



2021 Winter Update Commercial Electrical Questions and Answers

Question 1

"A contractor wants to replace an emergency generator that serves a 40 Unit Senior Apartment building. The current generator location is 8'-0" from a utility transformer and 5'-0" from the building wall. The walls of the building are type V-B (wood) construction. I plan on installing a barrier between the generator and the utility transformer. How much can distances be reduced with a barrier? Is the barrier required to have an hourly rating? And any issues with the generator being 5' from the building wall? Please advise."

Answer

State of WI. Admirative code SPS 316.700(2) assists with understanding. Reads: This is a department rule in addition to the requirements in 2017 NEC 700.12 (intro.):The enclosure of the alternate source of power located outdoors for emergency systems shall be located at least 10 feet horizontally from any combustible portion of a Type III, Type IV, or Type V building and at least 20 feet from an outdoor electrical transformer, electrical metering, service equipment, or normal power distribution equipment. These dimensions may be reduced where a noncombustible barrier is installed that extends at least 3 feet beyond each side of the alternate power source and transformer. The height of the barrier shall be at least one foot above the top of the transformer, electrical metering, service equipment, or alternate power source, whichever is higher.

SPS 316.700(2) requires only a noncombustible barrier be installed between the generator, transformer, and building wall. The barrier is not required to have an hourly rating per code. This noncombustible barrier however must comply with NEC 700.12 Reads: Equipment shall be designed and located to minimize the hazards that might cause complete failure due to flooding, fires, icing, and vandalism. Getting the design professional & owner involved is encouraged in making a proper decision. In addition, the manufacture installation instructions of the generator shall be used and complied with per NEC 110.3(B).

Question 2

"We are currently bidding a project with rows of 8' LED light fixtures. In each row there is emergency light fixtures that are controlled from an inverter. I understand that the emergency wiring and normal lighting circuits cannot be in the same raceway. Are they allowed together in the fixtures if we fed the row from one end? If not permitted, will the normal power circuit be allowed to run through the emergency fixture on to the next normal light fixture?"

Answer

2017 NEC Section 700.10(B)(2) requires that wiring from an emergency source to the emergency load be kept entirely independent of all other wiring and equipment wiring except for wiring supplied from two sources in exit or emergency luminaires. In order to comply with NEC 700.10(B)(2), the luminaires connected to the emergency lighting circuit (wired in a continuous row with other luminaires not supplied by this emergency panel), would need the emergency feed to exit the row and re-enter at the next designated emergency luminaire (separate conduit run), or the emergency feed would need to use a separate channel from the normal power conductors within the continuous row (with separate conduit entries / knockouts to accommodate the separation). There should be either a fixed barrier or a similar means of securing these separate circuits from intermixing within the non-emergency luminaire.

Question 3

"I have a led power supply that has dimming capabilities. The dimming leads are 0 - 10v class 2 wiring. The line voltage supply is 100 - 382v class 1 wiring. The switch that I have is a Lutron DVSTV-IV. It requires class one voltage to switch light on and off but uses 0-10v class 2 for the dimming portion. Since class 1 and class 2 wiring is integral to the switch it makes it impossible to separate the 2 classes. The manufacturer of the power supply says that if I use THHN conductors I can install them in the same conduit. I guess I need clarification on this."

Answer

The following will assist:

See 725.130 Exception No. 2. This exception permits Class 2 and Class 3 circuits to be reclassified and installed as Class 1 circuits if the Class 2 and Class 3 markings required in 725.124 are eliminated and the entire circuit is installed using the wiring methods and materials in accordance with Part II, Class 1 circuits. The Fine Print Note gives some additional guidance: "FPN: Class 2 and Class 3 circuits reclassified and installed as Class 1 circuits are no longer Class 2 or Class 3 circuits, regardless of the continued connection to a Class 2 or Class 3 power source."

Additional requirements that assist are located in NEC 725.

Separation from power conductors

Class 2 and Class 3 circuit conductors [725.136] Reads:

Must not be placed in any enclosure, raceway, or cable with conductors of electric light, power, and Class 1 circuits, except as permitted in 725.136(B) through (J). [725.136(A)]

Must not be installed with conductors of electric light, power or Class 1 conductors unless separated by a barrier [725.136(B)].

Can be mixed with electric light, power, and Class 1 conductors in enclosures if these other conductors are introduced solely for connection to the same equipment as the Class 2 or Class 3 circuits, and a minimum ¼ in. separation is maintained from the Class 2 or Class 3 conductors [725.136(D)].

Must be separated by at least 2 in. from insulated conductors of electric light, power, and Class 1 circuits, unless electrical power and Class 1 circuit conductors are in a raceway or metal-sheathed or nonmetallic-sheathed cable, or the Class 2 and Class 3 circuit conductors are in a raceway or metal-sheathed or nonmetallic-sheathed cable [725.136(I)].

Avoiding problems

The biggest threat to Class 2 and Class 3 circuits is voltage induced from wiring such as that supplying conductors of electric light, power, and Class 1 circuits. You need to keep these separate.

Question 4

"I have been cited on two commercial jobs recently for not having Tamper Resistant Receptacles installed. (1) job was a dental clinic, and the other was a small outpatient clinic/medical facility. I do not believe I need to install tamper resistant receptacles in these commercial occupancy waiting areas etc. Was is not the intent of the NEC to only require these in homes? I will need to change about 50+ receptacles if required."

Answer

The inspector is correct. 2017 NEC 406.12 requires some commercial buildings/structures to now have tamper-resistant receptacles installed. NEC 406.12 Reads:

Tamper-Resistant Receptacles. All 15- and 20-ampere, 125- and 250-volt nonlocking-type receptacles in the areas specified in 406.12(1) through (7) shall be listed tamper resistant receptacles.

(1) Dwelling units in all areas specified in 210.52 and 550.13

(2) Guest rooms and guest suites of hotels and motels

(3) Childcare facilities

(4) Preschools and elementary education facilities

(5) Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities

(6) Subset of assembly occupancies described in 518.2 to include places of waiting transportation, gymnasiums, skating rinks, and auditoriums

(7) Dormitories

The NEC exempts TR receptacles in locations above as follows:

Exception to (1), (2), (3), (4), (5), (6), and (7): Receptacles in the following locations shall not be required to be tamper resistant: Receptacles located more than 1.7 m (5 1/2 ft) above the floor (2) Receptacles that are part of a luminaire or appliance

(3) A single receptacle or a duplex receptacle for two appliances located within the dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord-and-plug-connected in accordance with 400.10(A)(6),(A)(7), or (A)(8)

(4) Nongrounding receptacles used for replacements as permitted in 406.4(D)(2)(a)

Question 5

"The project is an office building / warehouse which has an exterior natural gas generator (I think 150kW) for NEC Article 700 and 702 loads. Pretty standard application, nothing unique about the system or design. We plan on using natural gas to supply the generator. The inspector is saying I also must have an additional (2) hour on-site supply for the generator. Unsure what NEC section we're violating? We're not a seismic zone nor healthcare. Have you run into this before? Any information would be of help, thank you!"

Answer

Natural gas supply source for generators are permitted on projects throughout WI. Please note that NEC 700.12(B)(2) is also required as 2017 SPS 316 does not delete this additional requirement for premises supply fuel. NEC 700.12(B)(2) requires an additional on-site supply. NEC 700.12(B)(2) reads: (2) Internal Combustion Engines as Prime Movers. Where internal combustion engines are used as the prime mover, an on-site fuel supply shall be provided with an on-premises fuel supply sufficient for not less than 2 hours' full-demand operation of the system. Where power is needed for the operation of the fuel transfer pumps to deliver fuel to a generator set day tank, this pump shall be connected to the emergency power system.

If you desire not to have the additional code mandated on premise (2) hour supply, you must submit a petition for variance to DSPS. The variance shall include a position statement from the fire department & the local AHJ as well as a letter from the utility stating the reliability of the natural gas supply.

Question 6

"Please help with the NEC requirements for sizing junction boxes and pull boxes for conductor sizes 4 AWG and larger. I am struggling with my local inspector on sizing boxes. We are each coming up with different measurements. Of course, his box calculations are bigger than what I installed!"

Answer

You must size pull boxes, junction boxes, and conduit bodies large enough so you can install the conductors without damaging them. For conductors 4 AWG and larger, you size pull boxes, junction boxes, and conduit bodies per NEC 314.28. That means the minimum dimensions of boxes and conduit bodies must comply with the following:

- **Straight pulls.** A conductor that enters one wall of a box and leaves through the opposite wall is a straight pull. The minimum distance from the raceway entry to the opposite wall is eight times the trade size of the largest raceway.
- **Angle pulls.** A conductor that enters one wall and leaves through an adjacent one is an angle pull. The minimum distance from the raceway entry to the opposite wall is six times the trade size of the largest raceway, plus the sum of the trade sizes of the remaining raceways on the same wall and row.
- **U pulls.** A conductor that enters and leaves from the same wall is a U pull. The minimum distance from the raceway entry to the opposite wall is six times the trade size of the largest raceway, plus the sum of the trade sizes of the remaining raceways on the same wall and row.
- **Splices.** When conductors are spliced, the minimum distance from where the raceways enter to the opposite wall is six times the trade size of the largest raceway, plus the sum of the trade sizes of the remaining raceways on the same wall and row.
- **Rows.** Where there are multiple rows of raceway entries, you calculate each row individually and then use the row that results the largest distance calculation.

- **Distance between raceways.** The minimum distance between raceways enclosing the same conductor is six times the trade size of the largest raceway, measured from the nearest edge of one raceway entry to the nearest edge of the other raceway entry. The locknut or bushing doesn't apply to this calculation
- When conductors enter an enclosure with a removable cover, such as a conduit body or wireway, the minimum distance from the raceway entry to the removable cover is the bending distance listed in Table 312.6(A) for one conductor per terminal [314.28(A)(2) Ex, 366.58, 376.23, and 378.23].

Question 7

"A while back, the Department confirmed that chiropractor clinics are required to conform to NEC article 517, specifically redundant grounding, IF they are licensed under WI ss chapter 446. I will be inspecting the remodel of a former chiropractor clinic that housed a NON chapter 446 chiropractor. It is a type 5 b building and wired entirely in NM-Romex. The new owner is another chiropractor; however, they are licensed under chapter 446. Does this chiropractor change the occupancy of the building because of the license requirement? Can the existing wiring stay as is in the patient care rooms or can I require all the wiring be replaced with med grade m/c cable or another approved method? There will be one or two receptacles added in each room and new lighting installed. Please advise."

Answer

The existing wiring is not grandfathered if a change of occupancy use occurs and NEC 517 compliance must be met. The NEC Article 517 definition of a patient care area will assist you with compliance. We suggest that you obtain documentation from the governing body of the facility that details the anticipated use of the rooms in question if the contractor/governing body does not agree with your assessment of the anticipated care. Requiring documentation is supported in the definition as follows. NEC 517.2 Patient Care Area: Any portion of a health care facility wherein patients are intended to be examined or treated. Areas of a health care facility in which patient care is administered are classified as general care areas or critical care areas. **The governing body of the facility designates these areas in accordance with the type of patient care anticipated and with the following definitions of the area classification.** Informational Note: Business offices, corridors, lounges, day rooms, dining rooms, or similar areas typically are not classified as patient care areas.

Question 8

"I have a question regarding IBC (Building Code) 1008.3.3. It appears emergency lighting shall now be installed in all "electrical equipment rooms". Have you heard from the building group how they are viewing this? I would figure the areas covered would be rooms with main service equipment, sub panels, transfer switches, switchgear, transformers and possibly lighting control panels. What would be required in order for the space to be classified as a "room" or is the existence of "electrical equipment" enough to trigger emergency lighting regardless if it is in a room or not? I'm envisioning a hallway (that is not considered a path or egress which would not be required to have emergency lighting per 1008.3.1 or 1008.3.2) with an electrical panel installed in it."

Answer

Answer from DSPS Building Tech: You are correct in your understanding. In addition, the IBC Commentary on IBC 1008.3.3 reads: "The intent of items 1 through 4 is to have emergency lighting in areas significant for emergency responders or maintenance personnel who may be trying to locate and fix the loss of power issue for the building." As such even a "hallway" that has an electrical panel in it would need automatic illumination by that panel.

Question 9

"Older incandescent, high school, auditorium house lighting, was retrofitted by a lighting manufacturer, with UL recognized LED components. The manufacturer, Manning Lighting provided, submittal data which was then approved/stamped a professional engineer employed by the school district. SPS 316.022 (1)- Note is not specific to which professional engineer may or may not review manufacturer data for approval."

Is there a restriction on which professional engineer may or may not review manufacturer data as an independent third party?"

Answer

A PE can evaluate non-listed equipment as long as the PE is independent per SPS 316.022. Reads: Data, tests, and other evidence shall be provided by a qualified independent third party. Note: Examples of a qualified independent third party include a nationally recognized testing laboratory and a professional engineer.

A professional engineer employed by the school district used to evaluate the school districts non listed equipment violates the allowance and would not be deemed independent.

Question 10

"I probably should know this but, City maintenance past practices have my brain fogged. With the new Electrical Law, may an unlicensed person replace a light switch, a light fixture, ballast, etc.? The verbiage of; Installation of a new, or addition to service, feeder or branch circuit leaves this "open" in my opinion. Our "City Guys" have done too much in the past the way it "was"."

Answer

State of Wisconsin Statue 101.862 details the requirements. Unlicensed individuals can do limited electrical/maintenance work per the exception. They cannot install new wiring. Per the statues in 101.862 exemptions include: g) A person engaged in installing, repairing, or maintaining manufactured equipment or utilization equipment, including ballasts, electric signs and luminaires, or any other manufactured system that is designed to provide a function that is not primarily electrical in nature if the installation, repair, or maintenance only involves the modification or installation of conductors that are considered part of the equipment or system under this paragraph. For purposes of this paragraph, any conductor going from the disconnecting point or the nearest junction, pull, or device box to the manufactured equipment or utilization equipment or the manufactured system is considered part of the equipment or system. Unlicensed individuals can also replace outlets 20 amperes and less per the statues.

Question 11

"I have (2) questions.

- 1. Where can I locate a PDF/document of the current municipalities in Wisconsin that have commercial inspection delegation?*
- 2. How can I secure a State of Wisconsin commercial electrical permit for areas that are not delegated?"*

Answer

The department has a PDF document that is updated frequently of current delegated municipalities doing commercial electrical inspections. It is located on the DSPS electrical program page at:

<https://dsps.wi.gov/Pages/Programs/ElectricalLighting/Default.aspx>

To secure a State of Wisconsin Commercial electrical permit The Department has a new Electronic Safety and Licensing Application (eSLA) system for submitting applications for electrical permits, inspections, plan reviews and petitions for variance in non-delegated areas like Darlington.

The link to the eSLA portal is here: <https://esla.wi.gov/PortalCommunityLogin>

You can visit the eSLA Customer Information page for more information and resources on how to log on to the system as well as how to submit an application here: <https://dsps.wi.gov/Pages/eSLA.aspx>. There are also some eSLA job aids located on our Electrical & Lighting web site here:

<https://dsps.wi.gov/Pages/Programs/ElectricalLighting/Default.aspx>

You must submit your permit request electronically through the eSLA system in all areas of the state not currently delegated to do commercial electrical inspections.

Question 12

"Is ETL (Testing Lab) acceptable instead of UL listing of equipment? Also, can I get some kind of official explanation on the policy enforcement of NEC 110.2 & 3 that seems to have changed recently and is the reason for my ETL question."

Answer

In the State of Wisconsin, all electrical equipment with a hard-wired connection shall be in conformance with the following: 2017 NEC 110.3(C): C) Listing. Product testing, evaluation, and listing (product certification) shall be performed by recognized qualified electrical testing laboratories and shall be in accordance with applicable product standards recognized as achieving equivalent and effective safety for equipment installed to comply with this Code.

State of Wisconsin electrical code SPS 316.022 Use of approved materials and construction methods. (1)

MATERIALS. Materials, equipment, and products that do not comply with the requirements of this chapter shall not be used unless approved in writing by the department in an approval of a petition for variance. Approval of materials, equipment, and products shall be based on sufficient data, tests, and other evidence that prove the material, equipment, or product meets the intent of the requirements of this chapter. Data, tests, and other evidence shall be provided by a qualified independent third party. Note: Examples of a qualified independent third party include a nationally recognized testing laboratory and a professional engineer.

Please note: The list of approved listing agencies is found on OSHA's website and can be found here:

<https://www.osha.gov/dts/otpca/nrtl/nrtllist.html> **Note: ETL is recognized as an approved NRTL**

The reference to the AHJ in the definition of "Listed" is in regard to the organization that provides the listing. In other words, the AHJ must approve of the organization that provides the listing.

In Wisconsin we accept any of the listing agencies that OSHA recognizes in the link above

Question 13

"I have a state-owned building that I will be wiring. Is it true that the local inspection department cannot inspect State owned properties? Can State of Wisconsin Department of Administration employees (DOA) conduct the required inspection in lieu of a DSPS electrical permit & DSPS inspection? Thanks for your time."

Answer

State buildings are exempt from local permit and inspection rules, but they are not exempt from State rules. SPS 316.012(1)(a) would require a permit for electrical work done at State owned buildings if the buildings are in one of the categories listed in SPS 316.012(1)(a)1. through 7.

DSPS employee electrical inspectors shall only conduct the required SPS 316 inspections at state owned facilities. We do have this contingency built into our online permitting system (eSLA). The contractor can apply for the permit.

Information on how to register and apply for a permit can be found here:

<https://dsps.wi.gov/Pages/eSLA.aspx>

More information can also be found here: <https://dsps.wi.gov/Pages/eSLAResources.aspx>

Question 14

"One of my students wired a replacement commercial roof top HVAC unit. The inspector said that the unit would have to comply with NEC 440.10 as far as short circuit rating if it is a new or replacement unit. In this situation, he would have to find the SCCR (Short circuit current rating) for an existing service which maybe a little difficult. In looking at NEC 440.10, it does not spell out that it pertains to replacement units. Let me know what the states opinion is so I can get back to him."

Answer

The SCCR (Short circuit current rating) of the replacement unit would need to be higher than the available fault current imposed. Grandfathered rules in SPS 316.003 do not apply.

NEC 440.10 applies to new & replacement A/C units.

Reads: A) Installation. Motor controllers of multi-motor and combination-load equipment shall not be installed where the available short-circuit current exceeds its short-circuit current rating as marked in accordance with 440.4(B).

In addition, the HVAC units are required to be marked with a short circuit current rating, the available short circuit current and the date the short circuit current calculation was performed shall be documented and made available to those authorized to inspect the installation.

Question 15

"Would I have a question about a Fire Pump Installation

On site is a 100A 460V 3P Cont. Duty fire pump motor.

The contractor installed a listed fire pump controller. The name plate shows it is for a 100HP 480V 3P motor.

Service conductors originate from a service vault, run below grade, thru a transocket and terminate into the Fire Pump Controller.

Inside the Fire Pump Controller is a 150A circuit breaker which has a label that says it was sized per NFPA 20. It lists that it will trip in 8-20 seconds at 600% of the FLA. The representative said the NEC does not apply to the circuit breaker inside the Fire Pump Controller.

I do not see how the 150A circuit breaker will keep the motor energized if the motor reaches the 725A LRC rating.

The circuit breaker label indicates that it will trip in 8-20 seconds at 600% of the FLA. This does not meet the required 2 minutes at 600% listed in NEC 695.4(B)(2)(a)(2)a

I do not see this fire pump controller meeting the requirement of NEC 695.4(B)(2)(a), 695.4(B)(2)(a)(1) or 695.4(B)(2)(a)(2)

Does NEC 695.4(B)(2) apply to the circuit breaker installed inside the fire pump controller? There are no other disconnects or OCPD between the fire pump controller and the source of power."

Answer

The overcurrent device requirements in 695.4(B)(2) do not apply to the overcurrent device in a listed fire pump controller. The overcurrent device requirements in 695.4(B)(2) apply to any field installed disconnecting means and associated overcurrent device that is allowed to be installed per 695.4(B)(1). In this case it is a direct connection in accordance with 695.4(A).

Question 16

"The utility replied to an email regarding my inquiry as to the available fault current for upcoming service change. After research, the utility replied that 22k protection would satisfy install, (he noted new install would not exceeding 21K). If I provide a main fused switch rated for 22k must I replace all the QO 10k branch breakers in the three existing load centers to 22k?

I downloaded Eaton Bussmann App however did not address interrupting rating just ark flash for PPE gear."

Answer

You have 3 options.

- 1) A fully rated system where all overcurrent devices have AIC ratings higher than the available fault current.
- 2) A system selected under engineering supervision in existing installations in accordance with NEC 240.86(A).
- 3) A tested combination system. In these cases, the combination of overcurrent devices has been tested by the manufacturer. These combinations could have for instance a 22k AIC main with 10k AIC rated load side overcurrent devices per 240.86(B). Manufacturers usually have tables that list their tested combinations.

Question 17

"I was wondering where the state stands regarding a grounding electrode conductor needing protection from physical damage. More specifically a # 4 coming out of the ground running up the outside wall at the

rear yard of an apartment. It has been my feeling it is exposed to physical damage and I have been requiring protection by one of the methods listed in 250.64(B) (2). Several electricians have expressed a #4 does not require protection. Maybe it is interpreted by others differently?"

Answer

The wording in 250.64(B) has changed. All grounding electrode conductors that are exposed to physical damage are required to be protected regardless of size. If you deem the grounding electrode conductor to be subject to physical damage, you can require it to be protected by one of the methods listed.

Question 18

"I need some clarification on wiring methods for this project.

I have included the title sheet for reference.

This building was previously classified as a business and is now changing to educational with max occupancy of 99 persons.

The building construction type is VB.

The building was previously wired with NM-B cable.

My questions are as follows:

- 1. Is NM-B cable an acceptable wiring method for this project?*
- 2. If NM-B cable is acceptable, do we need to remove existing NM-B cable above the drop ceilings that are not going to be altered.*
- 3. If the drop ceiling was removed and a new drop ceiling is to be installed, do we need to remove the existing NM-B cabling?"*

Answer

NM cable can be used in a Type VB building. It would be acceptable for this project. NM cable can be used above drop ceilings in commercial buildings. SPS 316.334(2) removes the restriction of NM cables above drop ceilings in other than one- or two-family dwellings in NEC 334.12(2). NM cable cannot be used for fixture whips in this case per 334.30(B)(2).

Question 19

"Looking for a short narrative from the state regarding the enforcement of the RTU SCCR that some of the Electrical Inspectors are aware of and enforcing. RTU ratings either are available in 5KAIC or can be ordered at 65KAIC. I'm expressing to our HVAC Division that the 5KAIC units would be extremely difficult to meet the requirements when rated at only 5KAIC so plan on the 65KAIC as a default due to the fact that owners are responsible to provide the contractors with the coordination study to prove the rating at the unit which is rarely available. The cost to perform this coordination study at different sites to prove the 5KAIC would not be cost effective compared to the small up charge for the 65KAIC rated units or even possible at most sites. Thoughts?"

Answer

This has been an issue for some time. We ask for the fault current to ensure the SCCR ratings of equipment is compliant with NEC 110.10. I will say that we typically have not been requiring a coordination study, but sometimes it is provided because of the arc flash studies that are done. We have been accepting calculations using fault current calculators such as Eaton Bussmann's FC² fault current calculator (just to name one, we do not favor one over another). Providing equipment with a 65 KAIC rating typically negates any issues, but we would still ask for the available fault current at the equipment to verify compliance with NEC 110.10.

Question 20

"I am working on a project where we are being questioned on having the Legally Required Standby System panels in the same room as the Normal Power Distribution Equipment. I am only aware of the requirements for the separation of the circuits when the generator is located outdoors. Is there another requirement that I'm missing?"

Answer

Legally required systems panels can be in the same room as the normal service equipment. The confusion might be coming from NFPA 110 7.2.3 which states:

7.2.3* Level 1 EPSS equipment shall not be installed in the same room with the normal service equipment, where the service equipment is rated over 150 volts to ground and equal to or greater than 1000 amperes.

The definition of EPSS is:

3.3.4* Emergency Power Supply System (EPSS). A complete functioning EPS system 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 needed for the system to operate as a safe and reliable source of electric power.

The EPSS does not include the panels. It ends at the load terminals of the transfer switches.

Question 21

"How I was hoping you could provide some clarification for a fire pump service.

We are providing a new utility service (MGE, cold sequence metering) and a 1200A fused disconnect switch. The question I have is how you size the conductors from the disconnecting means to the fire pump control panel. I know the sizing from the fire pump controller to the pump motor is 125% of the rated load but I wasn't certain if we had to size the conductors to the fire pump control based on the 1200A rating of the disconnect."

Answer

The service conductors must be sized for the load, not the overcurrent device. See 230.90(A) Exception No. 4, 695.4(B)(2)(a), and 695.6(B) and (C).

Question 22

"Can There has been some discussion among a few of us in regards of the correct size of grounding conductor for our grounding bushing. Wondering if you could help us settle this issue.

Some want to connect all grounding bushings with one size and others want to ground the bushing individually with a different size. What is the correct size and way to complete this task?

We have parallel 750's aluminum pulled

The overcurrent device in circuit ahead is 2500 amperes."

Answer

NEC 250.102(D) covers this situation. You can either use one conductor (350 kcmil copper per 250.122) and connect all raceways (daisy chain) or you can run single conductors to each raceway. The single conductors would also have to be 350 kcmil copper.

Question 23

"I am designing a PV system that is to be connected to an existing electrical service. If my maximum designed demand on the service is 2,760 amps (actual load will be more around 800 amps) and I plan on using a 3,000 amp, 100% rated main breaker. Also connected to this switchboard is panel PV that will input 430 amp on to this switchboard through the 600-amp breaker. Does my switchboard have to be sized for 3,000 amp + 600 amp from the PV panel or 3,600 amps which would be a 4,000-amp

switchboard? I cannot seem to pin this down in the NEC code and your assistance would be greatly appreciated."

Answer

One on the methods listed in 705.12(B)(2)(3)(a) through (e) would need to be used. The most common method we see used is 705.12(B)(2)(3)(b). This method would allow up to 600 amps of current from the PV system to be backfed into the panel if the PV breaker is at the opposite end of the busbar as the main breaker. (3000 x 120% = 3600 amperes) See below. One of the other methods can be used, but they are generally more restrictive.

(b) Where two sources, one a primary power source and the other another power source, are located at opposite ends of a busbar that contains loads, the sum of 125 percent of the power source(s) output circuit current and the rating of the overcurrent device protecting the busbar shall not exceed 120 percent of the ampacity of the busbar. The busbar shall be sized for the loads connected in accordance with Article 220. A permanent warning label shall be applied to the distribution equipment adjacent to the back-fed breaker from the power source that displays the following or equivalent wording:

WARNING:

POWER SOURCE OUTPUT CONNECTION —

DO NOT RELOCATE THIS OVERCURRENT DEVICE.

The warning sign(s) or label(s) shall comply with 110.21(B).

Question 24

"I have an application where I have a switchboard feeding a transformer and then the secondary side of the transformer will feed a panelboard 100 feet away. Do I need a secondary disconnect if the panelboard has a main circuit breaker? If so, does this need to be a circuit breaker type or knife-switch style?"

Answer

The transformer secondary conductors would need to be protected in accordance with 240.21(C) depending on the conditions. Typically, the conductors must terminate in an overcurrent protective device and the length of the conductors is limited to not more than 10 feet with conditions per 240.21(C)(2) or not more than 25 feet with conditions per 240.21(C)(6).

Question 25

"I am looking for a clarification on classification for a feed mill. They have grain storage and mixing operations inside feed mill."

Answer

DSPS does not classify hazardous locations. NEC 500.4(A) requires hazardous locations to be documented. Someone who is familiar with classifying such locations should be involved to document the locations, and then the appropriate wiring methods can be used.

Question 26

"My question on NFPA 79 resulted from a search I was doing regarding the potential use of a 480 volt motor control circuit. I want to add a stop push button to a 480 v motor starter that has an integral start/stop push button control. The control circuit is tapped off of the line side of the motor contactor with no independent fusing. The conductors are sized for the overcurrent protection provided. I can't find anything that does not allow this. Do you know of any code articles that I may be missing?"

Answer

Motor control circuit overcurrent protection is covered in NEC 430.72(B)(1) and (2) and Table 430.72(B). Separate overcurrent protection is not required for motor control circuit conductors if certain conditions are met.

Question 27

"I have a question in regards to fire pumps. We are quoting a project at an assisted living facility. During a scheduled power outage then noticed that their fire pump (30 hp motor) was not on the generator. They would like us to quote putting it on the generator. Their system comes in from the generator with a 600 amp breaker to a panel, then feeds off the panel with sub breakers to the generator side of multiple ATS's. We would like to add an ATS and a breaker in the generator panel, then feed utility power through the ATS and off to the fire pump controller.

My question is, and with keeping 695.6 A2 in mind, with 2 sources of power (utility and generator) do we need to comply with the 2 hour rating of the raceway/wire assembly? Any assistance in answering this would be appreciated. Thanks."

Answer

The installation as you propose would not be compliant. The number of disconnecting means for an on-site generator supplying a fire pump is limited to two per 695.4(B)(1)(c) and must be installed in accordance with 700.10(B)(5) per 695.4(B)(3)(b). A breaker in a panelboard would not comply with 700.10(B)(5). Fire pump feeder conductors inside of a building must be protected with one of the methods listed in 695.6(A)(2)(d) except in the electrical equipment room and fire pump room per the exception. Also keep on mind that the transfer switch must be located in the fire pump room per 695.3(F).

Question 28

"I have a project where the generator is nestled in between two utility transforms. The transformer in front of the generator is for the school (which the generator provide emergency egress lighting NEC 700) and the second one feeds the football field. Per SPS 316.701 there needs to be a separation of 20' between the service equipment and the generator. This project was constructed back in 1990 and I don't believe this was a requirement back then. I looked at Comm 16.48 (2005 edition) and it was in there but when I looked back at ILHR 16 (1994 edition) and I don't see it and therefore I don't believe this was a code requirement back then. Do you agree? Do you know when this was introduced?"

More importantly my plan is to upgrade the electric service where I am hoping to keep the existing utility transformer pad but upsize the existing conductor in the existing raceway (1,600 amp to 2,000 amp). If I do this will I be in violation of SPS 316.701 because I am making revisions to the service?"

Answer

The 20-foot separation requirement for emergency and legally required systems first appeared in the 2005 Comm 16. If you are not changing the transformer and just changing the conductors, it would not be required to be moved. If the transformer is being changed it would be considered a new installation and the separation would be required.

Archives can be visited at:

<https://dsps.wi.gov/Pages/Programs/CodeArchives.aspx>

Question 29

"I have a commercial project. The lighting circuits are 120v and all fed by 20a branch circuits. 404.14 states "switches shall be used with-in their ratings and as indicated in 404.14 (A) through (F). Is it permissible to use 15a commercial grade snap switches for the individual office and alike in which have loads less than 15a or do all the snap switches need to be 20a rated?"

Answer

Switches rated at 15 amperes are allowed to be used in 20 ampere circuits as long as the load is 15 amperes or less. As you mentioned they are being used within their rating in accordance with 404.14.

Question 30

"I have a project where I've called out to use a 1200A frame size electronic trip enclosed breaker to be installed, and we will replace the factory 1200A max sensor with 1000A max trip sensor unit to be installed for the main service switch. This sensor would be dialed down to a 600A setting, and we are also installing

600A conductors to feed the downstream equipment. This limits our capacity to a maximum of 1000A. My interpretation of code is that since the max that this can be dialed up is 1000A, we do not need ERMS installed. Is this correct or do we need to install ERMS system components because the sensor could be replaced to the 1200A sensor?"

Answer

Once you install the 1000-amp max trip sensor in the 1200-amp frame breaker the breaker is now considered a 1000-amp breaker.

You are not required to have Arc Energy reduction on a 1000-amp circuit breaker.

We would inspect the breaker as it is installed at this time. If someone was to change the trip sensor to 1200 amps, they would then have to follow the requirements of NEC 240.87.

240.87 Arc Energy Reduction. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted is 1200 A or higher, 240.87(A) and (B) shall apply.

Question 31

"I have an industrial warehouse building that has an existing 120/208 service. They are moving in some manufacturing equipment that needs 480/277 equipment. The existing 120/208 service has a neutral, the proposed 480/277 service does not have a neutral. My question re: grounding.

NEC 250.58 requires common grounding electrodes, but wouldn't a common grounding electrode potentially allow objectionable neutral current on the shared grounding electrode system from the 120/208 service if tied together?"

Answer

NEC 250.24(C) Grounded Conductor Brought to Service Equipment. Where an ac system operating at 1000 volts or less is grounded at any point, the grounded conductor(s) shall be routed with the ungrounded conductors to each service disconnecting means and shall be connected to each disconnecting means grounded conductor(s) terminal or bus. A main bonding jumper shall connect the grounded conductor(s) to each service disconnecting means enclosure. The grounded conductor(s) shall be installed in accordance with 250.24(C)(1) through 250.24(C)(4).

NEC 230.42(C) Grounded conductor. The new 480/277-volt service will also require a neutral. It is now required to bring a grounded conductor to the service disconnect.

NEC 250.50 Grounding Electrode System. All grounding electrodes that are present at each building or structure shall be bonded together to form the grounding electrode system.

This way all the grounding and bonding is complete and both systems would have the same potential.

Question 32

"I just wanted to double check with you on this. If there is a quick disconnect inside the led fixture to remove the driver, do I have to still use a twist lock receptacle and plug or can I just hard wire the fixture cord into the 4 square?"

Answer

NEC 410.62(C) Electric-Discharge and LED Luminaires.

(1) Cord-Connected Installation. A luminaire or a listed assembly in compliance with any of the conditions in (a) through (c) shall be permitted to be cord connected provided the luminaire is located directly below the outlet or busway, the cord is not subject to strain or physical damage, and the cord is visible over its entire length except at terminations. (a) A luminaire shall be permitted to be connected with a cord terminating in a grounding-type attachment plug or busway plug. (b) A luminaire assembly equipped with a strain relief and canopy shall be permitted to use a cord connection between the luminaire assembly and the canopy. The canopy shall be permitted to include a section of raceway not over 150 mm (6 in.) in length and intended to facilitate the connection to an outlet box mounted above a suspended ceiling. (c) Listed luminaires connected using listed assemblies that incorporate manufactured wiring system connectors in accordance with 604.100(C) shall be permitted to be cord connected.

You will need to use a receptacle.

Question 33

"Dear Gentlemen, I have a question in regards to if type NM cable can be installed for the signaling circuit for a fire alarm system, a Power limited fire alarm (PLFA) system.

The type NM cable would supply low voltage horns, strobes and pull stations."

Answer

NO, Not listed for use as fire alarm cable per UL. Not listed in table 310.104 (A) for NPLFA, NEC 760.179 for PLFA

PLFA cable NEC 760.179

760.179 Listing and Marking of PLFA Cables and Insulated Continuous Line-Type Fire Detectors. PLFA cables installed as wiring within buildings shall be listed as being resistant to the spread of fire and other criteria in accordance with 760.179(A) through (H) and shall be marked in accordance with 760.179(I).

Question 34

"I performed an electrical inspection of a children's dental clinic

In conversation with the electrician, he is stating that the branch circuit(s) feeding the patient exam chair and dental hygienist rolling workstation with water supply and sink is not a "wet procedure location" requiring special protection against electric shock.

It is in my opinion that the Branch circuit(s) feeding receptacles and fixed equipment should be provided with GFCI protection per NEC 517.20(A)(2)

Could you please help me understand if this dental room area would be defined as a "wet procedure location?"

Answer

Take a look in the definitions in the front of NEC 517. This area does not meet the requirements of a Wet Procedure Area.

When there is a sink in the room which you indicated any receptacle that is within 6 feet of the sink is required to be protected by GFCI per NEC 210.8 (B)(5)

Question 35

"I have a farm wiring job coming up soon that I will be working with you on.

When doing direct bury what type of insulation can I use for the copper ground in the 4-wire system? I'm having trouble finding anything other than THWN."

Answer

NEC 547.5 (F) Separate Equipment Grounding Conductor

Where an equipment grounding conductor is installed underground with a location falling under the scope of Article 547, it shall be insulated.

NEC 250.120 (B) Aluminum and Copper-Clad Aluminum Conductors.

Equipment grounding conductors of bare or insulated aluminum or copper-clad aluminum shall be permitted. Bare conductors shall not come in direct contact with masonry or the earth or where subject to corrosive conditions. Aluminum or copper-clad aluminum conductors shall not be terminated within 18 inches of the earth.

Direct-burial conductors shall apply to the provisions of NEC 310.10(F).

Question 36

"Good afternoon, I am wiring an 8 unit apartment building. I am wondering if it is permissible for nm cables to enter through the rear of a residential surface mounted panel through a chase nipple or pvc adaptor."

Answer

The answer to your question is no, a terminal adapter or a chase nipple is not designed to secure the wires as required in NEC 300.15 Fittings and connectors shall be used only with the specific wiring methods for which they are designed and listed. NEC 312.5(C) Where cable is used, each cable shall be secured to the cabinet, cutout box, or meter socket enclosure.

Question 37

"We have a project coming up in Wisconsin, it is a Solar Power Generation Project. My question is in regards to the installation of the Solar Modules; Are these to be installed by certified Electricians? States regulate this differently, for example in Colorado, we can install the panel with a Mechanical craft employee, and all terminations to be done by Electrician. Maine on the other hand, is exactly the opposite."

Answer

The Solar Modules can be installed by your Mechanical craft employee.

We have an exemption that allows any individual to work on electrical equipment that operates at less than 100 volts. Your installer will be working with less than 100 volts.

State Statute 101.862(4) (4) Subsections (1) to (3) do not apply to any of the following:

State Statute 101.862(4)(d) (d) A person engaged in installing, repairing, or maintaining equipment or systems that operate at 100 volts or less.

Once the voltage exceeds 100 volts a licensed electrician is required to do the electrical wiring.

In the State of Wisconsin under Wis. Stat. § 101.862(4)(d) a person engaged in installing, repairing, or maintaining equipment or systems that operate at 100 volts or less does not need to be a licensed master electrician. This means if the photovoltaic (PV) system is under 100 volts, then a master electrician is not needed.

If the PV system is 100 volts or more, then a master electrician does not need to install the racking system; however, the master electrician is ultimately responsible for the grounding and bonding of the racking under the provisions of the 2017 National Electrical Code (NEC) 690.47 Grounding Electrode System. This means that the master electrician should, at a minimum, oversee the electrical considerations and grounding requirements of the racking system per the manufacturers installation instructions as well as ensure the grounding and bonding adhere to NEC 690.47.

Question 38

"I have an application that we are remodeling an interior office space and in the above suspended ceiling there is Romex cable being used. We plan to remove the Romex cable for the equipment we are replacing (lighting, receptacles) but there may be some Romex that is remaining for equipment that we are not touching. Is using Romex above a ceiling a code violation?"

Answer

SPS 316.334 (2)

SPS 316.334 Nonmetallic-sheathed cable: Types NM, NMC and NMS. (1) USES PERMITTED. (2) TYPES NM, NMC, AND NMS. The requirements specified in 2017 NEC 334.12 (A) (2) are not included as part of this chapter.

All the provisions of NEC 334.15(B) Protection from Physical Damage must be adhered to.

Question 39

"Looking to clarify demand factors at a camp-ground. Is the supply feeding multiple RV pedestals (daisy-chained or a multiple pedestal assembly) a feeder or just a branch circuit?"

If it's a feeder, for simple math, if you feed 2 peds (back-to-back) am I reading correctly that a 90% demand factor would apply?"

Answer

NEC 551.73(A) Where the electrical supply is in a location that serves two recreational vehicles, the equipment for both sites shall comply with 551.77, and the calculated load shall only be calculated for the two receptacles with the highest rating.

NEC 551.73 (A) would consider the wiring that feeds two pedestals a feeder as these pedestals have overcurrent devices in them that protect the receptacles at either 50-30 or 20-amperes. The wiring on the load side of the breakers would be branch circuits.

Question 40

"Please remind me, when natural gas piping or tubing (CSST) is required to be electrically bonded, does the person installing the bonding have to have an electrician's license or not?"

Answer

Your question pertaining to bonding CSST tubing does not apply to the National Electrical Code or State of Wisconsin building or electrical codes.

CSST bonding goes above minimum State code requirements and shall be bonded in accordance with the manufactures installation requirements that come with the product.

Several CSST tubing manufactures exist, each with unique required method's for properly grounding the tubing. Some CSST products do not even require bonding.

The manufacture shall be consulted with regards the date the bonding requirements began with their product if any. The product shall be installed in accordance with the manufacture's installation instructions.

The installer of the product is responsible to properly install & bond the tubing.

Our electrical group encourages the installer to verify what CSST manufacture they are working with and then examine the installation instructions for proper bonding requirements. Our electrical group at DSPS has no additional requirements.

Question 41

"We are relocating the meter location on a church. We are installing a new tran-socket around the corner and installing PVC pipe along the outside of the building approximately 10 feet and then entering the building and traveling (less than 8 feet) to reenter the existing main distribution panel. This is a 600-amp 3phase 120/208 volt service. I am wondering if the new PVC conduit needs to be schedule 80 or if schedule 40 is ok."

Answer

NEC 352.10 (F) Schedule 80 if there is a chance of physical damage to the raceway.

If this is in an area and height where no one could damage the raceway schedule 40 could be used.

I would also check with your local inspector as he would be the one determining if damage could occur to the raceway. (Information note: PVC Conduit, Type Schedule 80 is identified for areas of physical damage.)