



STATE OF WISCONSIN

Department of Safety and Professional Services

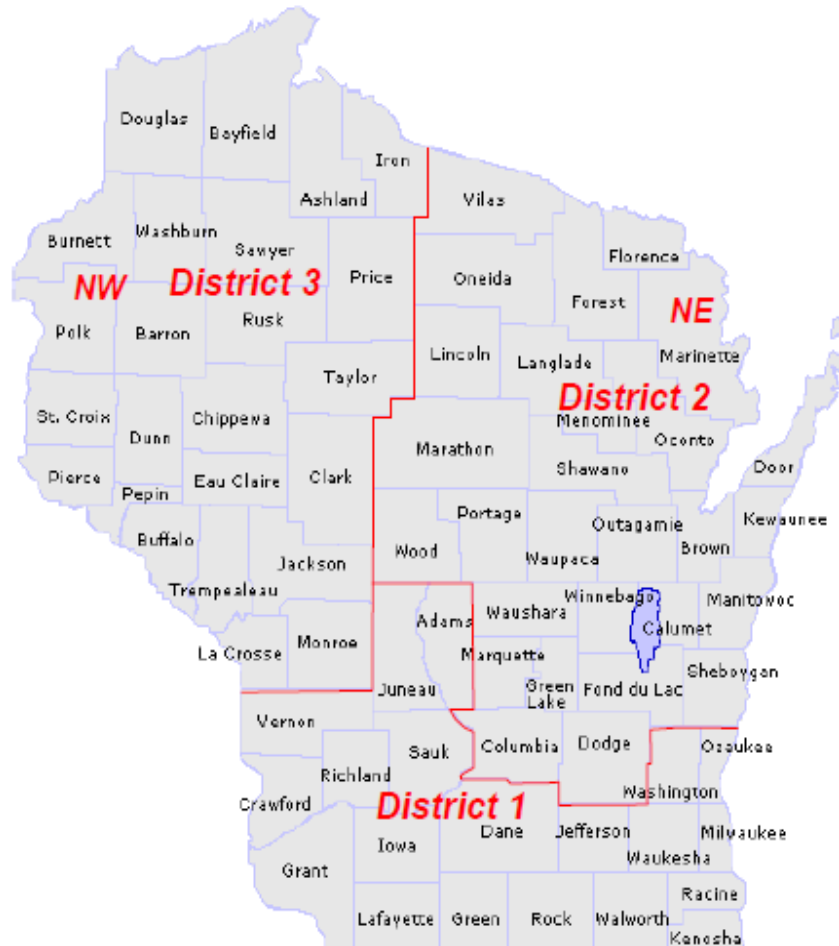
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2018

Commercial Electrical Program

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Three short topics will be covered. The first covers Fire stopping – Where and How for Electrical Installations. The second is Commercial Grounding and Bonding. The third is Wireway, Enclosure and Conductor Requirements. Our Code Panel will also answer questions submitted by our customers. Our panel consists of Inspectors from the Wisconsin Chapter of International Association of Electrical Inspectors.

Six continuing education credit hours for all electrical license categories will be given, including Registered (Beginning) Electrician.

Copies of both short programs and all answers to the Code questions will be made available. The link to these files is on our webpage. There is space in this handout for you to take notes.

Here is the link to the Electrical and Lighting Program Webpage:

<http://dps.wi.gov/Programs/Industry-Services/Industry-Services-Programs/Electrical-Lighting/>

Please let us know what you think of this program. We welcome your suggestions for future programs. Use the following link to submit your comments:

<https://www.surveymonkey.com/s/industryservicespeakingevent>

2018 Winter Electrical Code Update

Commercial Electrical Program

Notes:

1. Can low voltage wiring like fire alarm, fiber optic wiring, CAT5 etc... be fastened by ty-straps or taped to electrical conduits in the building? This is commonplace on a lot of projects I'm inspecting.

Answer: No in most cases. Generally Independent securing and supporting is required for low voltage cables. NEC 300.11(B) 800.133(B) & 725.143 requires the following:

NEC 300.11 Raceways Used as Means of Support. Raceways shall be used only as a means of support for other raceways, cables, or nonelectrical equipment under any of the following conditions:

- (1) Where the raceway or means of support is identified for the purpose
- (2) Where the raceway contains power supply conductors for electrically controlled equipment and is used to support Class 2 circuit conductors or cables that are solely for the purpose of connection to the equipment control circuits
- (3) Where the raceway is used to support boxes or conduit bodies in accordance with 314.23 or to support luminaires in accordance with 410.36(E).

725.143 Support of Conductors. Class 2 or Class 3 circuit conductors shall not be strapped, taped, or attached by any means to the exterior of any conduit or other raceway as a means of support. These conductors shall be permitted to be installed as permitted by 300.11(B)(2).

800.133(B) (B) Support of Communications Wires and Cables. Raceways shall be used for their intended purpose. Communications wires and cables shall not be strapped, taped, or attached by any means to the exterior of any raceway as a means of support.

2. Do water bottle filling stations require GFCI protection? They are hardwired at 120 V and are not part of a drinking fountain (NEC 422.52 2011) I noticed the 2017 code uses the term "drinking water coolers" in 422.5 and requires GFCI protection.

Answer: No. Water bottle filling stations do not require GFCI protection per the NEC. The manufacture may require GFCI protection in accordance with any instructions included with the product or its listing (SPS 316.110). These filling stations do not meet the definition/intent of a drinking fountain. You are correct that the language has changed in the 2017 NEC. These filling stations will not require GFCI when the 2017 NEC is adopted.

3. What does the NEC mean by an auxiliary grounding electrode?

Answer: Auxiliary electrodes are permitted, but they have no Code requirements since they serve no purpose related to electrical safety addressed by the NEC. If an auxiliary electrode is installed, it's not required to be bonded to the building grounding electrode system, required to have the grounding conductor sized to 250.66, or comply with the 25-ohm requirement of 250.53(A)(2) Ex.

CAUTION: An auxiliary electrode typically serves no useful purpose within the scope of the NEC and in some cases it may actually cause equipment failures by providing a path for lightning to travel through electronic equipment.

DANGER: Because the contact resistance of an electrode to the earth is so great, very little fault current returns to the power supply if the earth is the only fault current return path. Result—the circuit overcurrent protection device won't open and clear the ground fault, and all metal parts associated with the electrical installation, metal piping, and structural building steel will become and remain energized.

4. Can you send me any information you have on selective coordination in the State of WI please?

Answer: The State of Wisconsin is using the 2011 NEC & State of Wisconsin SPS 316 for enforcement at this time. The following is the State of Wisconsin interpretation on selective coordination: The 2011 NEC does not specify any duration of a fault event. Selective coordination must be achieved for a full range of possible overcurrent currents extending from the overload region up to an including a bolted fault. NEC 700.27 also requires that emergency system overcurrent devices shall be selectively coordinated with all supply side overcurrent devices. The requirement is and has been since 9/1/2005 in Wisconsin, to selectively coordinate overcurrent devices that are part of emergency and legally required systems with all upstream devices. So, selectivity shall be achieved across the entire time-current range for the EM system OCP devices. Please note: This requirement applies to new installations only. State of Wisconsin electrical code SPS 316.003 may be helpful working in existing facilities with existing distribution. The 2014 & 2017 NEC has amended the requirement for Article 517 Health care facilities. The State of Wisconsin plans to adopt the 2017 NEC sometime this year. The Article 517.30 change is as follows: *(G) Coordination. Overcurrent protective devices serving the essential electrical system shall be coordinated for the period of time that a fault's duration extends beyond 0.1 second.* Note: This change will only apply when the 2017 NEC is adopted to buildings defined in Article 517 as Health Care Facilities. A petition for variance might be considered.

5. I have a 120 volt 20 amp single phase circuit that normally uses 2#12 AWG, #12 AWG Ground, and I need to upsize the wires for voltage drop and the hot and neutral need to be #6 AWG. Can the ground wire be #10 AWG or does it need to be #6 AWG? How do you determine the ground wire size for voltage drop?

Answer: NEC section 250.122(B) requires that, "where conductors are increased in size to compensate for voltage drop or any other reason", wire type equipment grounding conductors shall be increased in size proportionally according to circular mil area of the ungrounded conductors. Use NEC Table 8 of Chapter 9 to determine the area in circular mils where the conductor size is given by a non-circular mil designation. The formula is as follows:

Selected ungrounded conductor Area/ required ungrounded conductor area = Ratio

Table 250.122 Equipment grounding conductor X Ratio= Required EGC

Your example is as follows: #6 area= 262400/6530(#12 AWG) = 4.01

#12 AWG 6530 X 4.01= 26185.3 Circular mils

A #6 AWG EGC is required per chapter 9 Table 8

6. I am in the process of working with a local developer on a 177 unit multifamily project. The projects first floor will be concrete cast in place Type I construction utilized as a parking garage for tenants. The 2nd-4th floor are Type V construction apartments and common area hallways. Can the entire building Type I & Type V construction be wired in NM Romex & SER Cable for the feeders?

Answer: No. NM Romex is permitted in Types III, IV & V construction per State of Wisconsin SPS 316.334. NM Cable & AL SER are not permitted in Types I & II construction unless installed in a raceway. This requirement is located in 2011 NEC 334.10.(5) it reads: Types I and II construction where installed within raceways permitted to be installed in Types I and II construction. If you propose to install SER or NM Romex in the Type I area of the project it must comply with code. The SER & NM Romex must be installed in a raceway in the type I portion of the building.

7. In past training sessions we were told tie wires were all that were needed to bond re-bar 20' to make a concrete encased electrode. Recently an area contractor said he didn't want to make a concrete encased electrode for a project because the re-bar needed to all be welded together. Has something changed?

Answer: No. The NEC permits multiple bars/rods to be connected by the usual steel tie wires. The allowance is found in NEC 250.52(A)(3). It reads: (3) Concrete-Encased Electrode. A concrete-encased electrode shall consist of at least 6.0 m (20 ft) of either (1) or (2):(1) One or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than 13 mm (1/2 in.) in diameter, installed in one continuous 6.0 m (20 ft) length, or if in multiple pieces connected together by the usual steel tie wires, exothermic welding, welding, or other effective means to create a 6.0 m (20 ft) or greater length; or (2) Bare copper conductor not smaller than 4 AWG

8. I have a question on equipment I have installed on a few projects. The equipment has an Intertek listing mark (ETL). The local inspector is questioning the product listing because it is not UL listed. Does the State of Wisconsin recognize the ETL listing?

Answer: Yes. The state of Wisconsin accepts ETL listings, and all others approved by OSHA. For the most current up to date list of Nationally Recognized Testing Laboratories (NRTLs), please check the OSHA website: <https://www.osha.gov/dts/otpca/nrtl/nrtllist.html>

9. I have a contractor that wired a paint booth. The paint booth is a listed piece of equipment. One of the motors on the booth is on the other end of the booth, and the controller is not in sight from the motor. There is an exception to the in-sight rule for Industrial Installations where there are written safety procedures, where only qualified persons are service the equipment. This really comes down to if this paint booth is considered an *Industrial Installation*. What is the definition of an *Industrial Installation in Wisconsin*? Any insight you can provide would be helpful.

Answer: The components and construction of listed equipment are not subject to the requirements of the NEC.

10. A contractor installed Cord & Plug connect LED Luminaires for the gym light fixtures. The receptacles for the lights are located about 20-36" from the side of the fixtures. Don't the receptacles need to be directly above the fixture to be code compliant?

Answer: The installation meets the intent of the NEC. Our department position on NEC 410.62(C)(1)(1) is as follows: The receptacle is there for servicing the fixture, and if you can reach the receptacle without having to move the ladder you are using to service the fixture, 3' from directly above would be acceptable and meet the intent of NEC 410.62(C)(1)(1) .

11. Is a NFPA 70E Arc Flash study required by State of Wisconsin electrical codes or is it an OSHA requirement?

Answer: Not a state electrical code requirement.

NFPA-70E details the requirements of what must be included in an Arc Flash study. Presently, the National Electrical Code does not require an Arc Flash analysis study & NFPA 70E is not an adopted State of Wisconsin code standard. The document is enforced by OSHA and used by many businesses to ensure worker safety.

NEC 110.16 requires that the Electrical equipment such as the switchboards, panelboards and etc... Be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment. (An Arc Flash Warning Sticker is required for all non-dwelling panelboard locations)

ANSI-Z535.4-1998 under Product Safety Signs and Labels provides guidelines for the design of safety signs and labels for your application/question.

NFPA-70E provides additional assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

- 12.** Can sump pumps, sewer pumps and condensate pumps be supplied by the legally required branch NEC Article 701? I assume yes as sewage overflow is a health hazard and flooding would also create a safety issue. Please let me know what you think.

Answer: No. The sump & sewer pumps would need to be supplied by an optional standby system NEC Article 702. Such pumps are not legally required to be provided with stand-by power. Pumps are not listed in Chapter 27 of the IBC, and as such would not be allowed to be connected to a legally required system. Also, 2015 Wisconsin Act 55 prohibits municipalities from adopting or enforcing electrical codes that are not in strict conformity with state codes. The sump pumps could be installed as part of a NEC 702, Optional Stand-by Load as long as the generator was sized to accommodate all of the required loads plus all optional loads.

- 13.** We have an 8ft x 12ft wood framed concession stand that will be used somewhere between 20 and 30 times per year. It is located on the parking lot of a school. The village has installed Ground Fault outlets on a light pole for us to use. Our thought was to use an extension cord from the light pole to power the building during those few hours of use on those occasions for home soccer games. When the building is not in use we will un-plug the extension cord. We were hoping that because of the potential need to move the building for snow clearing in winter that the connection for power could be considered temporary and the extension cord would be sufficient. Is this method permitted?

Answer: If the concession stand was installed on wheels, it might be allowable to utilize a cord and plug connection to supply the stand. We consider this a permanent structure. NEC 400.7 & 400.8 prohibits the installation as proposed. The stand must be hard wired with all wiring installed to 2011 NEC & SPS 316 requirements.

- 14.** We have a hotel project under construction. Rooms have kitchenettes, microwave and dishwasher. The microwave will be wall mounted directly above the sink. The electrician mounted a single, non GFCI protected receptacle about 3 feet directly above the sink to serve the microwave. The receptacle will be above the microwave, yet well within 6 feet of the sink. Is this permitted?

Answer: No. NEC 210.8(B)(5) requires the receptacle to be GFC I protected within 6' of sinks. The GFCI is also required to be readily accessible as defined in NEC article 100.

15. A contractor wants to add UL labels to unlabeled products at the job site. Is this acceptable?

Answer: No. UL Marks may only be applied at manufacturing facilities authorized by UL. Any violations should be immediately reported to UL. The only exception is if UL authorizes the UL Mark to be applied in the field as a result of a field inspection. During a field inspection UL representatives determine if the product complies with applicable safety standards and requirements, and if compliance is determined product labeling is performed in the presence of the UL representative. However, this takes place only after the local authority having jurisdiction has been consulted. When equipment is not listed, Wisconsin State Electrical Code in SPS 316.012(1) allows a qualified independent third party such as a nationally recognized testing laboratory or professional engineer to perform an evaluation of such equipment to an applicable standard.

16. I have a contractor that is telling me that he always drops SO cord to hardwire machinery in manufacturing facilities. This machinery is fasted to the floor. Apparently, and according to him, this has been allowed in numerous jurisdictions and inspected as being code compliant. I have never allowed this in the past, and reading through NEC 400.7 & 400.8, I don't see anything allowing it in either one of those code references.

Answer: You are correct in the code sections pertaining to the permitted & non-permitted uses of cords. Flexible cord is not allowed as a substitute for the permanent wiring of the building. NEC 400.7(A)(6) permits flexible cords used to connect utilization equipment to facilitate frequent interchange. The utilization equipment supplied by a flexible cord must have an attachment plug (400.7(B)) (See attached). In this installation I do not see a cord & plug connection. This is a violation of NEC 400.7(B). In determining frequent interchange, a letter from the owner of the building explaining the process of the equipment may assist with compliance. NEC 400.7(A)(7) may permit a connection without a cord & plug if the machine meets the following criteria: (7) Prevention of the transmission of noise or vibration

17. Does the initial foot candle requirement located in the IBC code required along the path of egress for Emergency lighting need to be a min of 1FC or maintain an average of 1FC?

Answer: Minimum of 1 FC for normal illumination. Average of 1 FC for emergency illumination. The following is copied from 2009 IBC 1006.4 and is unaltered by SPS 362. 1006.4 **Performance of system.** Emergency lighting facilities shall be arranged to provide initial illumination that is at least an average of 1 foot-candle (11 lux) and a minimum at any point of 0.1 foot-candle (1 lux) measured along the path of egress at floor level.

- 18.** We are looking at a project that involves installing power and data openings in an existing 1-hour fire wall. My understanding is that the boxes have to be attached to the structure and not only supported by the drywall. Is this accurate? We understand the back to back separation and rated component portion, but would appreciate clarification on the mounting.

Answer: The boxes are required to be fastened to the studs. See the language from the UL White Book below. Certified single- and double-gang metallic outlet and switch boxes with metallic or nonmetallic cover plates may be used in bearing and nonbearing wood stud and steel stud walls with ratings not exceeding 2 hrs. The boxes are intended to be fastened to the studs with the openings in the wallboard facing cut so that the clearance between the boxes and the wallboard does not exceed 1/8 in. The boxes are intended to be installed so that the surface area of individual boxes does not exceed 16 sq in, and the aggregate surface area of the boxes does not exceed 100 sq in per 100 sq ft of wall surface.

- 19.** Is there any licensing exemption that would allow a School District Maintenance employee to install wiring in a School District building? I am aware of the exemption for Industrial and/or Manufacturing but I don't believe it would apply to the School District.

Answer: Unlicensed individuals can do limited maintenance/repair work per the exceptions in ss 101.862(4). They would not be able to do installation work.

- 20.** I have a new plating line being installed in a factory and the control panels only have a CE rating. Should I be requiring a third party to list this equipment? The equipment is from Germany.

Answer: If the inspector is not comfortable approving the installation, a field evaluation from a NRTL or Wisconsin professional engineer can be required in accordance with SPS 316.012. It reads: **SPS 316.012 Use of approved materials and construction methods:** 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. SPS 316.012 **Note:** Examples of a qualified independent third party include a nationally recognized testing laboratory and a professional engineer. CE Marking is not recognized in the United States as a qualified National Recognized Testing Lab. **The CE marking on products is not a certification mark.**

- 21.** I have a contractor that is in the bid process of a new Hospital. The concern is that with the 2017 NEC adoption somewhat eminent, the Contractor is unsure of how to bid the project, whether to base it on the 2011 NEC or 2017 NEC. I told the Contractor that I always enforced the NEC

edition based on the date the **Building Plans** for the project were **approved**. Please let me know your thoughts as the difference could mean several thousand dollars.

Answer: You are correct. The answer is located in SPS 361.003(7). It reads as follows: **(7) NEW BUILDINGS AND STRUCTURES.** Buildings, structures and additions to buildings, structures and components, to be constructed or erected shall be designed, constructed and maintained in accordance with the rules of this code as the rules exist on one of the following:

SPS 361.03(7)(a) **(a)** Pursuant to s. SPS 361.30, the date plans for the building, structure or addition are approved by the department or authorized representative.

SPS 361.03(7)(b) **(b)** The date the local building permit is issued, if plan submission and approval is not required under s. SPS 361.30.

SPS 361.03(7)(c) **(c)** The date construction is initiated, where pars. (a) and (b) do not apply.

You are correct in stating to the contractor that the date the plans are approved is used for the compliance of the NEC edition in effect.

- 22.** I'm trying to decipher exactly what the requirements are for enclosure ratings of safety switches (disconnects) and load centers in agriculture buildings, specifically inside a traditional style pipeline milking barn and a free stall barn for dairy cattle. According to 547.5 (C), they must be rated for the conditions. 547.1(B)(1) states animal excrement may cause corrosive vapors, which I interpret as a corrosive atmosphere. What exactly are the requirements for these buildings for the enclosure ratings? Are they required to be plastic? Or can steel be used?

Answer: Our State of Wisconsin Electrical group wouldn't consider the inside of an entire agricultural building to be a corrosive atmosphere, only places where the corrosive conditions exist (near a manure pit or places that are washed down using chemicals). Typically, electrical equipment is placed in areas that we would not consider to be a corrosive environment. For example, in a typical free-stall barn, we would not consider it to be a corrosive area, but we would consider it as an area that is subject to excessive dust and require the enclosures to be at least a Type 4. Metallic enclosures could be used in a corrosive environment as some Type 4X enclosures are constructed of aluminum but have a finish that is suitable for the environment. NEC 547.5(C)(3) requires the following: **(3) Corrosive Atmosphere.** Where wet dust, excessive moisture, corrosive gases or vapors, or other corrosive conditions may be present, equipment enclosures, boxes, conduit bodies, and fittings shall have corrosion resistance properties suitable for the conditions.

Informational Note No. 1: See Table 110.28 for appropriate enclosure type designations.

Per NEC Table 110.28 if the location is deemed corrosive, you are correct a 4X or even a 6P enclosure shall be selected. You are correct that while not a requirement NEC 547.5(C)(3) Info

note 2 assists with proper installation selection in corrosive conditions. Informational Note No.

2: Aluminum and magnetic ferrous materials may corrode in agricultural environments. Plastic is not corrosive and is commonly used in these locations. Steel has magnetic ferrous materials and may corrode and should not be used unless a suitable finish is suitable for the environment.

- 23.** Would two separate freestanding sections of 1200 amp gear 54" wide each separated and connected by nipples that are 10-12" long be exempt from the requirements of 110.26 C 2&3? I have a retrofit where I can either use individual breaker enclosures or a gear lineup but existing door layout prohibits the doors at each end of the gear as well as an existing door that swings inward that prevent meeting the requirements of gear 1200 amps over 6' in width. I can use 4 individual breaker enclosures mounted to wall but I feel the gear sections are a cleaner approach.

Answer: You would be exempt from the requirement outlined in NEC 110.26(C)(2) since the equipment proposed is not over (6' wide). You would not be exempt from NEC 110.26(C)(3). NEC 110.26 (C)(3) shall be enforced. It reads: **Personnel Doors.** Where **equipment rated 1200 Amps or more** that contains overcurrent devices, switching devices, or control devices is installed and there is a personnel door(s) intended for entrance to and egress from the working space less than 7.6 m (25 ft) from the nearest edge of the working space, the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure. The existing door outlined in your email must comply with NEC 110.26(C)(3) and open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.

- 24.** Does UL consider other non-electrical requirements when certifying a product for safety?

Answer: Yes. A UL Certification Mark means the product has been investigated for all foreseen hazards typically relating to electric shock, fire and injury to people. In addition, UL doesn't only certify electrical products; UL writes safety standards and certifies products in a broad spectrum from building materials and fire resistive assemblies to plumbing fixtures and water treatment additives to sustainable products.

- 25.** I am having people asking questions on when an EQ plane **Shall be installed.** I know what NEC 547.10 (A) (1) says. The question comes in when the code says (NEC where metallic equipment may become energized and accessible to live stock). I have been told when in all metal building (complete metal frames) it requires a plane in the entire floor. Wood buildings with fans mounted on wood post (structures) do not need it. What is the SPS official interpretation of where and when it is required? I need the answer back (asp)

Answer: NEC 547.10 defines where the plane is required. State of Wisconsin has no additional requirements that differ from the NEC. **NEC 547.10 Reads: (A) Where Required.** Equipotential planes shall be installed where required in (A)(1) and (A)(2). **(1) Indoors.** Equipotential planes shall be installed in confinement areas with concrete floors where metallic equipment is located that may become energized and is accessible to livestock. **(2) Outdoors.** Equipotential planes shall be installed in concrete slabs where

metallic equipment is located that may become energized and is accessible to livestock. The equipotential plane shall encompass the area where the livestock stands while accessing metallic equipment that may become energized. Note: The building type, (wood or steel construction) is not the defining factor if a plane is required and where the plane shall be installed. If electrical equipment is attached to the steel structure and any structural steel supports that can come into contact with livestock then yes a plane would be required throughout the entire floor where accessible to the livestock. Site conditions come into play on projects like these.

- 26.** Good morning DSPS, the question has arisen about using hospital grade receptacles in non-patient care areas. Is this a requirement to use hospital grade receptacles in areas such as offices, utility rooms, equipment rooms, and storage areas in the hospital, where patients will not be present?

Answer: No. NEC 517.18(B) requires only the Patient Bed location areas to be installed with receptacles identified as "Hospital Grade". Offices, utility rooms, equipment rooms, and storage areas in the hospital, do not require hospital grade receptacles per the NEC. Our State of Wisconsin SPS 316 electrical code does not modify the minimum NEC requirement. NEC 517.18(B) reads as follows: ***(B) Patient Bed Location Receptacles. Each patient bed location shall be provided with a minimum of eight receptacles. They shall be permitted to be of the single, duplex, or quadruplex type or any combination of the three. All receptacles shall be listed "hospital grade" and shall be so identified.***

- 27.** Are you required to have a switched neutral when using a 4-wire standby generator connected to a service entrance rated automatic transfer switch and a 4-wire electric service?

Answer: It depends on how the generator is wired. The pictures below show a single phase service, but the connections would be the same for a three phase service. The pictures also show a separate service disconnect and overcurrent protective device, but if the transfer switch is rated as suitable for use as service equipment and has overcurrent protection in it the connections from the generator would not change, just the location of the main bonding jumper would change (it would be in the transfer switch). If the neutral and equipment ground are connected at the generator it would be a separately derived system and the transfer switch would have to switch the neutral. See below. (Some generators have a removable jumper that can be removed to make a separately derived system and non-separately derived system)

- 28.** Is it legal to install a 15 amp rated light switch on a 20 amp branch circuit. The load of the permanently wired luminaires (not cord and plug) is considerably less than 15 amps. I have looked under article 210 and 404 and cannot find where it would not be legal for this application. Please help!

Answer: Yes. NEC 404.14 is helpful in understanding the requirement. It reads:

404.14 Rating and Use of Snap Switches. Snap switches shall be used within their ratings and as indicated in 404.14(A)through (F).

The current code requires (2) current related things of the branch circuit conductors. 1) That they have sufficient ampacity for the load served.

2) That they be suitably protected by the OCPD feeding the circuit.

But code only requires one current related thing of switches:

1) That they be rated for the load served. NEC 404.14.

The switch only sees the current that will be passing through the load it serves. If that load is under 15 amps, you can use a 15 amp switch to control it. If a given switch serves a load that exceeds 15 amps, then that switch must be rated for more than 15 amps.

- 29.** I had an electrical inspector ask if emergency power for egress lighting is required to be installed in bathrooms. Will the answer guys please help!

Answer: No. IBC 1006.3 does not require EMERGENCY POWER for egress illumination. Note that 2015 - IBC 1008.3.3 WILL require emergency power for public restrooms with an area greater than 300 square feet

- 30.** Yesterday I received a call from a new customer who wants to put in a new restaurant in part of an existing building. The existing service is not sufficient, and is located on the opposite side of the building, and not practical to consolidate a new service into for the restaurant, so we will have to install an additional service for the restaurant. I know that you cannot have two services from different sources unless the services are separated by a fire wall. The structure has an existing cement block wall that separates the area of the new service from the existing service. So, my question is: is this sufficient to satisfy the code or are there other considerations that I need to consider?

Answer: If the new service is of a different nominal voltage from the first service it would be acceptable. If the services share the same nominal voltage, one of the following conditions must be met:

- The fire separation must be 3 hr. with all door openings 3 hr. rated.
 - The (2) services of the same voltage is permitted where if located more than 150 feet apart, measured in a straight line, and provided that all electrical wiring supplied by each service has no common raceway or connection with any other service.
 - Depending on unique utility circumstances, a petition for variance may be granted to allow the second service.
- 31.** Does a garage which houses compressed natural gas vehicles but does not meet the definitions in NEC Article 511.2 for “Major Repair Garage” or “Minor Repair Garage” have a classified area at the ceiling?

Answer: No. **NEC 511.3 Area Classification, General. A) Parking Garage Reads:** Parking garages used for parking or storage shall be permitted to be unclassified. Informational Note: For further information, see NFPA 88A- 2011, *Standard for Parking Structures*, and NFPA 30A-2008, *Code for Motor Fuel Dispensing Facilities and Repair Garages*. **Please note: key language “parking or storage”**

- 32.** Can a person attach to a piece of rebar sticking out of the bottom of a footing that is in direct contact with earth?? At a code seminar it was brought to our attention that this was not allowed because the theory was that the rebar would eventually rust and deteriorate over time resulting in the loss of that electrode. This was at a Wisconsin seminar and it might have been Neitzl but not for sure.

Answer: You are correct with the theory of the rebar rusting if not provided with corrosion protection. Many AHJ's in Wisconsin & throughout the country have been requiring the rebar to be located where not subject to corrosion and are using various language in Article 110 to assist. Thankfully this been clarified in the 2017 NEC to assist us. 2017 NEC 250.68(C)(3) reads: A rebar-type concrete-encased electrode installed in accordance with 250.52(A)(3) with an additional rebar section extended from its location within the concrete to an accessible location that is not subject to corrosion shall be permitted for connection of grounding electrode conductors and bonding jumpers. The rebar extension shall not be exposed to contact with the earth without corrosion protection. Our group would support compliance now with installation clarification in the 2017 NEC. This is a life safety code, and when given the opportunity to interpret the NEC it's good to have clarification in codes not yet adopted to assist.

- 33.** I have a situation where an electrician ran Romex along the trusses to feed some lights for a covered porch in a hotel. The trusses and Romex are exposed from underneath to the outside. I feel this is a damp location and Romex should not be allowed. The electrician feels it's under a roof and is the same situation as a garage. What would you allow?

Answer: Article 100 definitions are helpful in your enforcement. Historically, the State has permitted NM romex in covered exterior soffits and porch's. If the NM is exposed and not covered under the porch Article 100 definition of location "damp" & "dry" can be used to assist. It reads: Location, Damp. Locations protected from weather and not subject to saturation with water or other liquids but subject to moderate degrees of moisture. Examples of such locations include partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold-storage warehouses. Location, Dry. A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction. The question you need to answer: What article 100 definition of location does the installation meet? We would agree with your assessment based on the clear definition of a damp location "roofed open porches"

- 34.** NFPA 110, 2005 edition, section 7.2.2 requires Level 1 EPSS to not be in the same room with normal service equipment which is over 150V and over 1000A. Is there a room construction requirement that should be separating the EPSS equipment from the normal equipment, such as 2-hour fire rating? I would assume this separation is required to mitigate fire damage caused from an explosion on the normal service equipment.

Answer: NFPA 110 does not have any requirements on the rating of the separating walls between an EPSS and the normal service equipment. The separating walls are not required to have a rating. You are correct that this requirement is to prevent a catastrophic failure of the normal equipment from damaging the EPSS.

- 35.** We are having difficulty locating in the national codes and standards where the clearance requirements are for oil-filled transformers and building openings, combustible walls/surfaces, windows, doors, etc. Could you please direct us to where these distances are defined?

Answer: We don't know of any specific clearances from the items you mentioned, but oil insulated transformers installed indoors have to be in a vault constructed in accordance with Part III of Article 450 unless one of the exceptions are met. Part III is pretty restrictive with no combustibles allowed.

For oil insulated transformers installed outdoors, 450.27 has rules to follow if the installation presents a fire hazard. There is nothing to define when an outdoor transformer presents a fire hazard. The NEC also lists various options but no specific requirements for how those options are implemented. I would verify protection methods with the building code official.

Less flammable liquid insulated transformers installed indoors shall be installed in accordance with 450.23(A)(1), (2), or (3). No distances mentioned if you meet the conditions.

Also check with the manufacturer for installation requirements.

- 36.** We have a condition in a major repair garage where we are being required to install explosion proof photoeye sensors. We feel that with the ventilation that is being used to declassify the floor area that we do not have to comply with this requirement.

Answer: SPS 316.511(1) deletes the allowance for unclassifying the floor area of a major repair garage by providing ventilation. The floor areas of major repair garages are considered Class 1 Division 2 whether ventilation is provided or not.

- 37.** We have a project we are working on finalizing designs for a building. It is classified as an A3 occupancy. This is all wood construction, with 5/8" drywall. No specific fire rating has been stated. It is non-sprinkled. Per 517.4(B) – if the building does not have a fire rating, we can use romex (nm cable). If they do give it a fire rating, we must use MC cable. Is this statement correct?

Answer: You are correct. The architect should be able to give you the construction type (Type VB for example) and that would tell you if it is rated construction or not. Informative Annex E on page 814 of the 2011 NEC has some helpful information.

- 38.** Is the label for a sign required to be on the exterior of the sign or can it be on the interior of the sign? I am

not able to find any reference for this.

Answer: The markings are not required to be on the outside of the sign per 600.4(C).
(C) Visibility. The markings required in 600.4(A) and listing labels shall not be required to be visible after installation but shall be permanently applied in a location visible during servicing.

- 39.** I just had a guy ask me if he adds a 12volt chair lift by his swimming pool that he brings a battery to, does that have to be bonded to the bonding system in the pool? It is a commercial pool in a hotel and he has to fasten it down to the concrete. Any help you can give me that would be greatly appreciated!

Answer: It would need to be bonded to the bonding system per 680.26(B)(7).

- 40.** One of my industrial customers is looking to place a pad mount transformer (oil filled) next to a masonry building which will require windows to be closed up. Would sheet steel over the window opening with a steel frame inside be acceptable? Utility code states that Sheet steel with a wood frame is considered combustible. What about no wood?

Answer: It would have to be installed per 450.23(B) or 450.27 depending on the type of liquid in the transformer. The use of one or more of the protection methods listed in 450.27 would depend on the site conditions.

- 41.** I have a 5-unit townhouse with a group of meters on one end of the building. The ufer ground is connected in the end unit garage. The water services are copper and will be bonded. Here are my questions:
Since each of the units are independently owned, should I be concerned about the ufer being in only one unit? I hoping that since it will be behind a sheetrocked wall it will be out-of-sight-out-of-mind and no one will mess with it. Any thoughts?
Each 4-wire feeder runs from the service disconnect to subpanel in each unit. Can the water be grounded from the subpanel or does the grounding electrode conductor need to go from each of the 5 water services back to the service equipment?

Answer: The ufer ground only has to be connected in one location per 250.52(A)(3)(2). If the connection is made to rebar that is stubbed up it has to be accessible per 250.68(A).
If the water pipes qualify as a grounding electrode per 250.52(A)(1) they all would have to be connected per 250.50 using individual grounding electrode conductors or bonding jumpers.
The location of the grounding electrode conductor connection is described in 250.24(A)(1) which is typically the neutral bar in the service equipment.

- 42.** We have a conduit less than 24" long feeding from a j-box to a "T" conduit body. Our conduit fill comes in slightly higher than 40%. Would this fall under the 60% fill note?

Answer: You would not be able to use the 60 percent fill. Note 4 to the tables in Chapter 9 indicate you can fill conduit or tubing to 60 percent when the conduit or tubing is less than 24 inches and they "are installed between boxes, cabinets, and similar enclosures".

We would not consider a conduit body a "similar enclosure" as a box or cabinet. You would be limited to 40 percent fill for the raceway.

- 43.** I wanted to check on something before we proceed with plans. A new county highway shop will have a fire pump in its own room. Can I use free wall space in the room to mount keycard access system panels? There would be duplex outlets for the power supplies and data outlets as the system is IP based. Keeping minimum clearance distances is a given. I'm not sure if there is a building code that only fire pump related equipment can be in a fire pump room.

Answer: NFPA 20 5.12.1.1.4 limits equipment in fire pump rooms to only that which is essential to the operation of the pump and related components.

5.12.1.1.4 Rooms containing fire pumps shall be free from storage and penetrations not essential to the operation of the pump and related components.

- 44.** What does NFPA 110 say about the location of transfer switches?

Answer: 2005 NFPA 110 section 7.2.2 prohibits the installation of a Level 1 EPSS in the same room as the normal service equipment when the service equipment is rated over 150 volt to ground and 1000 amperes or greater. Section 3.3.5 defines an EPSS as all components of the systems "up to and including the load terminals of the transfer equipment....".

- 45.** We are currently working on a CBRF and our inspector is saying we need fan rated boxes in the bed rooms. We ran a 12-2 for each switch leg. NEC 314.27(C) says only if a 3 wire is installed to the lighting outlet, and SPS 316 only requires for dwelling units. There are no provisions at all for cooking in the rooms. So I'm at a loss as to why the inspector is requiring this. Please let me know if I'm wrong in my thinking.

Answer: If the CBRF does not meet the Article 100 definition of a dwelling unit, then the units can be wired per specifications. NEC & SPS316 dwelling unit code requirements including fan box requirements per SPS 316.314 would not apply.

- 46.** What is the state's interpretation, are elevators classed as an emergency load?

Answer: Section 2702 of the IBC is what is used to determine what is to be supplied with an emergency system and what is to be supplied by a standby system. IBC 2702.2.5 requires accessible means of egress elevators to be supplied by standby power (Article 701). IBC 2702.2.18 requires elevators be provided with a standby power system in accordance with the sections listed. Backup power for elevators is not considered an Article 700 Emergency system. IBC 2702.2.14 references 403.4.7 and 403.4.8 for high rise buildings and does have some allowances for a few other things to be connected to the emergency system, but 403.4.7.2 specifies that backup power for elevators shall be a standby system.

- 47.** Can you please answer the following? Building inspector is stating all gas pipe must be bonded per NFPA 54, even if the below is installed. Is this a new adoption, we have never bonded the gas pipe with a

heavy-walled flexible pipe? Please let me know.

Answer: From the DSPS Commercial building group:

In the WI Commercial Bldg Code, 2009 IFGC adopts NFPA 54-2007 under SPS 365.0800. How the NFPA 54 standard is to be applied is addressed under SPS 365.0400. CSST bonding requirements, in addition requirements in NFPA 54, can be found under 2009 IFGC 310. It should be noted that WI Building Product Evaluation Approval 201107-H FN 0119007 recognizes a conductive jacketed CSST tubing, thus a separate bonding wire would not be required. Other similar approvals for such gas tubing assemblies have been recognized by ICC testing services.

- 48.** We are currently wiring a Class IIB Church building. Occupancy is 400-500. Single story 10,591 square feet slab on grade. It is a completely metal frame building with metal stud walls. I would like to use PVC under slab for a lot of the feeders. Are there any restrictions on using PVC in the church building itself? Would I need to switch to a metal rigid elbow to penetrate the slab?

Answer: According to Table 601 in the IBC a Type IIB building does not have a fire rating and is considered Nonrated construction. 518.4(B) would allow PVC to be used in Type IIB building.

- 49.** I have just started inspecting for the City a couple of months ago. I have a couple of local contractors in the area that think a fixture whip does not need to be supported at the junction box per NEC 330.30D (due to 6' length) and I have been using NEC 330.30B and requiring it. Am I interpreting this correctly?

Answer: NEC 330.30(b) starts by saying "unless otherwise provided". NEC 330.30(D) provides an alternative to the main rule. NEC 330.30(D) can be used as long as the conditions are met in the article. It reads: (D) Unsupported Cables. Type MC cable shall be permitted to be unsupported where the cable: (1) Is fished between access points through concealed spaces in finished buildings or structures and supporting is impractical; or (2) Is not more than 1.8 m (6 ft) in length from the last point of cable support to the point of connection to luminaires or other electrical equipment and the cable and point of connection are within an accessible ceiling.

- 50.** We have a question about emergency lighting for a large room with two or more exits. If the architect has established a defined 36" wide path of egress path on their published plans are we required to provide emergency egress lighting beyond the defined path to include the entire room lit to 1 foot candle average as defined in the IBC?

The application in this case is a large service area and showroom of a car dealership building.

Answer: I understand that the architect has established a 36" wide path of egress on the published plans. In a showroom for cars we see different vehicles moved in and out that could block the designated aisle ways. In the open showroom of a car dealership we would expect the total area to be lit to at least one foot candle as required by 1006.2, and the emergency lighting would have to average 1 foot candle in accordance with 1006.4.

- 51.** The project is an ambulatory surgery center and professional office building. In the future (unknown time frame) the facility will become a full I-2 occupancy. We are designing as much as we can to an I-2. The question that arose is if lighting egress needs to provide illumination extending just past the width of the exterior door opening or if it needs to extend to the site's property line.

Answer: The exit discharge is required to be automatically illuminated upon power failure per 1006.3 (5). This is generally taken to mean that the illumination has to extend until a person has more than one direction of travel from the building.

- 52.** Is there any code prohibiting or establishing criteria for installing gas lines and electric lines in the same trench? Reviewing both the IFGS and NFPA 54, I can't seem to identify anything applicable, but it seems logical this might not be allowed (or there may be some installation/separation requirements.)

Answer: Chapter 7 of NFPA 54 would not prohibit the installation of gas lines and electrical lines in the same trench.

- 53.** I'm working on a project with indoor multi-stack metering located in an underground parking structure for an apartment complex. The meter stack is located against the elevator shaft which the sprinkler contractor must also enter from the same side due to building constraints. The meters are not in a dedicated room but do have the working clearances marked out with protective bollards since the equipment is near the drive aisle.

Do the rules of NEC 110.26(E)(1) apply to multi-stack metering?

If they do apply then can I have the sprinkler contractor run his pipe over the 4" spacer between the termination compartment and the meters to the left of it?

If the sprinkler pipe is run above the spacer NEC 110.26(E)(1)(b) states that there would need to be protected from condensation, leaks and breaks. What would you expect to see for this protection?

Answer: Yes the rules of NEC 110.26 (E)(1) do apply, if there overcurrent protection for each meter. If this is the case the meter stack may be considered to be a panelboard.

My next question is what is your ceiling height in this basement? Do you have 6 feet above the metering equipment NEC 110.26 (E)(1) (a) would allow a pipe above the metering equipment if it is higher than 6 feet above the top of the equipment.

If not then I would say you could have the sprinkler contractor run his pipe over the 4" spacer between the termination box and the metering equipment.

For your question # 3 a pan of some sort would be appropriate for protection from leaks and breaks.

- 54.** I had a customer use 14-2 nm cable to feed the horn strobe lights on his fire alarm system. Is that true he can use 14-2 nm-b cable on his fire alarm system?

Answer: No. NPLFA conductors shall comply with 760.49(A) & (B) and NFPLA cables shall comply with 760.53. PLFA cables shall be of the type described in 760.179 in accordance with 760.130(B).

- 55.** The addition we are working on requires we add a fire pump. 695 in the NEC says we can use the Electric Utility Service Connection if it is a separate service or from a connection located ahead of and not in the same cabinet, enclosure, vertical switchgear section, or vertical switchboard section as the service disconnecting means. I would like to design it using this section 695.3(A)(1), and not use an on-site standby generator.

Answer: A fire pump is allowed to be supplied from a separate service without generator backup where the AHJ deems the source "reliable". See 695.3(A). You may want to contact the electrical inspector that is involved with this project as they may want to see some data from the utility provider regarding the reliability of the power distribution in the area.

- 56.** We are looking at the electrical prints for a cell tower with a backup generator. SPS 316.700 says that a generator needs to be 20 feet from electrical metering. This does not seem logical to me. Why 20 feet? This distance seems a lot for a small project.

Answer: The 20 feet is in case of an explosion or fire. If the generator is too close to the Normal Power Supply and say that the transformer had a fire, The generator could also catch on fire. Now you would lose your normal source of power and your emergency source of power. The equipment shall be designed and located so as to minimize the hazards that might cause complete failure due to flooding, fires, icing and vandalism. If this generator is for optional stand-by power the 20 feet would not be required. SPS 316.700 is for Emergency Circuits in 700,701. 702 is an optional system and the requirements of SPS 316.700 would not apply.

- 57.** If an EC is installing a panel and components for industrial machinery does the completed panel required UL listing as an assembly?
If so, is the owner of the equipment or the EC responsible for getting this listing?

Answer: The code does not require that control panels be listed, part III of NEC 409 provides the AHJ with a set of requirements that can be used as a benchmark for approval of a field-constructed control panel. I recommend that you look through article 409 in the 2011 NEC 409.110 Marking. In this section there are several things an Industrial Control Panel shall be marked with after installation. If the inspector is not comfortable approving the installation, he or she could require an evaluation in accordance with SPS 316.012.

- 58.** I have a two story building that is being renovated. Main floor and basement are occupied by a restaurant. Second floor and penthouse is an office which is also the building owner. The electrical contractor currently has two meters set on the building - one for each tenant space. I am citing PSC 113.0802(3) to require a 3rd meter for common area loads including elevator, stairwell lighting, parking lot light, and other misc. common loads. Electrical contractor contends that the common area loads can be served by the owner's meter. What if the owner leases his space out in the future? Should the building have 2 or 3 meters?

Answer: Yes a common meter & panel is required per the PSC 113.803(3) and NEC 210.25(B) If the tenant who has the common lighting in their panel fails to pay the utility bill and is disconnected, the common lighting is also disconnected. This can create safety issues if the stairwell and basement lights are disconnected.

- 59.** Can NM cable be used in Type III-B construction in an A2 or A3 occupancy in rated and non-rated construction for less than 100 persons?

Answer: Yes NM-B Cable can be used in this Type III-B construction.

334.10 Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following:

- (1) One- and two-family dwellings and their attached or detached garages, and their storage buildings
 - (2) Multifamily dwellings permitted to be of Types III, IV, and V construction except as prohibited in 334.12.
 - (3) Other structures permitted to be of Types III, IV, and V construction except as prohibited in 334.12.
- Cables

- 60.** I received a question from a customer asking if there is any code not allowing pneumatic air lines to be pulled in the same conduit as 24v control cables. I see the installation often but I guess I haven't seen any code not allowing it. Or would this be an AHJ question?

Answer: NEC 300.8 does not apply to Class 1, 2 or 3 circuits per the 2011 NEC 725.3. Pneumatic tubing is allowed to be installed in the same raceway as Class 1, 2 or 3 circuits. Note that the 2017 NEC would prohibit this installation per 725.3(K).

- 61.** Do the requirement of NEC 110.26, space clearance apply to disconnects located above the suspended ceiling?

Answer: Maybe. Do the disconnects contain overcurrent protection? If so NEC 110.26(A) applies. The minimum dimension is 36-inches measured in the direction of access to the electrical parts or equipment. The 2017 NEC does have wording for clearances above suspended ceilings. We have not adopted the 2017 NEC but thought you would like to read what is to be in the 2017 code NEC 110.26 (A)(4) Limited Access. Where equipment operating at 1000 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized is required by installation instructions or function to be located in a space with limited access, all of the following shall apply:

- (a) Where equipment is installed above a lay-in ceiling, there shall be an opening not smaller than 559 mm × 559 mm (22 in. × 22 in.), or in a crawl space, there shall be an accessible opening not smaller than 559 mm × 762 mm (22 in. × 30 in.).
- (b) The width of the working space shall be the width of the equipment enclosure or a minimum of 762 mm (30 in.), whichever is greater.
- (c) All enclosure doors or hinged panels shall be capable of opening a minimum of 90 degrees.
- (d) The space in front of the enclosure shall comply with the depth requirements of Table 110.26(A)(1). The maximum height of the working space shall be the height necessary to install the equipment in the limited space. A horizontal ceiling structural member or access panel shall be permitted in this space.

- 62.** Are there any special wiring requirements for a new Veterinary Clinic? I checked the NEC, but couldn't find anything.

Answer: To wire a veterinary clinic you would follow the requirements of SPS 316 and 2011 NEC. There are no special requirements. You may be thinking of a Health Care Facility, these requirements do not apply to animal hospitals.

- 63.** I have a remodeling and additions project at our High School. This building will have a new emergency generator which will power life safety egress lighting. The generator is anticipated to be natural gas fueled. This building is also designated as a storm shelter. My question is: Since this building is a storm shelter is a certain fueling system for the generator required by code? If the generator is natural gas is a dual fuel source (LP backup) required?

Answer: Take a look in SPS 316.700(3) it states "The requirements in NEC 700.12 (B) (3) are not included as part of this chapter." The Dual Supply requirements of 700.12(B)(3) do not apply in Wisconsin.

- 64.** We have a project that is a service department of a car dealership. The service area is ventilated at less than 4 air changes per hour so NEC 511.3(1)(b) has been applied to this project with the entire floor area up to a level of 18 in above the floor is classified as Class I, Division 2. The overhead doors have sensor eyes located 6" above the floor which are low voltage. The local inspector says these sensor eyes need to be moved up to 18 in. NEC 511.3(1)(b) only applies to line

voltage NOT low voltage in this case for the sensor eyes correct? The sensor eyes have to be 6" above the floor for UL safety requirements.

Answer: The wiring to the low voltage sensors is in a Class I Division 2 or Group B environment when located less than 18" above the floor. The wiring to the sensors has to be rated for the location. NEC 500.1 the Scope covers the requirements for electrical wiring and electronic equipment and wiring for all voltages in a Class I, Division I and 2 Location.

They do make photo eyes and sensors for garage door openers that are rated for the environment. You had stated the sensors need to be located at 6" above the floor for the UL listing. The sensors and wiring need to be rated for the location in which they are placed.

NEC 501.150 Signaling ,Alarm, Remote Control, and Communication Systems

(B) Class I, Division 2. In Class I, Division 2 locations, signaling, alarm, remote-control, and communications systems shall comply with 501.150(B)(1) through (B)(4).

(4) Wiring and Sealing. All wiring shall comply with 501.10(B), 501.15(B), and 501.15(C).

65. I'm working at a job where they are trying to incorporate power cable trays under 600 volts.

They will use conduits to go to motors, disconnects & panel boards. They will use TC, MC, & VFD cables in cable trays & conduits. I can't find fill tables for conduits where multiconductor cables will be used. I did see notes to ampacities where jamming can occur. Is there derating where 2 or more multiconductor cables are in a conduit.

Answer: NEC 358.22 directs us to use the Chapter 9 Tables for conduit fill. Note (9) to the Tables indicates that cables shall be treated as a single conductor using the cross sectional area for conduit fill purposes.

66. We have a question here from a girl in charge this year of our 4H building at the fairgrounds that parents have brought up. They serve food out of this building. It is a metal building (wood frame, pole barn, metal on the outside, no inside covering) and it is wired in Romex. It has been like this since day one...back in the 70's? One parent has brought up that it is illegal and another said it is grandfathered in. It is open for maybe 3 weeks during the year and really maybe only one week during the fair.

They want to add a couple of circuits and this poor girl is stuck between these 2 parents and is wondering if the building has to be rewired or can the circuits be added with today's wiring...mc or conduit. I really don't know how to answer her so that is why I am contacting the experts. Any help you can give me would be greatly appreciated.

Answer: The wiring method that can be used for the wiring of this wood frame, pole building can be NM-B cable, conduit or MC cable.

Any wiring method recognized in Chapter 3 of the 2011 NEC unless modified by other codes.

SPS 316.334 Nonmetallic-sheathed cable: Types NM, NMC and NMS. (1) USES PERMITTED. Substitute the following wording for NEC 334.10 (3): Other structures permitted to be of Types III, IV, and V construction

except as prohibited in NEC 334.12.
NM cable shall be protected where subject to physical damage.

- 67.** I recently wired an Urgent Care area of the Hospital; I looked in NEC 517.13 (A) & (B) for the wiring method I should use. When the inspector came to inspect he would not allow the Hospital Grade MC to be used on the Critical Branch Circuits, How am I supposed to know this?

Answer: NEC 517.30 (C)(3) Mechanical Protection of the Emergency System.

The wiring of the emergency systems in hospitals shall be mechanically protected. Where installed as branch circuits in patient care areas, the installation shall comply with the requirements of 517.13(A) and (B). The following wiring methods shall be permitted:

(1) Nonflexible metal raceways, Type MI cable, or Schedule 80 PVC conduit. Nonmetallic raceways shall not be used for branch circuits that supply patient care areas.

- 68.** The farm has a diesel fuel tank. The gas tank and pump are gone. The pump motor sits on top of the tank and is wired with a blue extension cord. Do I need to wire the pump with IMC and seal-offs? Do I need to located a disconnect within sight of the pump?

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

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

- 69.** We are working on a new dairy facility. We do not install the service equipment yet. The shop drawings shown the enclosure is 73-inches high with the main disconnect near the top. I would really like to bring our pipes in from the bottom but I'm worried about it getting too high by the time we install expansion joints. Can I build a platform if we exceed the 6' 6" height to the disconnect?

Answer: Yes. NEC 110.26 The permanent platform to meet the reach range requirement is OK. The minimum size would be the minimum required by Table 110.26(A). Presumably this would be 30-in by 36-inches.

- 70.** I found this tank had been installed at an existing tank site late yesterday afternoon. This is a diesel tank. There is a solar panel attached to the roof, which powers a battery. The battery powers the pump for the diesel tank. As this is not gasoline, I did not immediately hit the panic button. Since its DC, do the requirements of the NEC apply?

Answer: Yes. NEC 514 It is a Motor fuel Dispensing Facility as covered by Article 514 of the National Electrical Code (NEC). The nice part is that it appears to be diesel fuel only and as such Section 514.3 (A) of the NEC would leave it as an unclassified area since the flammable liquids handled do not have a flash point below 100 degrees F. This allows any suitable NEC Chapter 3 wiring method as well as that allowed by Article 690 for Solar Photovoltaic Systems.

That being said, it is still a Motor fuel Dispensing Facility and NFPA 30 as well as the NEC require the emergency disconnect for power to the dispensing device. This would include disconnection of the battery.

- 71.** In an apartment unit that has a panel do we need to provide circuit breakers locks or other type of disconnect for a hard wired cook top circuit?

Answer # 30 Yes. The appliance is not motor operated so you have two options. You do need to provide a disconnecting means for the appliance that meets either NEC 422.31(A) or (B). Either a disconnect within sight or a permanently installed "lock-off" means at the branch circuit breaker is permitted.

- 72.** A trucking company customer would like us to install receptacles in their parking area for engine block heaters for the semi tractors. Do I need to GFCI protect the receptacles if I use a single receptacle for each parking space?

Answer: Yes. 210.8(B)(4) All 125 volt single phase 15 and 20 ampere receptacles located outdoors are required to be GFCI protected. Also 406.8(B)(1) would require a cover that is weather-proof whether or not a plug is inserted, and the receptacle is required to be a listed weather-resistant type. 406.4(D)(6) in the 2011 NEC requires weather-resistant receptacles be installed when replacing a receptacle that is required to be weather-resistant by the code.

- 73.** On a new restaurant project we GFCI protected the kitchen receptacles that were installed to serve the counter tops. The inspector wants us to GFCI protect all of the receptacles in the kitchen including the refrigerators. Is this correct?

Answer: Yes; 210.8(B)(2) Receptacles located in kitchens in other than dwelling units are required to be GFCI protected by 210.8(B)(2). The definition of a kitchen in Art. 100 is described as an area with a sink and permanent provisions for food preparation and cooking. All 15 and 20 ampere 125 volt single phase receptacles in this area would be required to be GFCI protected.

- 74.** I installed 16-#12 AWG THWN conductors in a 1" EMT conduit the receptacle circuits on our project. The inspector has indicated I need to change out the 20 ampere circuit breakers to 15 ampere. I know we

have not overfilled the conduit and the spec calls for 20 ampere protection for all receptacle circuits so this isn't going to work. Is there anything else I can do?

Answer: Yes 310.15(B)(2), Table 310.15(B)(2)(a), Table 310.16, Annex C Table C.1

The inspector is referring to the fact that you did not derate your conductors for the number of conductors in a raceway. 310.15(B)(2) indicates when you have more than 3 current carrying conductors in a raceway the allowable of each conductor is reduced per Table 310.15(B)(2)(a). The Table indicates that for 10-20 conductors you need to reduce the ampacity by 50%. Table 310.16 indicates a #12 THWN conductor is rated for 30 amperes using the 90 deg. Column. This would limit them to 15 amperes. You could add a conduit and divide the conductors in each conduit which would then require derating by 70% and you would be ok at 20 amperes. Or replace the conductors with #10 AWG and you would also be ok. You can check my math later but I think 16, 10 AWG THWN-2 insulated conductors will just fit in 1-inch EMT.

- 75.** I am wiring a new building that is being feed from an existing service in the power plant. I want to run 2 300 amp feeders from the I-line panel out to feed this building as my load is 480 amperes. Can I do this as the NEC says I can have only one feeder to an outdoor building or structure per NEC 225.30

Answer: Yes, SPS 316.225(2)(a) allows the installation if certain conditions are met. It reads:

For the purpose of this section, multiple feeders that are supplied from the same distribution point, having a total rating of 300 amperes or more, and that supply not more than 6 disconnecting means grouped at the same location shall be considered as one supply.

- 76.** We were asked to install a branch circuit for the vacuum pump at a new facility we are wiring. The milk equipment people then installed the VFD controller and compressor. The inspector "red-tagged" us when he saw that the controller is located directly above the vacuum pump. We put the branch circuit where we were told so I don't think it's our problem. What do you think?

Answer: I agree, but it is a problem. NEC 110.26

The NEC requires the installation of equipment that may require servicing while energized to meet the working space requirements found in 110.26(A)(1) thru (3). At some point while trouble shooting motor controllers they will typically be energized for testing of the control or motor circuits. Either the controller or the pump will need to be moved. If you put the circuit where you were told let the owner decide if he wants you or the installer to correct the mistake.

- 77.** To avoid the common trip circuit breakers, we are proposing to install separate neutrals for each ungrounded conductor for a total of 12 current carrying wires in a ¾" EMT conduit. Can we install 20 ampere circuit breakers on these circuits?

Answer: No. Assuming all conductors are #12 THHN copper, NEC 310.15(B)(3)(a) requires derating of 50% when 12 conductors are in the same raceway. The allowable ampacity of 12 AWG conductors with THHN insulation is 30 amperes @90°C is:

50% of 30 amperes = 15 amperes

The maximum size breaker permitted by your proposed installation is 15 amperes.

- 78.** We intend to extend a 12-volt circuit from a self-contained, battery-back-up exit sign to supply remote "heads". The remote heads are located outdoors. Can the 12-volt wiring be installed with properly sized Class 2 cable? Do the connections at the remote heads need to be in junction box? Or can the splice be tucked in behind the remote heads due to the fact this is a low voltage circuit?

Answer: Class 2 Cable?-No. Connections in a box?-Yes. The permitted wiring methods for emergency circuits are raceways, Type AC, and type MC cables per SPS 316.700(1)(a). The circuit from the emergency source (battery in exit sign) to load (remote head) is an emergency circuit.

- 79.** Afternoon, can a non-license contractor pull an electrical permit for fire alarm system replacement? I could see if just a fixture replacement but seems to be a little more than that. More like complete replacement. They changed out the fire panel, 9 smokes and 6 horn / strobes. Our local permit the above listed items and is usually filled out by a license contractor with master & electrical contractor license.

Answer: Yes, it is permitted by State of Wisconsin Statute 101.862. Your question is very similar to questions & answers regarding the State of Wisconsin licensing law posted at www.dsps.wi.gov. Wis. Stat. 101.862 does not address permits; local requirements for electrical permits still apply. The municipality can require additional permits for fire alarm wiring installation and termination. The contractor does not need to be licensed by DSPS to secure the permit. Per Wis. Stat. 101.862 (4) (d) Stats, individuals who work on electrical systems that operate at 100-volts or less are exempt from the licensing requirements. (This includes CCTV, Fire Alarm, Card Access, etc.) Municipalities may require a local license for installation of wiring 100-volts or less. No State of Wisconsin License is required. (Check with the municipality before starting a project)

- 80.** At one of the hospitals in my inspection area, there is a 5 KVA transformer that is being installed to connect to the UPS system for the controls of a piece of examination equipment. There is no neutral being derived. Would 250.21(A) (3) apply in the regard of not needing to be grounded? The contractor said the system is designed by an engineer from Siemens.

Answer: Yes. The conditions may be used if all of the requirements are followed in NEC 250.21(A)(3) and the manufactures listing & Installation instructions are complied with in full (SPS 316.110). The

requirements read: 250.21 Alternating-Current Systems of 50 Volts to Less Than 1000 Volts Not Required to Be Grounded. (3) Separately derived systems supplied by transformers that have a primary voltage rating less than 1000 volts, provided that all the following conditions are met:

- a. The system is used exclusively for control circuits.
- b. The conditions of maintenance and supervision ensure that only qualified persons service the installation.
- c. Continuity of control power is required.

We encourage you to obtain in writing from the governing body of the hospital requirements (B&C) listed above and attach to the inspection/permit report.