National Electrical Code Forum

Code Panel #3

Meet Your Distinguished Experts

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UL , NEC CMP 1 & 19

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NM Cable and Spray in Foam

91. Is the expansion foam that is used to seal air passages around NM cable identified or listed for use with the outer jacket of the NM cable?

.

NM Cable and Spray in Foam

91.

Reference: NEC 110.3(B)

No, there are no foams that have been evaluated for use with the outer jacket of NM cable. Look at the UL Mark on the can, it will tell you what it is UL Certified as, typically these expansion foams are UL Classified for Surface Burning Characteristics (flame spread and smoke developed) and has nothing to do with air passage or use with Type NM or any other cable

Question Number 92.

If I am wiring (5) 208 volt 3 phase welders for welders in a shop. They are positioned on production lines and there will never be more than one welder operating at a time. Can I put them on the same branch circuit?

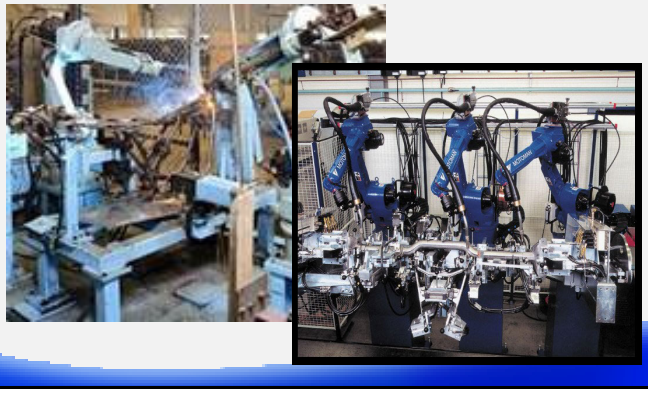
NEC Article 630.11 (Arc Welders)

630.11 Ampacity of Supply Conductors.

The ampacity of conductors for arc welders shall be in accordance with 630.11(A) and **(B)**.

NEC Article 630.11 (B) Group of Welders

Minimum conductor ampacity shall be based on the individual currents determined in 630.11(A). Calculation is determined by adding 100 percent of the two largest welders, plus 85 percent of the third largest welder, plus 70 percent of the fourth largest welder, plus 60 percent of all remaining welders.



Answer:

Can I put them on the same branch circuit?

Yes. The installer may put them on the same circuit however, the branch circuit would have to be sized based on the percentages of 630.11 (B). The fact the question indicates that no two welders will operate at the same time, has no impact on the requirement.

Reference: 630.11(B) and 630.12 (B) for OCP.

630.12(B) For Conductors.

Conductors that supply one or more welders shall be protected by an overcurrent device rated or set at not more than 200 percent of the conductor ampacity.

Warning Tape in Ditch

93. Do we have to have a warning tape in a ditch if the conductors are in conduit?

Reference: 2011 NEC Section 300.5(D)(3)

Answer: No. Marking tape is required above direct buried cables not encased in concrete but not over conductors installed in conduit.

Panelboard Installation

94. Can panel boards be installed in [a] "janitor closet" in a school?

References:

Definitions

110.26(A)(1)

Table 110.26(A)(1)

110.26(A)(2)

110.26(A)(3)

110.26(B)

240.24(D)

Panelboard Installation (Cont'd)

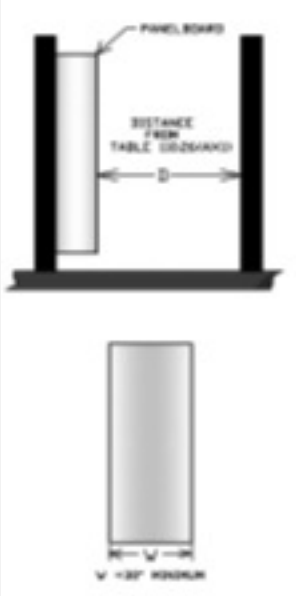
94.

Answer:

Not a clothes closet per definition, therefore, 240.24(D) does not apply.

Panelboard not prohibited.

Note 110.26(B) requires clear space around electrical equipment.



Industrial Establishments / Restricted Access

95. Is a non-fused switch acceptable as a service disconnecting means?

Reference: NEC 230.66, 230.70, NEC 230.79,230.90, 230.91…

Answer: Yes. The requirements for service disconnects are found in Article 230 Part V - VII. The disconnect must be listed and marked SUSE, have a rating not less than the calculated load to be carried, have overload protection integral or **immediately adjacent**, and open during a ground fault event if the rating falls within the requirements for GFPE in 230.95.

Residential Services and Feeders

96. In a residential application, can a #4 copper conductor be protected with a 100A breaker to a feeder panel?

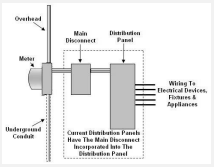
- **Answer:**
- **Yes, Section 310.15 (B) (7) allows this, provided the following are true:**
- **This is an individual dwelling unit (one-family, two-family, or multi-family)**
- **The feeder is 120/240 single phase**
- **This is the main power feeder between the main disconnect and the panel board supplying all loads associated with that dwelling unit.**
- **Conductor Types are as listed in the Table**

Table 310.15(B)(6) Conductor Types and Sizes for 120/240-Volt, 3-Wire, Single-Phase Dwelling
Services and Feeders. Conductor Types RHH, RHW, RHW-2, THHN, THHW, THW, THW-2, THWN, THWN-2, XHHW, XHHW-2, SE, USE, USE-2

	Conductor (AWG or kcmil)	
Rating	CU	Al/Cu-AL
100	4	2
110	3	1
125	2	1/0
150	1	2/0
175	1/0	3/0
200	2/0	4/0
225	3/0	250
250	4/0	300
300	250	350
350	350	500
400	400	600

•When is the This Applicable?

ONLY where there is a single set of service conductors/single feeder



Service conductors and single feeder, the rule applies here

- Multiple feeders serving loads in the house…the rule does NOT apply here

97. If an outdoor generator is equipped with a readily accessible disconnecting means, is an additional disconnecting means required where the ungrounded conductors service or pass thru the building or structure served?

readily accessible disconnect

Probably not. NEC 225.31 & 32 state "a disconnecting means shall be installed either inside or outside the building or structure served….at a readily accessible location nearest the point of entrance of the conductors".

But when you look at 700.12[B]6, 701.12[B]5 and 702.12 it states that the additional disconnect is not required where a outdoor housed generator has a readily accessible disconnect "within sight" of the building or structure served.

16 Gauge Extension Cords

98. A 16ga extension cord with a triplex female receptacle end on the cord was found at a customer's house, with a running 1500 watt space heater plugged into the cord. My question is, those cords have been around for years, and most of the time, they are being over loaded. How are the cords code compliant when they have three receptacles on them, and no built in over-current protection? And how can something like this be listed?

16 Gauge Extension Cords

98.

Reference: NEC 110.3(B), 240.5(B)(3) and (B)(4)

Extension cords are Listed as cord sets under Cord Sets and Power Supply Cords, (ELBZ) (Pg. 128 in UL White Book) and evaluated to UL Standard 817. Like all electrical equipment, they are required to be marked with electrical rating and other caution and warning markings. User is not to exceed rating of cord set also space heater marked not to plug into extension cord. 240.5(B)(3) Listed extension cords considered to be protected when used within its Listing.

Question Number 99.

It is required that elevators have a single means for disconnecting all ungrounded car light, receptacle(s), and ventilation power-supply conductors for that elevator car. The disconnecting means is required to be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position. Could a general-use snap switch suitable only for use on ac be utilized per 430.109(C) if it can be installed where it can be locked in the open position?

NEC 620.53 Ex. (New in the 2011 NEC)

Where an individual branch circuit supplies car lighting, a receptacle(s) and a ventilation motor not exceeding 2 hp, the disconnecting means provided by 620.53 shall be permitted to comply with 430.109(c). This disconnect shall be listed and shall be capable of being locked in the open position. The provision for adding a lock.....

NEC 430.109(C)

(C) Stationary Motors of 2 hp or less and 300 volts or less, the disconnecting means shall be permitted to be one of the devices specified in (1), (2), or (3):

- (1) A general-use switch having an ampere rating not less than twice the full-load current rating of the motor
- (2) On ac circuits, a general-use snap switch suitable only for use on ac (not general-use ac–dc snap switches) where the motor full-load current rating is not more than 80 percent of the ampere rating of the switch
- (3) A listed manual motor controller having a horsepower rating not less than the rating of the motor and marked "Suitable as Motor Disconnect"

Answer:

- **Could a general-use snap switch suitable only for use on ac be utilized per 430.109(C) if it can be installed where it can be locked in the open position?**

Yes

The installer can use a general snap switch meeting the requirements of 430.109 (C) and the locking provisions mentioned in 620.53 Exception.

Reference: 620.53 Exception and 430.109 (C).

Flexible Cord for service conductors/Temporary

100. Can a flexible cord be used for the service conductors of a temporary panel?

Reference: 2011 NEC 230.43 and 590.4(A)

Answer: 230.43 does not list a flexible cord as a wiring method for service conductors. 590.4(A) states that services shall be installed in conformance with Parts 1 through 8 of Article 230, as applicable. Flexible cords are mentioned in 590.4(H),(I), and (J). If is unclear if they are acceptable but under 590.2(B) Approval it states that temporary wiring methods shall be acceptable only if approved based on the conditions of use and any special requirements of the temporary application. I would recommend consulting the AHJ responsible for inspecting this prior to using flexible cords for service conductors.

Pressure Washer Installation

101. A high pressure spray washer is 1 phase and less than 250 volts. Can this equipment be hard wired to a disconnect or a j-box? The cord and plug pressure washer at this rating needs to be gfci protected in a cord or receptade as per 422.49. If direct wired, is gfci protection required? In the UL White Book DMKK it seems to read a receptacle is required.

Pressure Washer Installation

101. Continued

References:

UL White Book

NEC 110.3(B)

NEC 422.49

Answer:

Must have GFCI protection.

If equipped with a cord and plug, the plug may not be removed.

White Book includes double-insulated washers, and requires GFCI protection.

OR

Insulating Restrictions

102. If the label on the panel specifically says that the installation of circuit breakers other than the manufacturer's breakers will void the warranty, can you install other manufacturers breakers if they are listed as interchangeable by a testing laboratory?

Reference: NEC 110.3(B)

Answer: Approval of the installation is the AHJ's call. However, there are items to consider for such cases. Does the owner understand that the breakers are from a different manufacturer and that there may be an impact on the product warranty? Are the requirements of NEC 110.3 met? As a manufacturer, complaints about such products are received in the areas of mechanical strength and durability, evidence of over heating, and arcing effects.

•Swimming Pool Equipment

103. A swimming pool installed at a single-family dwelling has several motors, as well as other loads associated with it, and a panel in a NEMA 3R enclosure is installed on posts near the pool equipment to serve these loads. An inspector has called this a separate structure and is requiring a main breaker in the pool panel. Are the posts that the pool panel is mounted to considered to be a structure?

- Article 100
- ***Structure: that which is built or constructed***
- ***Examples of structures: light poles, bridges, highway signs, "unistrut" racks, bollards, railroad semaphores, etc.***
- ***It seems that Article 225, Part II would apply***

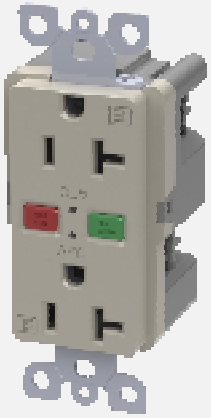
•Swimming Pool Equipment

Buildings or Other structures supplied by a Feeder(s) or Branch Circuits

- 225.30 "A building or structure that is served by a branch circuit or feeder on the load side of a service disconnecting means shall be supplied by only one feeder or branch circuit…"
- (exceptions for special conditions, special occupancies, capacity requirements, characteristics, documented switching procedures)
- 225.31 'Means shall be provided for disconnecting all ungrounded conductors that supply or pass through the building or structures."

104. Where can we get an arc-fault receptacle?

Although it is reported there are some listed, finding one at this time is difficult. True Safe shows one on the Internet.

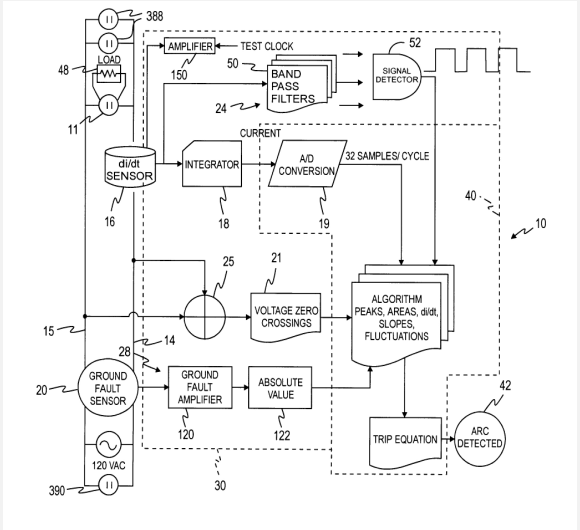


True-Safe's Receptacle Outlet AFCIs are of the combination type which affords circuit protection against low and high current arcs. Low current arcs are those that occur along a current-carrying conductor such as a loose terminal connection, whereas, high current arcs are those that occur between two current-carrying conductors which sometimes are mistakenly thought of as a short circuit because of the intensity of the arcs. These receptacle outlets are classified under UL Standard 1699 as Branch circuit/Feeder type since they provide complete circuit protection from the first outlet to downstream outlets and connections . These products are offered with dual rating of 15A and 20A at 120V system voltage.

An arcing fault protection assembly in an electrical outlet, and a correspon din g method determine whether arcing is present in an electrical device connected to the outlet. The assembly comprises a sensor, a broadband noise circuit, a controller and s an electrical device. The sensor detects a current and develops a correspon din g sensor signal. The broadband noise circuit determines the presence of broadband noise in the sensor signal and produces a correspondi ng output signal. The controller processes the sensor signal and the output signal in a predetermi ne d fashion to determine whether an arcing fault is present. The sensor, the broadban d noise circuit and the controller are mounted to the outlet receptacle or to an outlet box which houses the receptacle. The electrical device is connected in parallel to the first electrical outlet on the load side of the sensor.

Arc fault receptacl e with a feed-through connection

United States Patent 6621669



Hydromassage Bath Tub Bonding

105. A hydro-massage tub has faucets that are metallic. Some are single faucets and some use a metallic unit with both the hot and cold water. Do these faucets need to be bonded? How is this done if required?

Reference NEC 680.70 and 680.74

NEC 680.70 states that hydro-massage bathtubs shall only have to comply with part VII of this article. 680.74 states that all metal piping systems and all grounded metal parts in contact with the circulating water shall be bonded with an No. 8 AWG bonding wire.

I would use grounding clamps on the water pipes, that will also bond the faucets

Hydromassage Bath Tub Bonding

105.

Question Number 106.

In the 2011 NEC 630.13 added the word "identified" as a descriptive word for disconnecting means. Is the word "identified" being used in the sense of the definition of "identified" in Article 100 or in the sense of 110.22, Identification of Disconnecting Means, to indicate its purpose?

NEC 100-Definitions

Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, and so forth, where described in a particular Code requirement.

Informational Note: Some examples of ways to determine suitability of equipment for a specific purpose, environment, or application include investigations by a qualified testing laboratory (listing and labeling), an inspection agency, or other organizations concerned with product evaluation.

NEC 110.22

110.22 Identification of Disconnecting Means.

(A) General. Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. The marking shall be of sufficient durability to withstand the environment involved.

Answer:

Is the word "identified" being used in the sense of the definition of "identified" in Article 100 or in the sense of 110.22, Identification of Disconnecting Means, to indicate its purpose?

In my opinion "Both". How can we argue the definition.
"recognizable as suitable for the specific purpose"
And also the requirements for marking in 110.22.

References: NEC 100 (Identified) and 110.22

Temporary Panel Receptacle for Trailer

#107 - A temporary panel has a receptacle for a construction office/job trailer. Does this receptacle need to be GFCI protected?

Reference: 2011 NEC 590.6 and 590.6(A)(1)

Answer: Additional information needed concerning this question. Is the construction trailer in excess of 30 amperes? Is the trailer single-phase or three phase? If single-phase and 30 amperes the receptacle would need to be GFCI protected. If single-phase and above 30 amperes then GFCI protection is not required. If the trailer is three-phase then GFCI protection would not be required regardless of the amperage.

Extending Existing Circuits

108. If you extend existing circuits that have a shared neutral, is it required to install handle ties on the breakers if they were existing without the tie?

References:

- 210.4(B) Disconnecting means
- 210.4(C) Grouping

Answer:

Required for new installations.

Not required for extensions.

Listed Handle Tie

Multi-pole breaker

Insulating Restrictions

109. NEC 702.4(B) (2) requires optional standby sources, utilizing automatic transfer equipment, to be sized to supply the full load, calculated in accordance with Article 220, or employ a load management system. Does this require the load management system to be included with the source (normally a generator), in the transfer equipment, or as a separate piece of equipment?

Reference: NEC 702.4(B)(2)

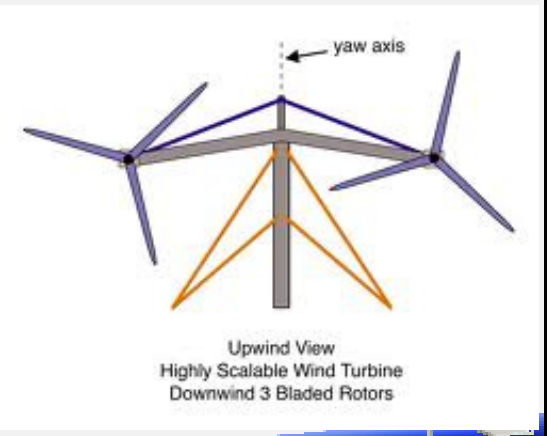
Answer: The code does not specify the location but the sequence of operation must prevent the generator from having too much load connected. For large systems this can be complex based on various load priorities and sizes. Because the transfer equipment connects the load to the generator, simple load management sequences are usually controlled by this equipment.

•Wind Turbine Support Grounding

110. Is it permissible to utilize the guy wires used to steady a wind turbine tower as part of a lightning protection system, and if yes, are there any special requirements for using the guy wires and their support footings?

- Yes this is permitted

- 694.40 (B) Guy wires used to support turbine towers shall not be required to be connected to a equipment grounding conductor or to comply with the requirements of 250.110
- 694.40 (4) auxiliary electrodes and grounding electrode conductors shall be permitted to act as lightning protection system components where *meeting applicable requirements*. If separate, tower lightning protection system shall be bonded to the tower auxiliary grounding electrode system. Guy wires used as lightning protection system grounding electrodes shall not be required to be bonded to the tower auxiliary grounding electrode system.



Upwind View
Highly Scalable Wind Turbine
Downwind 3 Bladed Rotors

- **NFPA 780 Annex "N" gives information on Wind Turbine Lighting Protection**

•111. 60. A utility interactive PV inverter has built in output overcurrent protection. The output conductors terminate in a non-fused disconnect prior to terminating in the utility transformer. Should there be overcurrent protection at the disconnect? And if not, wouldn't the inverter need to be service rated?

One must start at the listing and construction of the inverter to see if the protection is really what you think. Most will not provide the protection of a fuse or circuit breaker as a Service.

Article 690.9[A] states the installation of circuit conductors need to meet the requirements of 240. In 240 it refers to 230.91 for the 'service' where it states The service disconnecting means needs to have overcurrent protection integral or immediately adjacent. Protection would be required as the utility is providing some amount of power to the inverter/system.

PV Equipment disconnecting means to isolate the PV system are found in 690.13 & 15 and need to be grouped but that may not be in the same location as the utility meter connections so that additional disconnect with overcurrent would be required.

Service rated is not required per 690.14[A]

690.9A, 690.13, 690.15, 240.4, 240.15, 240.21, 230.90

•NM Cable to a Hot Tub?

112. When wiring a hot tub in a residential application, I run a 6/3 nm from load center to hot tub disconnect, then from the disconnect, using liquid tight flexible conduit, or pvc conduit, go to the hot tub. Wiring in the seal tight/pvc would be #6 THHN with a #10 green for equipment ground. Is the 6/3 NM allowable for this installation because it has a bare equipment grounding conductor?

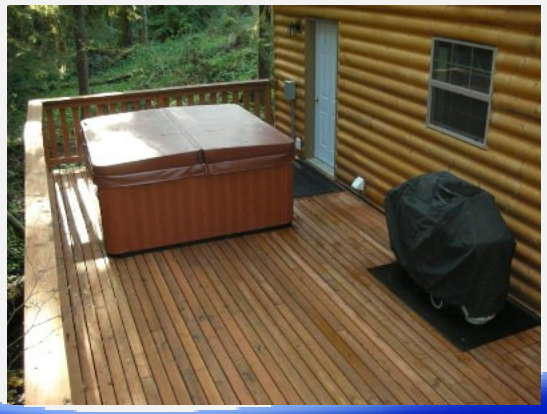
Reference: 680.42(A), 680.42(C), 300.9 and 310.10(C).

Assuming that this is a Listed self contained spa or hot tub in accordance with 680.42(A) installed outdoors and the disconnect is on the wall of the house and the connection to the disconnect was through the back of the disconnect so that the NM was never in a wet location,

•NM Cable to a Hot Tub?

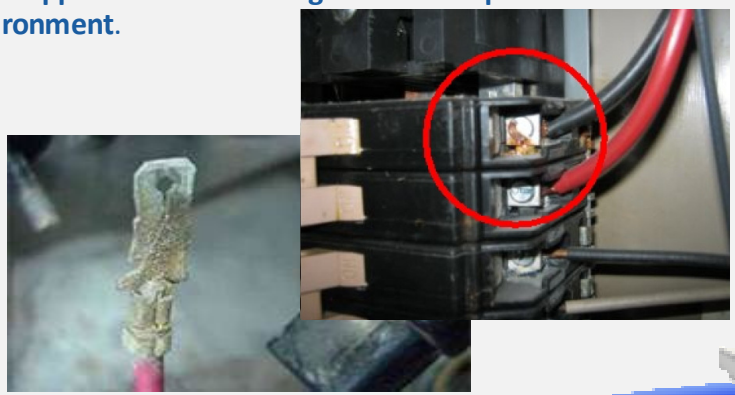
112.

- I would say it is ok, per 680.42(C) unless there is a light in the hot tub, then you have to comply with 680.23 which requires an insulated equipment ground. I would also say that the THHN would have to be THWN per 300.9 and 310.10(C)



Question Number 113.

NEC 310.10(G) requires conductors installed in corrosive conditions to have insulation suitable for the application. What type conditions would cause deleterious effects on conductors or insulation and what type insulation would be suitable for those applications? Please give an example of such environment.



Answer:

NEC 310.10(G) Corrosive Conditions.

Conductors exposed to oils, greases, vapors, gases, fumes, liquids, or other substances having a deleterious effect on the conductor or insulation shall be of a type suitable for the application.

Example (from the 2011 Handbook)

Nylon-jacketed conductors, such as Type THWN, that are suitable for use where exposed to gasoline have gained widespread acceptance because of their ease in handling and application as well as for economic reasons.

The UL Guide Information for Electrical Equipment — The White Book-2010 states in the category for Thermoplastic-Insulated Wire (ZLGR) in part:

THWN — wire that is suitable for exposure to mineral oil, and to liquid gasoline and gasoline vapors at ordinary ambient temperature, is marked "Gasoline and Oil Resistant I" if suitable for exposure to mineral oil at 60°C, or "Gasoline and Oil Resistant II" if the compound is suitable for exposure to mineral oil at 75°C. Gasoline-resistant wire has been tested at 23°C when immersed in gasoline. It is considered inherently resistant to gasoline vapors within the limits of the temperature rating of the wire type.

GFCI Protection for Temp Wiring/Trade Shows

114. Is GFCI protection required for temporary wiring in exhibition halls used for display booths in a trade show?

Reference: 2011 NEC, Article 518, Assembly Locations

Answer: **(B) Temporary Wiring.** In exhibition halls used for display booths, as in trade shows, the temporary wiring shall be permitted to be installed in accordance with Article 590. Flexible cables and cords approved for hard or extra-hard usage shall be permitted to be laid on floors where protected from contact by the general public. The ground-fault circuit-interrupter requirements of 590.6 shall not apply. All other ground-fault circuit-interrupter requirements of this *Code* shall apply. Where ground-fault circuit interrupter protection for personnel is supplied by plug-and-cord-connection to the branch circuit or to the feeder, the ground fault circuit interrupter protection shall be listed as portable ground fault circuit interrupter protection or provide a level of protection equivalent to a portable ground fault circuit interrupter, whether assembled in the field or at the factory.

Ground Fault Protection for Standby Power Systems

115. Where a 277/480 volt, 3-phase, solidly grounded wye voltage system serves a legally required standby system utilizing 1000 ampere or more circuit protective devices, is there any special requirements for installing ground fault protection?

References

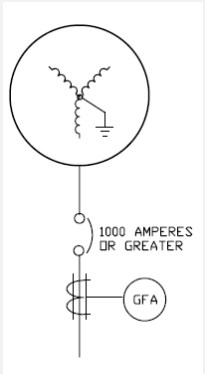
NEC 701.26

NEC 701.6(D)

Answer

Ground fault protection is not required for this system.

Must have ground fault indication.



Insulating Restrictions

116. Where a set of branch circuit conductors only pass through a panelboard and do not originate or terminate in the panelboard they are passing through, is there any requirement for identifying where the overcurrent device is located for these conductors?

Reference: NEC 312.8(3)

Answer: Yes, a warning label identifying the closest disconnecting means for any feed-through conductors must be applied to the panelboard enclosure. This marking is in addition to panelboard source marking found in 408.4(B).

•Electrified Truck Parking Spaces

117. Is each 120-volt receptacle required for an electrified truck parking space required to be served by an individual 120-volt branch circuit? Are there a minimum number of 120-volt receptacles required for each electrified truck parking space?

- 626.24 (B) receptacle
- All receptacles shall be listed and of the grounding type. Every truck parking space with electrical supply shall be equipped with (B)(1) and (B) (2)

•Electrified Truck Parking Space Receptacles

626.24 (B) 1

- A maximum of three receptades each 2-pole 3-wire grounding type and rated 20 amperes, 125 volts and two of the three connected to two separate circuits

•Electrified Truck Parking Space Receptacles

626.24 (B) (2)

One single receptacle,3-pole,4-wire grounding type, single phase rated either 30 amperes 208Y/120 volts or 125/250 volts. The 125/250 volt receptacle shall be permitted to be used on a 208Y/120 volt single-phase circuit.

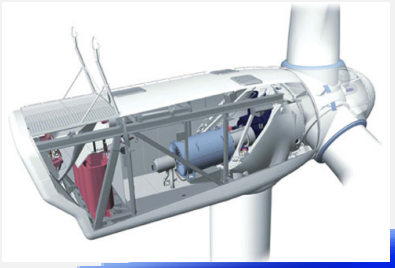
Exception: Where electrified truck parking spaces supply equipment provides heating, air-conditioning, and comfort-cooling function without requiring a direct electrical connection at the truck, only the two receptacles identified in 626.24(B) shall be required

• 118. What type of a grounding electrode system is required for the inverter of a small wind turbine?

New to the 2011 is article 694 which applies to Small Wind Electric Systems [100KW and less] Article 694.3 states when the system is "interconnected" to also see 705.

Grounding in 705.50 refers you to 250 where 250.160 for DC systems has requirements in 250.166 for sizing the Grounding Electrode Conductor. Equipment Grounding is covered In 694.40 and 690.40C referencing grounding on the Tower as in NEC 250.54, 250.52[A]3, 250.136[A] & 250.110.

All of these refer to the "system", so It does not appear that there are any special requirements for the Inverter.



•Chase Nipple Bonding

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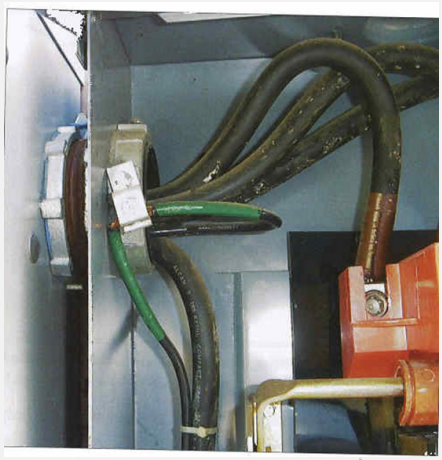
119. Are chase nipples recognized for bonding purposes between two metallic enclosures on the line side of the service disconnecting means? How about on the load side of the service equipment?



•Chase Nipple Bonding

119.

Reference: 250.92(B), DWTT Pg. 118 UL White Book
KDER Pg. 217 UL White Book

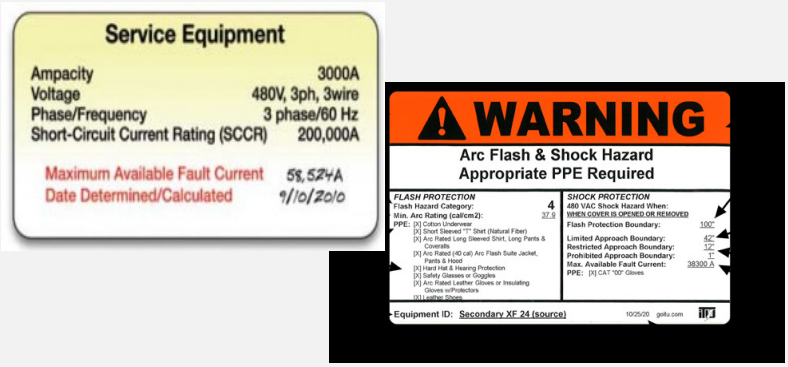
Most chase nipples are Listed under the product category Conduit Fittings (DWTT), located on page 118 in the UL White Book. The Guide Information for DWTT states All fittings are suitable for grounding.

However, NEC 250.92(B), does not permit ordinary locknuts used with chase nipples, you would need a Bonding Type locknut or bushing Listed as Grounding and Bonding Equipment, (KDER).

A properly installed Listed chase nipple would be suitable for other than services.

Question Number 120.

This question is regarding non-dwelling unit service equipment. Is this equipment required to be field marked with the amount of available fault current when installed or modified as required per NEC 110.24? How can we meet this requirement?



NEC 110.24 (Summary)

(A) Field Marking.

Service equipment in other than dwelling units shall be legibly marked in the field with the maximum available fault current. The field marking(s) shall include the date the fault current calculation was performed and be of sufficient durability to withstand the environment involved.

(B) Modifications.

When modifications to the electrical installation occur that effect the maximum available fault current at the service, the maximum fault current shall be verified or recalculated to ensure the service ratings are sufficient. The field markings are also required to reflect the changes.

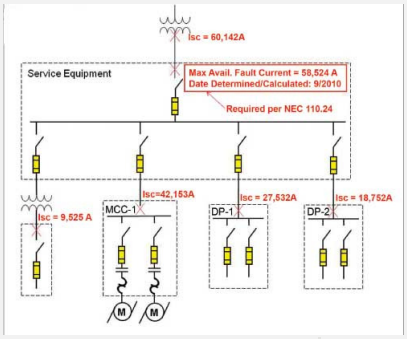
Watch the exception!

Answer:

Is this equipment required to be field marked with the amount of available fault current when installed or modified as required per NEC 110.24?

Yes

References: 110.24 (A) and 110.24(B)



NEC 110.24 Assistance

Websites with direction.

- http://www.cooperindustries.com/content/dam/public/bussmann/Electrical/Resources/Solution%20Center/technical_library/BUS_Ele_Tech_Lib_Short_Circuit_Current_Calculations.pdf
- http://www.bussmann.com/library/indcon/System%20available%20fault%20currents.pdf
- http://www.electricianmath.com/advanced/short_circuit_current.htm

Vertical Support for 250 MCM Conductors

121. What is the maximum vertical length 250 MCM Copper conductors can be run in a wireway without support.

Reference: 2011 NEC Article 376, Article 378 and 300.19

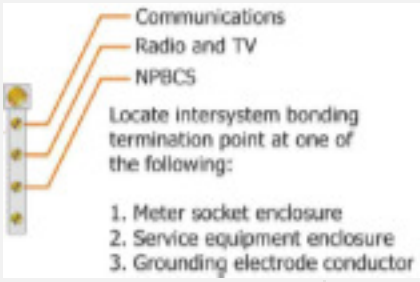
Answer: Articles 376 and 378 offer no guidance towards this question. Section 300.19 gives direction toward raceway systems. Conductors in vertical raceways shall be supported if the vertical rise exceeds the values in Table 300.19(A). One cable support shall be provided at the top of the vertical raceway or as close to the top as practical. Intermediate supports shall be provided as necessary to limit supported conductor lengths to not greater than those values specified in Table 300.19(A). The table gives a distance of 60 feet.

PV Inverter Grounding Requirement

122. Is it required to run a bond wire from a photovoltaic inverter grounding electrode system to the intersystem bonding terminal at the normal service disconnect means served by the utility? If the answer to the question is yes, what is the minimum size for such bonding conductor?

Reference:
Definition— Intersystem Bonding Termination. A device that provides a means for connecting bonding conductors for communications systems to the grounding electrode system.

Answer: No, it does not have to be connected to the ISBT because it is not communication equipment.



Insulating Restrictions

123. Are there special wiring requirements for commercial woodworking shop fluorescent lighting?

Reference: NEC Articles 500, 501.130, 502.130, 503.130

Answer: Yes, if the location is classified as a hazardous location. Commercial woodworking activities may involve flammable chemicals/vapor and create ignitible fibers/flyings and/or combustible dusts.

Service Disconnect Location

124. Does Section 230.71(A)1 require a service disconnect on the structure or could it be located away from the structure (pole)? If it can be located away, what is the maximum distance?

- 230.71 (A) provides requirements for the maximum number of service disconnects permitted. 230.71 gives descriptions of : up to six (6) service disconnects on a single enclosure or groups of enclosures or in or on a switchboard. It does not give guidance on location.

- *230.70 (A) is the section that gives direction on location of service disconnecting means*

•Service Disconnect Location

Is there a specific length limit ?

- 230.70.(A) (1) requires only that the service disconnecting means is located at a ***readily accessible*** location ***either inside or outside of a building or structure*** ***nearest the point of entrance of the service conductors.***

- There is no minimum or maximum distance. Services for billboard signs, for over 600 volts, temporary services, mobile homes and and others are all examples of service disconnecting means installed some distance from a building or structure.

125. What wiring method shall be used for DC photovoltaic source and output circuits inside a building, without a disconnect switch on the outside of the building at the point of entrance?

- ***The base requirement 690.14[C]1 state a disconnecting means shall be installed either inside or outside the building or structure served….at a readily accessible location nearest the point of entrance of the supply conductors.***
- ***The 'exception' however states it is not required if compliant with 690.31[E].***
- ***That section requires the use of Metal Raceways, MC Cable that complies with 250.118[10], or Metal Enclosures from the point of penetration of the building to the first readily accessible disconnecting means.***
- ***Besides complying with [E]1-4 it must also comply to 690.14 [A][B]& [D]. All of which is to provide additional fire resistance and also protection from emergency response persons etc. from inadvertent contact of the PV conductors.***

•110 C Supply Wires?

126. The package labeling for metal halide fixtures states: "Use 110 C supply wires". Does that mean 110 degree C conductor insulation for the entire circuit? What conductor is rated for 110C? What Table does one use?

Reference: 410.117, 402.10, 402.11

For Sizing: 210.19(A)(4) Exc. 1, 402.5 and Table 402.5

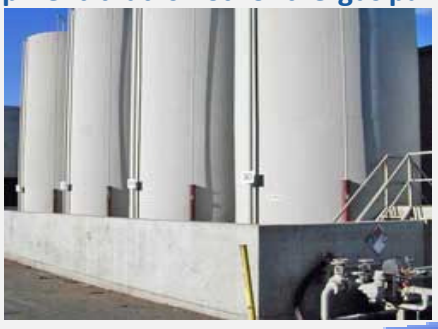
It means the conductors that connect to the luminaire should be rated 110C.

Conductors that may be rated that high or higher are Fixture Wires covered under Article 402. Using fixture wires for the entire branch circuit, is prohibited by 402.11, you can use them as a tap to the luminaire in accordance with NEC 402.10 and NEC 410.117 .

For sizing see 210.19(A)(4) Exc. No. 1 you would need a conductor rated 15A. The fixture wires shall be sized in accordance with NEC 402.5 and Table 402.5.

Question Number 127.

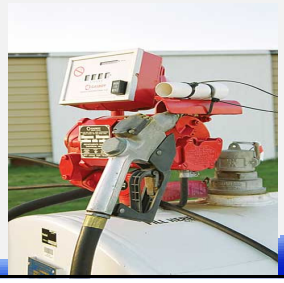
I am wiring one gas and two diesel tanks with dispensing motors for a farmer. These tanks are above ground and hold 10,000 gallons a piece. Do I reference Article 514, 515 or both in wiring them? Also, does the code mandate these tanks be in a dike? Can you run PVC two feet under the concrete near gas pumps for equipment that is not for the gas pumps?



Do I reference Article 514, 515 or both in wiring them?

Both

Article 515 covers facilities that store (in bulk) and distribute flammable liquids as opposed to dispensing liquids into fuel tanks of vehicles. Flammable liquid dispensing locations, including those within the bulk storage facility, are covered under Article 514. Bulk storage tanks may be located inside buildings or outside either above ground or underground. (NEC Plus)



Also, does the code mandate these tanks be in a dike?

Depends- Check with your state.

Example- Minnesota Pollution Control Agency

All regulated tanks with a capacity greater than 1,100 gallons must:

Have secondary containment along with many other guidelines.

The dike for secondary containment

Materials

The acceptable impermeable materials that must be used for construction of the containment area for ASTs installed on November 2, 1998, or later include:

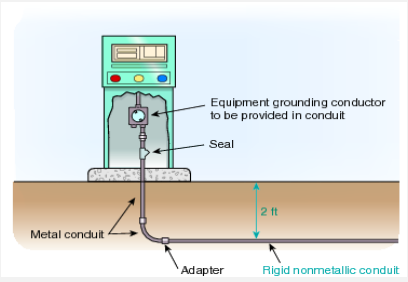
- compacted clay (if clay is used, it must have a minimum of 12 inches
- a geosynthetic clay liner
- concrete
- a synthetic membrane
- the outer layer of a double-walled tank
- fabricated steel
- fiberglass

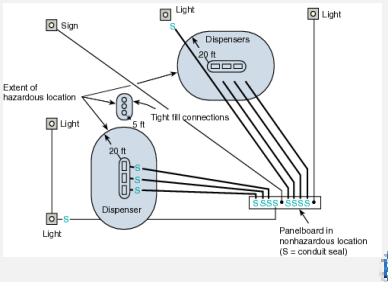
Minnesota Pollution Control Agency

Can you run PVC two feet under the concrete near gas pumps for equipment that is not for the gas pumps?

Exception to NEC 514.8 & NEC 515.8

Where Type PVC or RTRC conduit is used for underground wiring, threaded rigid metal conduit or threaded steel intermediate metal conduit must be used for the last 2 ft of the underground run to the point of emergence or to the point of connection to the aboveground raceway. The PVC or RTRC conduits, including any nonmetallic conduit elbows and fittings, must be located not less than 2 ft below grade.





Answer:

Yes

Depends on the distance and location of the underground installations in proximity to the tanks, dikes and dispensers.

References: NEC 514.8, Table 514.3, 515.8 and Table 515.3

Vertical Support for 250 MCM Conductors

128. The paving in a gas station parking lot is going to be 6 inch thick concrete. When applying the depth requirements from 300.5, do I measure from the top of the concrete or the top of the dirt?

Answer: From the top of the concrete.

Table 300.5 Notes:

Cover is defined as the shortest distance in millimeters (Inches) measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.

Bridge Crane Motors

129. Where multiple motors are used to drive a bridge crane as a unit and are protected by a single set of overload devices with a rating equal to the full load current of all the motors, how is an over-temperature condition handled that may happen in any of the individual drive motors?

References:

430.126(B) Multiple Motor Applications

430.126 Motor Overtemperature Protection (A) General.

Answer:

Author probably refers to multiple motors on adjustable speed drive systems, but could be applied elsewhere.

Preferred method—Use thermal sensors (RTD) embedded in motor windings.

Resistance Temperature Detectors (RTD)

Insulating Restrictions

130. A high leg system is added to an elevator and the main panel is marked for the presence of the high leg as per code. A pipe run containing three hots only is run out to disconnect by hopper tank for motor. Does this disconnect need to be labeled for the presence of a high leg also?

Reference: NEC 110.15

Answer: No. The marking is only required where the grounded conductor is present.

•Sealing at Class I, Div 2 Boundaries

131. What type of sealing compound can be used for the conduit seals at the boundaries of a Class 1 Division 2 location where they are not required to be explosion-proof?

- 501.15(B)(2)
- Class I, Division 2 Boundary. In each conduit run passing from a Class I, Division 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 3.05 m (10 ft) of the boundary. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the Division 2 location, and a threaded connection shall be used at the sealing fitting. Except for listed reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 2 location.

•Sealing at Class I, Div 2 Boundaries

What Type sealing compound is permitted ?

- *Conduits shall be sealed to minimize the amount of gas or vapor within the Division 2 portion of the conduit from being communicated to the conduit beyond the seal. Such seals shall not be required to be explosionproof but shall be identified for the purpose of minimizing passage of gases under normal operating conditions and shall be accessible.*
- ***Any inert ,non-conductive seal approved by the AHJ for this purpose.***

•What does 'identified" mean?

What does Article 100 say?

- Identified (as applied to equipment)
- Recognizable as suitable for the specific purpose, function, use, environment, application, and so forth where described in a particular *Code* requirement

132. Does a commercial building need an outside light for egress at the walkout door?

No, not from the NEC. Article 210.70C has no requirement for Commercial, only Dwellings.

The International Building Code has requirements in IBC section 1006 basically needing "not less than 1 foot candle at the walking surface".