. Is there a requirement to locate an emergency generator a certain distance from a building?

Answer: Yes, with exceptions.

Code Reference: SPS 316.700, SPS 316.701

If the generator supplies emergency or legally required standby systems the generator cannot be located closer than 10 feet from any combustible portion of a Type III, IV, or V building.

43. Our designer selected non IC rated fluorescent lights for the hallways in a hotel we are working on. Several of the lights ended up under a portion for the building with an attic space that must be insulated. We built drywall boxes around the lights. The drywall box is over 3 1/2" away from any side of the recessed housing. The area above is well insulated. Is this type of installed permitted for a non-IC recessed luminaire?

Answer: No.

Code Reference: SPS 316.110 UL Guide Information, Fluorescent Recessed Luminaires (IEVV)

The Guide information from the UL White book for non-IC fixtures indicates: "Recessed luminaires, except those identified as Type IC or for use in concrete, are intended to be installed in an uninsulated or insulated ceiling (or wall), with all insulation kept a minimum distance of 3 in from the sides of the luminaire and not placed over the luminaire such that it would entrap the heat produced by the luminaire."

44. Who determines the fault current at a site? The inspector says the equipment must be adequate for the fault current throughout the system. How is that figured out?

Answer: Engineering Calculations.

Code Reference: 110.9

The utility will provide the available fault current at the service point. An engineer can calculate the fault current throughout the system. 110.9 requires equipment to have an interrupting rating not less than the available current at the line terminals of the equipment.

45. I have designed a hospital that contains a swimming pool. The pool can be used by employees but will be used in the treatment programs for the patients. For that reason the pool is equipped with several emergency telephones and nurse call stations. These are "low voltage". Do the separation requirements of Article 680.22 apply?

Answer: Yes.

Code reference: 680.22(D)

NEC 680.22(D) indicates "Other outlets shall not be less than 3.0 m (10 ft.) from the inside walls of the pool. Measurements shall be determined in accordance with 680.22(A)(5)."

The informational note under NEC 680.22(D) indicates "other outlets may include but are not limited to remote-control, signaling, fire alarm, and communications circuits."

The nurse call stations are "switching devices" and would need to meet the requirements of 680.22(D). They would need to be at least 5 ft. from the inside walls of the pool, unless the listing of the switch allows the switch to be located closer than 5 ft.

Equipment specifically listed for use in conjunction with swimming pools is always an alternative. This type of "low voltage" equipment is constructed and has been tested to provide increased protection against shock.

46. I see a lot of older installations that do not have a 36" working depth. These are 120/240 volt or 120/208 volt systems. Was there a time when 30" was the permitted depth of the working depth?

Answer: Yes.

Code Reference: SPS 316.003 (3)

- No change in the working clearance requirements of NEC 110.26 has been made since the 1978 NEC edition. The language has remained the same.
- Prior to the 1978 NEC the following working clearances were required:
Condition 1: 2 ½' from 0-600 Volts to ground
Condition 2: 2 ½' from 0-150 Volts to ground, 3 ½' for 151-600 Volts to ground
Condition 3: 3' from 0-150 volts to ground, 4' for 151-600 Volts to Ground
- An exception was also included in the requirements of pre. 1987 NEC 110.26 editions that no longer exists today. The Exception read: *By Special Permission smaller spaces*

may be permitted where it is judged that the particular arrangement of the installation will provide adequate accessibility.

- “Special permission” Language in NEC 110.26 Exception was removed in the 1987 NEC.

47. Am I required to install the terminal strip for intersystem bonding for commercial services and feeder panels for additional buildings?

Answer: Yes, if one of the other systems is to be installed.

Code Reference: NEC 250.94

The terminal strip is required for any additional building has telephone or other types of systems that require bonding to the electrode system. NEC 250.94 requires the installation for intersystem bonding in the following locations. At the service or metering equipment of the building and at the disconnecting means of each additional building or structure.

48. Am I required to group the conductors of multi-wire branch circuits in enclosures?

Answer: Yes

Code Reference: NEC 210.4(B)

NEC 210.4(B) requires where more than one neutral conductor associated with different circuits is in an enclosure, grounded conductor of each circuit shall be identified or grouped to correspond with the ungrounded circuit conductor wire, markers, cable ties, or similar means in at least one location within the enclosure.

If the grouping is obvious then a tie strap or tape to call out the group is not required.

49. A stand-by generator has a 480 volt, 3 phase, 4-wire output. The feeder from the generator disconnect to a 3 pole transfer switch has both a Neutral and an Equipment Grounding Conductor. Is the neutral required to be bonded to the generator frame? Is a grounding electrode conductor connection required to the generator metal enclosure?

Answer: No. Yes.

Code Reference: NEC 250.30

This generator is not a separately derived system because the neutral conductor is common to both systems. You indicated that it is a 3-phase, four-wire system but only the ungrounded conductors are switched by the transfer switch. Therefore the generator is not a separately derived system.

A grounding electrode connection is required if the generator is separately derived. If it is a wye configuration, the center point of the wye would have to be grounded per 250.30(A)(1). This connection is permitted at either the generator or the first disconnect.

50. When can metal flexible conduit be used as an equipment grounding conductor?

Answer: There are several Restrictions

Code Reference: NEC 250.118(5), 250.102(E), & 250.122

The raceway terminates in listed fittings, the conductors are protected by an overcurrent device rated 20 amps or less, the combined length of the flexible conduit in the same ground fault path does not exceed 6 feet.

A wire-type equipment grounding conductor is always required in installations where flexibility is needed to minimize vibration from equipment or to provide flexibility for equipment that requires movement after installation.

51. Are emergency generators required to be tested after installation? Are electrical inspectors required to witness this test? How do we do this and what is required?

Answer: Yes. Yes. Not specified by the NEC.

Code Reference: 700.3

Unlike fire alarm system, the test procedure for emergency systems is not specified by the NEC. Typically the emergency system is tested at some time under "Full Load" conditions. If the same emergency source also supplies optional loads through a different transfer switch, the ability of the generator to both start and run under while fully loaded conditions should be demonstrated.

NEC 700.3(D) does require a written record be kept. It does not specify the frequency of the testing but merely requires that the AHJ witness a test of the complete system "periodically" after initial installation.

52. I am wiring a 2 story apartment building. I installed the receptacles in the second floor apartments at 12" AFF. The inspector said they needed to be 15" minimum above the floor. There is no elevator so this is not "accessible" to a person in a wheel chair. We did place the receptacles in the first floor apartments 15" above the floor. Is she making this up?

Answer: No.

Code Reference: IBC and ANSI A117.1

The inspector may be correct. Check with the building code official as to what areas need to meet ADA requirements.

53. Is a sign disconnect permitted to be located where it is out-of-sight from the sign? The sign I am inspecting has LED letters on the outside of the building but the power supplies are inside.

Answer: No.

Code Reference: 600.6, 600.6(A)(1)&(2)

A disconnect shall open all ungrounded conductors that supply the sign. It shall also be located within sight of the sign it controls. If the disconnecting means is not within sight of all of the sections that may be energized by the disconnecting means, the disconnect shall be capable of being locked in the open position. The means for locking or adding a lock must remain in place whether the lock is installed or not.

54. Can I make my own contactor assembly in a UL listed enclosure? All wiring is 120 volts including the coils.

Answer: Yes

Code Reference: SPS 316.012, NEC 409

If required by the AHJ, the assembly would have to be evaluated by a PE or NRTL.

55. Do I have to install putty pads on metal boxes installed in a 2 hour rated wall? The boxes are mounted with at least 24-inches of separation between boxes on opposite sides of the wall.

Answer: No

Code Reference: 300.21, IBC 713.3.2, ANSI/UL 263 Wall Opening Protective Materials

If the boxes are at least 24 inches apart, no firestopping is needed. If not, use of a listed wall-opening protective material will allow a reduced spacing or use in walls of staggered or offset stud construction.

56. I had to run a conduit through a 2-hour rated wall. I put fire stop caulk around the opening. The inspector asked me what system was used. I said the red caulk like we always do. He said he wanted a system number. What is a system number?

Answer: Method of Identification for Listed Firestop Systems

Code Reference: IBC 713.3.1.2, White Book Through-Penetration Firestop Systems (XHEZ)

The caulk that was used shall be used according to the manufacturer's instructions to create a fire rated system. Fire stop systems are specific constructions consisting of a

wall or floor assembly, a penetrating item passing through an opening in the wall or floor assembly, and the materials designed to prevent the spread of fire. The NRTL has tested the assembly and given the system number or similar specific identification.

57. I ran a low voltage cable without a metallic shield in a PVC conduit. The cable was used to provide information from a control panel in the restaurant to a reader board out near the road. Do I need a primary protector at the building? Does the cable have to be suitable for a wet location?

Answer: Yes. No.

Code Reference: 800.47, 800.50, 800.90

A primary protector is a device that protects the circuit from transient voltages such as lightning. It is required on inter-building communication circuits. They can be found at electrical supply houses. The cable does not have to be of a type suitable for wet locations. 800.47 exempts communications cables from the wet location requirements of 310.10(C).

58. Do all types of flexible cords have to be listed to UL 62?

Answer: No.

Code Reference: 400.4, SPS 316

Listing to UL 62 is one, but not the only, method of approval. Both NEC 400.4 as well as SPS 316.102 provided alternative paths for approval.

(Note to presenter: Examples are cords used for shore power or mines with alternate markings)

59. We ran Type MC Cable to lights, outlets, fans and other equipment within the cavity of a suspended ceiling. Drywall was secured to the grid of this type of "hard ceiling". The inspector said we had to strap the MC Cable within a foot of the equipment. The code says we can run 6 feet. Is the inspector correct?

Answer: Yes.

Code Reference: 330.30(D)

NEC 330.30(D)(2) permits MC Cable to be unsupported in lengths of up to 6 feet where "the cable and point of connection are within an accessible ceiling. A typical "hard ceiling" is inaccessible. If access to the cavity can be gained through an access hatch or similar, the AHJ may judge the cavity to be accessible.

60. We are installing the wiring for a CNG station dispensing station. A post used for supporting the canopy is located next to the dispenser. A GFCI protected receptacle is mounted on the post and approximately 24-inches horizontally from the dispenser and 24 inches above grade. Does this circuit and equipment need to be treated as a Class 1 area?

Answer: Yes.

Code Reference: Table 514.3(B)(2)

The table defines the area within 5 feet in all directions from the dispenser enclosure as a Class I Division 2 location. This includes the area above the dispenser enclosure.

61. We are building an addition to an industrial building. The construction is walls of masonry block. Steel posts, trusses, and steel decking make up the roof construction. The electrical supplies are feeder circuits are run from the existing distribution equipment. Are both steel frames required to be bonded together?

Answer: Yes

Code Reference: 250.104(C), 250.66

NEC 250.102 (C) requires steel used as the structural frame of a building be bonded to the electrical service enclosure. Bonding the structural steel in both building together is one method of accomplishing this. The size of the bonding jumper is based upon the size of the ungrounded service conductors using Table 250.66.

62. We intended to mount sconce-type fixtures 6 feet above finish floor in an office building. The manufacturer indicated the sconces are ADA compliant at this height. Does this building need to meet ADA requirements?

Answer: Yes.

Code Reference: ANSI 307.2

The ADAAG regulations require objects with leading edges shall protrude no more than 4" maximum into the circulation path. This applies where the object, such as a sconce is mounted on a wall at a height between 27" and 80" above floor.

63. Does the Code permit a single breaker in the generator to supply both critical loads and standard back up power as long as the generator was not larger than 150 kW?

Answer: No.

Code reference: 517.13(B)(4)

You might be thinking of NEC 517.30(B)(4). This section would permit a single feeder and single transfer switch to supply essential system loads in a small hospital or nursing home. The condition is the essential loads total must be 150kVA or less. NEC 517.41(B) permits a similar arrangement for nursing homes. In both cases, only essential system loads may be connected to this system. Such loads are listed in Article 517.

In no case may optional power loads be connected to the same feeder and transfer switch as essential system loads, and this exception only applies to health care facilities.

64. Am I permitted to splice tap conductors?

Answer: Yes.

Code Reference: 110.14, 240.21

Tap length stops where overcurrent protection per 240.21(B) is applied.

Example: Tap from a distribution equipment where the utility prohibits “cold-sequence” metering. Tap starts at the tap box on the distribution equipment, extends through the metering equipment, and end at the first overcurrent device.

65. Is it permissible to install conductors in a “pit” under open bottom switchgear? I concerned about the water and the critters.

Answer: Yes.

Code Reference: 110.28

Switchgear located outside would have to be rated for conditions expected during use such as wind-blown water, sleet, and snow. Enclosures types shall be selected accordingly in order to comply with NEC 110.28. It is unlikely that open bottomed switchgear would have the required markings.

66. Does a GFCI receptacle installed for a drinking fountain (bubbler) need to be readily accessible?

Answer: No.

Code Reference: NEC 422.52, 210.8

All GFCI devices need to be in an accessible location for testing purposes. The requirement for ready access applies only to those locations listed in 210.8. GFCI protection for “Electric Drinking Fountains” is required for 422.52. A GFCI receptacle that is located under the drinking fountain would be considered readily accessible. A

GFCI device located within the enclosure that can be accessed after installation for testing meets the current requirements.

67. Under-cabinet luminaires are specified for a patient care room. We have the additional insulated 12 AWG equipment grounding conductor run to each luminaire. However, these lights have plastic termination boxes. Then a rubber cord is run to the lights. Does the luminaire need two equipment grounds?

Answer: No.

Code Reference: 517.13(B)(1)(3)

The conductive surfaces must be directly connected to an EGC that is installed with the phase conductors.

Based on your description, it is doubtful that these luminaires are listed for use in patient care areas. Cords are not permitted as a wiring method for such equipment by NEC 517.13(A). An alternative would be specific listing as "Medical Equipment". The UL White Book covers such equipment under Category PIDF.

68. We are wiring the procedure rooms in a dentist's office. The plans call for receptacles on the end of a moveable tray that holds the tools of pain. This receptacle can be located within 6 feet of a sink if the tray is positioned right. Is GFCI protection required for these receptacles?

Answer: Yes

Code Reference: 210.8(B)(5)

All receptacles installed within 6 feet of the outside edge of a sink need to be GFCI protected.

69. A new CBRF has a sprinkler system installed to meet NFPA 13D. The water supply for the system is pumped from storage tanks in the basement. The pump is black not red and the pump controller is a listed 240-volt pressure switch in a red box. What code requirements apply to this pump?

Answer: NFPA 13D. Not Article 695.

Code reference: UL QZKE, NFPA 13D

Based upon the information provided, the pump systems are probably required only to meet NFPA 13D. If this is the case, Article 695 does not apply and there is no basis for requiring a standby source of power per the IBC or NEC.

70. A 4' LED retrofit tube is made to be installed connecting the branch circuit conductors to one of the fluorescent sockets. The new operating voltage is 120-volts. The conductors from the existing socket are 22 AWG. Is this code compliant?

Answer: No.

Code Reference: NEC 402.6, 240.5(B)(2)

The minimum size of fixture wires is 18 AWG. The tube must be listed as a LED retrofit kit/assembly. Follow the installation instructions of the LED tube manufacturer.

71. We are installing a transformer vault in a large apartment building. The intake air for ventilation will come from the underground parking garage. It will be exhausted via a concrete area well that eventually opens into the sidewalk. There are large metal grates over the both the intake and exhaust openings. The inspector says we can't do this. Is he correct?

Answer: Yes.

Code Reference: SPS 314.450(2)

SPS 314.450 (2) requires vaults vented directly to exterior without flue or duct. An areaway is considered a flue or duct. The vault may not be required if less-flammable liquid used and the listing is followed. Another alternative is developing a risk analysis, receiving buy-in from the local fire and building officials, and applying for a petition for variance from DSPS.

72. Are drop cords allowed in operating rooms?

Answer: Yes.

Code Reference: NEC 517.61(C)(1) Exception, 517.71(A) Exception

The use is permitted through 517.61 (C), Exception, for anesthetizing locations such as OR's. Typical gasses currently used for anesthesia are not considered "flammable vapors".

73. Do we consider communications, security and door control/access systems as “electrical wiring” for purposes of applying the Code?

Answer: Yes.

Code Reference: SPS 361.20 (6)

Yes- such systems are considered "electrical systems". All the systems noted in the question fall under the scope of SPS 316 and the NEC.

74. I thought telephone wire in elevator machine rooms had to be in conduit to be considered "protected". An elevator inspector has been seeing telephone wire in flexible ribbed plastic sheathing and in rigid plastic stick-on wire-mold type material. Are those acceptable?

Answer: Yes.

Code Reference: 620.21(A)(3)(c), 90.3, 800.3,800.24

There are several different ways that “low voltage” and communication conductors can be installed without an additional raceway.

One is the exception for short lengths of "low-voltage" control cables as permitted by 620.21(A)(3)(c). The physical protection could easily be justified by the location (within a locked room) and the routing of the cable. Physical protection is often afforded by the way the cable is routed. A cable installed such that it follows the contours of the surface and is secured to the surface is considered "protected" from ordinary damage.

75. Where I have a question is in regards to the wording in IECC 505.2.2.2 Automatic Lighting Shut Off. It says "Buildings larger than 5000 SQ FT shall be equipped with automatic control devices to shut of lighting in those areas. Do individual offices require some type of “shut-off” control?

Answer: Yes.

Code Reference: IECC 505.2.2, SPS 363.0505

Several types of lighting controls are required in commercial buildings. IECC 505.2.1 requires manual lighting controls that are accessible to the occupants. This section applies to individual areas enclosed by walls or floor to ceiling partitions.

IECC 505.2.2.1 applies to the same type of spaces. It requires controls to uniformly reduce the lighting in a reasonable uniform manner.

There are some additional Wisconsin requirements in SPS 363.0505