

CAPTAIN CODE[®] 2020 NEC[®] Code Changes

Includes Expert Commentary on Over 60 Code Changes



Introduction

NFPA 70, also known as The National Electrical Code® (herein after “NEC®”) and the contents of this Pocket Guide are intended for qualified electrical and low-voltage professionals with an existing understanding of electrical theory, terminology and safety practices. This includes electrical inspectors, electrical contractors, electrical engineers and other similarly qualified professionals. This Pocket Guide is intended to be used with the National Electrical Code and not as a replacement for it. Obtain the 2020 NEC® to ensure compliance.

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Scope, Purpose and Cautions

This Guide was developed to illustrate the primary changes to the 2020 NEC when compared to the 2017 NEC®, the previous version. This enables electrical and low-voltage professionals to keep informed and stay in Code compliance from one Code cycle to the next. Articles covered primarily relate to Wiring Devices and Communications Systems with limited discussion of Over-Current Protection, Raceways, Wires, Luminaries, Emerging Markets and other mainstream requirements.

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Text Legend	
Category	Color/Style
Summary of Change	Standard black text
Actual NEC® Text from NFPA 70	Serif-style font within green box
Expert Analysis	Standard black text
New NEC® Text for 2020	Shaded serif-style font within green box
Previous 2017 NEC® Text Removed for 2020	Crossed-out text
Leviton Commentary	Insights from Leviton Manufacturing are in green text
Leviton Solutions	Leviton solutions which address applicable code articles are in blue text

Vertical Market Legend			
Agricultural		Healthcare	
Commercial & Industrial		Hospitality	
Education		Institutional	
Entertainment		Recreational	
Global (Applies to all applications)		Residential	
		Sustainability	

Vertical market icons appear to help identify and categorize specific code changes

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Revision



110.22(A) Circuit Source Label Identification on Disconnect Means

Change Summary

- In addition to being marked with the purpose, disconnects are now required to identify the source of the branch circuit or feeder for the disconnect at the disconnecting means enclosure (other than one- or two-family dwellings).

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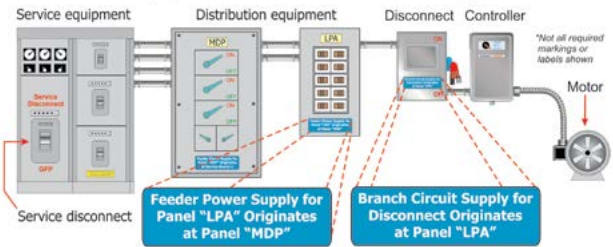
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110.22 Identification of Disconnecting Means.

(A) General. Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. In other than one- or two-family dwellings, the marking shall include the identification of the circuit source that supplies the disconnecting means. The marking shall be of sufficient durability to withstand the environment involved.

Expert Analysis

110.22(A) Identification of Disconnecting Means



A disconnecting means is required to be marked with a label to identify exactly what the disconnect is for. If the disconnect is installed right next to something like a motor and the wiring method goes right to the motor, no label is required as it is evident as to the purpose of the disconnect. This label or marking is required to be suitable for whatever environment the disconnect is installed such as outdoors. For the 2020 NEC this label or marking is also required to provide identification of the circuit source that supplies the disconnecting means. This identification of the circuit source does not apply to a disconnect installed at one- or two-family dwelling unit. By identifying the source of a circuit (branch circuit or feeder) at the disconnecting means enclosure, this will

bring this requirement in line with 408.4(B) for the same identification requirement for switchboards, switchgear, and panelboards.

Many times, in industrial, commercial, and multifamily dwellings with multiple disconnects located throughout the buildings and or around the premises, it can be difficult to locate the source of supply for an individual disconnect. The time-consuming task in locating the power supply source can be critical in an emergency situation and exasperating during normal maintenance operations. The added wording of “shall include the identification of the circuit source” requires the identification or marking to show a specific device and location. A general reference to a location such as “Electrical Room 2” will not be sufficient for this requirement. The final marking should require notation of specific devices. This power supply identification practice will enhance the safety for the electrical personnel who service these disconnects.

Revision



210.8 GFCI Measurement Distance — Door Barrier Removed

Change Summary

- Revision removes “door” and “doorway” as items the supply cord of an appliance connected to the receptacle must not pass through in order to satisfy measurement requirements for GFCI protection.

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210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (E)(F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

Informational Note No. 3: See 555.9 for GFCI requirements for boat hoists.

Informational Note No. 4: Additional GFCI requirements for specific circuits and equipment are contained in Chapters 4, 5, and 6.

continued on page 12

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For the purposes of this section, when determining the distance from receptacles the distance shall be measured as the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or the shortest path without passing through a door, doorway, or window.

Expert Analysis

For the 2017 NEC, a new provision was added at the parent text of 210.8 to indicate that measurements from receptacles to objects (such as a sink) that would qualify for GFCI protection should be measured as the “shortest path” a cord of an appliance connected to a receptacle would take without piercing a floor, wall, ceiling, or fixed barrier, or passing through a door, doorway, or window.

210.8 Measurements for GFCI Protection



When determining if GFCI protection for personnel is required and a measurement is involved, the distance from a receptacle is required to be measured as the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or the shortest path without passing through a door, doorway, or window [210.8]

These requirements were further revised for the 2020 NEC by removing “doors and doorways” as items the supply cord of an appliance connected to the receptacle must not pass through. Is a cabinet door a “door” that would qualify for this measurement requirement? Most in the electrical industry would have answered, “yes” to that question. To eliminate all doubt, CMP-2 removed “door” and “doorway” from the list of obstacles that should not be measured through for this Code cycle. The receptacle that has raised the most question for this GFCI protection has been the 120-volt, 20-ampere receptacle under the kitchen sink for the garbage disposer. In the previous editions of the Code, in order to apply GFCI protection for this receptacle,

one would have had to take the measurement from the top, inside edge of the sink [see 210.8(A)(7)] and pass through the kitchen cabinet door to complete this measurement (which was prohibited by the parent text of 210.8). For the 2020 NEC, passing the measurement through the cabinet door is no longer prohibited.

Some in the electrical industry would argue that this revision took this GFCI requirement too far. The removal of “door” would have accomplished the intent of getting GFCI protection for the receptacle located under the kitchen sink behind a cabinet door. By also removing the word “doorway,” this opened up GFCI protection to something like a receptacle located in a bedroom, but also located within 1.8 m (6 ft) of a bathroom sink when the measurement is taken from the top, inside edge of the bathroom sink, through the bathroom doorway to the bedroom receptacle located around the corner from the doorway. A bedroom receptacle outlet has never drawn requirements for GFCI protection but would demand GFCI protection under these unique circumstances.

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Revision and New



210.8(A); (A)(5); (A)(11)

GFCI Protection for Dwelling Unit:

- Receptacles Rated 125 - 250V
- All Basement Areas
- Indoor Damp or Wet Locations

Change Summary

- Dwelling unit GFCI protection has been expanded to all 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground installed in the specified areas of 210.8(A).
- GFCI protection now required for ALL dwelling unit basements (not just unfinished portions of basements).
- GFCI protection is now required at indoor damp and wet locations of dwelling units.

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210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.

(A) Dwelling Units. All 125-volt through 250-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

(4) Crawl spaces — at or below grade level

(5) Basements Unfinished portions or areas of the basement not intended as habitable rooms

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve

the countertop surfaces

(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(8) Boathouses

(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Expert Analysis

Historically, GFCI protection at dwelling units has been limited to 125-volt, single-phase, 15- and 20-ampere receptacles. For the 2020 NEC, GFCI protection for personnel in dwelling units will be expanded to include all 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground in the specific locations specified at 210.8(A)(1) through (A)(11) (bathrooms, kitchens, outdoors, etc.).



The addition of up to 250-volt receptacles and removing the amperage limitations of 15- and 20-amperes will provide GFCI protection to most receptacles commonly used in the specified areas of 210.8(A).

What this means is the 240-volt, 30-ampere dryer receptacle in the utility room will now require GFCI protection, Same with the 240-volt, 50-ampere oven or range receptacle. Any receptacle rated up to 250-volts supplied by single-phase branch circuits rated 150 volts or less to ground and installed in a dwelling unit kitchen,

bathroom, laundry area, garage, or any other dwelling unit location addressed at 210.8(A)(1) through (A)(11) will now require GFCI protection for personnel.

Leviton Comment

The above requirement for GFCI protection of receptacles up to 250-volts may tempt installers to hardwire certain appliances to avoid this requirement. Keep in mind that if an appliance comes from the factory with an attachment plug, it is likely that the UL listing will be voided if the plug is removed and appliance is hard-wired. This can be problematic for inspectors. At the time of the printing of this book, Leviton does not manufacture a 240/250-volt GFCI receptacle (we don't believe any other manufacturer does either). So a Circuit breaker based solution is the only option.

For the 2020 NEC, changes to the Code effected the GFCI requirements for receptacles in both an unfinished basement and a finished basement intended as a habitable space. While this GFCI requirement was historically reserved for “unfinished” basements, changes to the 2020 NEC threw this GFCI provision open to **ALL** dwelling unit basements (not just unfinished basements), including basements that are finished out to be a habitable room or space such as a bedroom, exercise room, or game room.

210.8(A)(5) GFCI Protection for Basements



Unfinished Basement

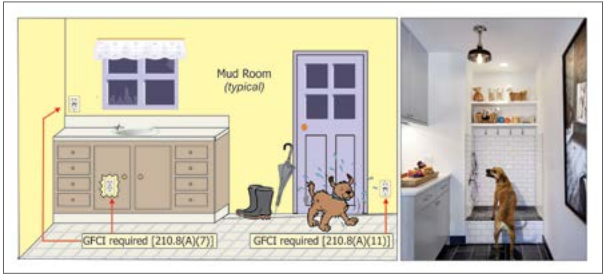


Finished Basement

For the 2020 NEC, a new list item (11) was added that will require GFCI protection for all 125-volt through 250-volt receptacles supplied by a single-phase branch circuit rated 150 volts or less to ground installed in indoor damp or wet locations regardless of the room or areas of the dwelling unit it might be located in. The areas that come to mind are mud rooms with no sink or a mud room with a sink but receptacles in that area are located greater than 1.8 m (6 ft) from said sink. Another area that this new provision will cover would be an indoor area

where animals like dogs are washed down before being permitted to re-enter the main dwelling unit.

210.8(A)(11) GFCI Protection for Indoor Damp or Wet Locations



Of course, this is open to interpretation. What is an indoor damp or wet location? Hopefully, the definitions for a damp, wet, or dry location found in Article 100 will be considered in making the determination as to an area's location being considered damp, wet, or dry. Who determines if a location (indoors or outdoors) is considered a damp, wet, or dry location? That would be up to the authority having jurisdiction (AHJ).

Leviton Solution

Appliances installed in unattended areas like basements and crawlspaces can benefit from Leviton's Audible Alert GFCI Receptacle. A power interruption due to a ground fault provides important protection to people but can shut down freezers, sump pumps and other necessary equipment if left undetected. Often GFCIs in an out-of-the-way place such as a back corner or storage area make daily visual checks for GFCI tripping unlikely. The new SmartlockPro® Slim GFCI with Audible Alert is the smart solution.



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New



210.8(B) GFCI Requirements at Non-Dwelling Unit Locations Expanded

Change Summary

- Non-dwelling unit GFCI protection has been expanded to all 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less installed in areas specified at 210.8(B)(1) through (B)(12).
- In addition to the areas listed in the 2017 NEC, GFCI protection was expanded to non-dwelling unit (2) kitchens or areas with a sink and permanent provisions for either food preparation or cooking, (6) indoor damp locations, (8) accessory building, (11) laundry areas, and (12) receptacles that are installed within 1.8 m (6 ft) of the outside edge of a bathtub or shower stall.

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210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (E)(F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

(See NEC for remainder of Code text)

(B) Other Than Dwelling Units. All single-phase 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground or less, 50 amperes or less and all receptacles supplied by three-phase receptacles branch circuits rated 150 volts or less to ground or less, 100 amperes or less installed in the following locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

- (1) Bathrooms
- (2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking
- (3) Rooftops

Exception: Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

- (4) Outdoors

Exception No. 1 to (3) and (4): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified

personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

(5) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B)(1), GFCI protection shall not be required shall be permitted to comply with 517.21.

(6) Indoor damp and wet locations

(7) Locker rooms with associated showering facilities

(8) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(9) Crawl spaces — at or below grade level

(10) Unfinished portions or areas of the basements not intended as habitable rooms

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas

(12) Bathtubs and shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Expert Analysis

In the 2017 NEC, GFCI protection at non-dwelling units was limited to receptacles supplied by a branch circuit rated single phase 150V to ground or less/50A or less and 3-phase branch circuits rated 150V or less to ground/100A or less. For the 2020 NEC, GFCI protection at non dwelling units is now required for all 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less installed in areas locations specified at 210.8(B)(1) through (B)(12).

Also in the 2020 NEC, the GFCI provisions for 210.8(B)(2) have been expanded to include not only kitchens but “areas with a sink and permanent provisions for either food preparation or cooking.” The definition of a “kitchen” remains the same in Article 100 as “an area with a sink and permanent provisions for food preparation and cooking.” The additional added language clarifies

that areas (not defined as a kitchen) with a sink and either permanent provisions for cooking or food preparation have the same potential for shock or electrocution hazards as a kitchen. This would include areas such as ice cream parlors, coffee shops, yogurt or smoothie stores, etc. These areas typically have stainless steel countertops and/or stainless-steel appliances but no “permanent provisions for cooking.” These facilities have at least the same potential for shock or electrocution hazards as a kitchen.

210.8(B) GFCI Protection for Other Than Dwelling Units



The next significant change in 210.8(B) was list Item (6) where an indoor “damp” location was added to the existing GFCI requirement for indoor wet non-dwelling unit locations. This revision occurred for clarity and consistency as the shock or electrocution hazard in a damp location is similar in nature to a wet location.

The requirement for GFCI protection for receptacles in a non-dwelling unit accessory building were added at 210.8(B)(8) that already covered garages, service bays, and similar areas other than vehicle exhibition halls and showrooms.

An exception to (B)(1) through (B)(5), (B)(8), and (B)(10) was added pertaining to “listed locking support and mounting receptacles” utilized in combination with compatible attachment fittings installed for the purpose of mounting a ceiling luminaire or ceiling fan. This exception deleted GFCI protection for these devices. GFCI protection for non-dwelling unit receptacles was intended for a traditional receptacle where a cord cap would be inserted. The same exception was also added at 210.8(A) for dwelling units.

A new List Item (11) was added to 210.8(B) that will require GFCI protection for receptacles installed in

non-dwelling unit laundry areas. GFCI requirements were added for dwelling unit laundry areas in the 2014 NEC. Laundry areas at non-dwelling units are similar to laundry areas of a dwelling unit and require the same GFCI protection.

210.8(B)(2) GFCI Protection for Kitchens and More



And finally, a new List Item (12) was added to 210.8(B) calling for GFCI protection for receptacles installed within 1.8 m (6 ft) of the outside edge of a non-dwelling unit bathtub or shower stall. Shower stalls and bathtubs can exist in commercial and industrial locations outside of a locker room or bathroom for a variety of purposes.

New



210.8(D), (E) and (F) GFCI Protection for Specific Appliances, Equipment Requiring Servicing & Outdoor Outlets

Change Summary

- New List Item (D) correlates with the requirements found in 422.5(B) (Type of GFCI protection for appliances) and refers to the list of GFCI requirements for appliances in 422.5(A) for continued consistency as the list is modified in future Code editions.
- GFCI protection is now required for the receptacles required by 210.63 for HVAC equipment, indoor service equipment, and indoor equipment requiring dedicated equipment space.
- GFCI protection is now required on dwelling unit outdoor outlets supplied by single-phase branch circuit rated 150 volts or less to ground, and 50 amperes or less (including 240-volt AC units).

continued on next page

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210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (E)(F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

(See NEC for remainder of Code text)

(D) Specific Appliances. Unless GFCI protection is provided in accordance with 422.5(B)(3) through (B)(5), the outlets supplying the appliances specified in 422.5(A) shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2). Where the appliance is a vending machine as specified in 422.5(A)(5) and GFCI protection is not provided in accordance with 422.5(B)(3) or (B)(4), branch circuits supplying vending machines shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2).

(E) Equipment Requiring Servicing. GFCI protection shall be provided for the receptacles required by 210.63.




(F) Outdoor Outlets. All outdoor outlets for dwellings, other than those covered in 210.8(A)(3), Exception to (3), that are supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, shall have ground-fault circuit-interrupter protection for personnel.

Exception: Ground-fault circuit-interrupter protection shall not be required on lighting outlets other than those covered in 210.8(C).

Expert Analysis

The new text at new 210.8(D) titled, “Specific Appliances” and the move of the GFCI requirement for dishwashers correlates the requirements found in 422.5(B) and refers to the list of appliances requiring GFCI protection in 422.5(A). This new requirement attempts to build a bridge for GFCI requirements from

210.8(E) GFCI for Equipment Requiring Servicing

<p>210.63(A) HVAC and Refrigeration Equipment</p> 	<p>210.63(B)(1) Indoor Service Equipment</p> 
<p>210.63(B)(2) Indoor Equipment Requiring Dedicated Equipment Space</p> 	<p>GFCI protection shall be provided for the receptacles required by 210.63</p> <p>A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location within 7.5 m (25 ft) of the equipment as specified in 210.63(A) and (B)</p>

210.8 to 422.5. This new provision at 210.8(D) calls for GFCI protection to be provided for an appliance either as an integral part of the attachment plug, located within the supply cord not more than 300 mm (12 in.) from the attachment plug, or factory installed within the appliance. If those three options are not achievable, then the GFCI protection must be provided by the overcurrent device or a GFCI device installed in the supply circuit such as a GFCI receptacle located at the outlet for the appliance.

For the 2020 NEC, a new 210.8(E) titled, “Equipment Requiring Servicing” will require GFCI protection for all the receptacles required by 210.63 (indoors and outdoors). The receptacles required by 210.63 are typically required for the expressed purpose of providing maintenance workers with the necessary access to power for the use of portable tools on the described equipment. Additionally, these receptacles can be located up to 7.5 m (25 ft) away from the equipment, so the use of an extension cord is not uncommon, which can increase the likelihood of a shock or electrocution hazard.

For the 2020 NEC, 210.63 was revised and divided into two list items with the “125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet to be installed at an accessible location within 7.5 m (25 ft)” of list items (A) and (B). List Item (A) is the text from previous 210.63 dealing with HVAC equipment. New 210.63(B) (1) is the previous text from previous 210.64 dealing with indoor service equipment. New 210.63(B)(2) is a new requirement pertaining to indoor equipment requiring dedicated equipment space. If this equipment is located outdoors, the requirements of 210.8(A)(3) and 210.8(B)(4) would drive GFCI protection for this required receptacle. In previous editions of the Code, there was no GFCI requirement for the required receptacle when it was installed indoors.

For the 2020 NEC, all outdoor outlets for dwelling units (with exceptions) that are supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less will be required to be GFCI protected. A branch circuit dedicated to deicing and snow-melting equipment is exempt for this GFCI requirement to avoid a conflict with requirements at 426.28 (fixed outdoor electric de-icing and snow-melting equipment.) and 427.22 (electric heat tracing and heating panels).

GFCI protection is also exempted for outdoor lighting outlets other than those covered in 210.8(C) (crawl space lighting outlets).

The most dramatic effect this new requirement will have is requiring GFCI protection for dwelling unit outdoor-installed heat pumps and air-conditioning units. With this requirement applying to “all outdoor outlets,” this would include outdoor hard-wired AC units.

Leviton Solution

For areas where more power is required for appliances and tools, Leviton’s 20-Amp GFCI is a great solution. The device is rated at 20-Amp, 125-Volt with 20-Amp feed-through. It is Tamper-Resistant and offers back and side wiring with self-grounding clip included. Available in non-TR versions and available in several popular colors.



Revision



210.11(C)(4) Dwelling Unit Garage Branch Circuits

Change Summary

- At least one 120-volt, 20-ampere branch circuit is required to be installed to supply the receptacle outlets required by 210.52(G)(1) for attached garages and in detached garages with electric power. These branch circuits intended for the 210.52(G)(1) garage receptacle outlets are to have no other outlets with an exception for readily accessible outdoor receptacle outlets.

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210.11 Branch Circuits Required (C) Dwelling Units.

(4) Garage Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one 120-volt, 20-ampere branch circuit shall be installed to supply receptacle outlets in required by 210.52(G)(1) for attached garages and in detached garages with electric power. This circuit shall have no other outlets.

Exception: This circuit shall be permitted to supply readily accessible outdoor receptacle outlets.

Expert Analysis

For the 2020 NEC, a provision was changed in article 210.11(C)(4) to provide at least one 120-volt, 20-ampere branch circuit installed to supply receptacle outlets “required by 210.52(G)(1)” (for each vehicle bay and not more than 1.7 m (5. ft) above the floor) in attached garages and in detached garages with electric power. In other words, garage receptacle outlets NOT required by 210.52(G)(1) do not have to be supplied by this dedicated 120-volt, 20-ampere branch circuit(s) or even be supplied by a 20-ampere rated branch circuit (could be a 15-ampere rated branch circuit). This seems to defeat the entire purpose for the previous 2017 NEC provision for a 20 ampere rated branch circuit for garage receptacles, which was to provide a branch circuit properly sized for large power tools, etc. installed in today’s modern dwelling unit garages.

Revision



210.12(C) and (D)

AFCI Protection in Patient Sleeping Rooms in Nursing Homes and Limited-Care Facilities and AFCI Protection for Branch Circuit Extensions in Guest Rooms/Suites

Change Summary

- AFCI protection has been expanded to patient sleeping rooms in nursing homes and limited-care facilities. In addition, Guest rooms and guest suites of hotels and motels have been added to the areas requiring AFCI protection for extensions and modifications of existing occupancies.

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210.12 Arc-Fault Circuit-Interrupter Protection.

Arc-fault circuit-interrupter protection shall be provided as required in 210.12(A), (B), (C), and (D). The arc-fault circuit interrupter shall be installed in a readily accessible location.

(C) Guest Rooms and, Guest Suites, and Patient Sleeping Rooms in Nursing Homes and Limited-Care Facilities.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets and devices installed in guest rooms and guest suites of hotels and motels and patient

sleeping rooms in nursing homes and limited-care facilities shall be protected by any of the means described in 210.12(A)(1) through (6).

(D) Branch Circuit Extensions or Modifications - Dwelling Units and, Dormitory Units, and Guest Rooms and Guest Suites. In Where branch circuit wiring for any of the areas specified in 210.12(A) or, (B), where branch-circuit wiring or (C) is modified, replaced, or extended, the branch circuit shall be protected by one of the following:

(1) A listed combination-type AFCI located at the origin of the branch circuit By any of the means described in 210.12(A)(1) through (A)(6).

(2) A listed outlet branch-circuit-type AFCI located at the first receptacle outlet of the existing branch circuit

Exception: AFCI protection shall not be required where the extension of the existing branch circuit conductors is not more than 1.8 m (6 ft) and does not include any additional outlets or devices, other than splicing devices. This measurement shall not include the conductors inside an enclosure, cabinet, or junction box.

Leviton Comment: While there was no specific change to dormitory units here in 210.12 (C) or (D), the NEC did add a definition in Chapter 1 clarifying and expanding what a dormitory is:

Dormitory Unit. A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities (CMP 2)

Expert Analysis



For the 2020 NEC, AFCI protection has been expanded to include patient sleeping rooms in Nursing Homes and Limited-Care facilities. The wiring methods employed to supply areas of limited care facilities and nursing homes that are used exclusively as patient sleeping rooms are often NEC Chapters 1 through 4 wiring methods as addressed at 517.10(B)(2). AFCI technology will provide the same protection from the danger of arcing

faults to the occupants of these rooms that is afforded occupants of conventional dwelling units and guest rooms and guest suites of hotels and motels.

Also in the 2020 NEC the areas where AFCI protection for existing branch circuit extensions or modifications is required has been expanded to guest rooms and guest suites of hotels and motels for consistency. All these areas (dormitory units, guest rooms, and guest suites) are areas that are typically used and treated much like a dwelling unit.

210.12(D) AFCI protection for Extensions/Modifications of Guest Rooms and Guest Suites of Hotels and Motels



One last change that needs to be addressed here is the measurement of the extended branch circuits.

The exception to AFCI protection for existing branch circuit extensions or modifications states that AFCI protection is not required for existing branch circuit conductors where extended not more than 1.8 m (6 ft) and does not include any additional outlets or devices (other than splicing devices). For the 2020 NEC, CMP-2 added a new last sentence to this exception which states that “this measurement shall not include the conductors inside an enclosure, cabinet, or junction box.” This means that the extension could consist of something like 1.8 m (6 ft) of flexible metal conduit from the panelboard to an outlet device box with 3.0 m (10 ft) of conductors from the circuit breaker terminal to the receptacle at the first outlet box.

Leviton Comment

Dormitories, Nursing Homes, Guest Rooms and Guest Suites can present unique challenges for AFCI protection. Quite often people staying in these rooms don't have access to breaker panels to reset the circuit should the AFCI breaker trip. Since receptacles can be reset at point of use, they are a convenient and preferred method of

AFCI protection among students, patients, guests and facility personnel.

The NEC allows for AFCI receptacles to satisfy 210.12(B) and (C) as long as RMC, IMC, EMT, Type MC or steel-armored type AC cables are used on the installation. This is often the case for commercial installations like dormitories, nursing homes and guest rooms/suites. In addition, the NEC specifically calls out AFCI receptacles as an allowable solution for branch circuit extensions and modifications as identified in 210.12(D) above.

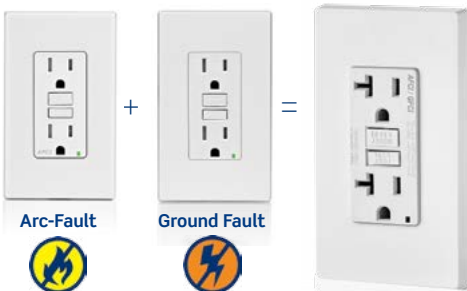
Please reference 210.12 for complete details.

Leviton Solution

Leviton offers AFCI receptacles and dual function AFCI/GFCI receptacles. The SmartlockPro® Dual Function AFCI/GFCI Receptacle offers protection both from electrical fires that could result from arc-faults and from electrical shock or electrocution due to ground faults in one smart device.

Through advanced technology, the SmartlockPro® Dual Function AFCI/GFCI Receptacle helps protect home and family by working to detect arc-fault and ground fault hazards and, if detected, quickly cuts off power to help avoid a potential fire or shock/electrocution occurrence. The SmartlockPro® Dual Function AFCI/GFCI Receptacle offers a National Electrical Code® (NEC®) compliant option for AFCI/GFCI protection in residential kitchens and laundry areas for new construction, modifications/extensions and replacement receptacles. It is also ideal as a replacement for ungrounded receptacles, satisfying NEC® requirements for both AFCI and GFCI protection. Leviton's AGTR1 is rated at 15-Amp, 125-Volt, 20-Amp Feed-Through. It is Tamper-Resistant, back and side wired and a self-grounding clip is included.

An Industry First!



Dual Function SmartlockPro® AFCI/GFCI Receptacles help protect against BOTH electrical fires and shocks

You Ask. We Deliver.

There are no shortcuts when it comes to safety. We offer a total safety solution and the experience to back it up.



The SmartlockPro® Advantage

For new construction or retrofit, installing the best means satisfied customers and fewer call backs. SmartlockPro® GFCIs, AFCIs and Dual Function AFCI/GFCIs deliver the protection you need from the brand you trust. Learn more at Leviton.com/protection



THE FUTURE IS ON™

LEVITON®

**New**

210.15 AFCI, GFCI, GFP Devices Can't Be Reconditioned

Change Summary

- New section added prohibiting GFCI devices, AFCI devices, and ground-fault protection equipment from being reconditioned.

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210.15 Reconditioned Equipment.

The following shall not be reconditioned:

- (1) Equipment that provides ground-fault circuit-interrupter protection for personnel
- (2) Equipment that provides arc-fault circuit-interrupter protection
- (3) Equipment that provides ground-fault protection of equipment

Expert Analysis

During the Second Draft stage of the 2020 NEC revision cycle, each Code Making Panel (CMP) was asked to review the equipment they have purview over and determine what equipment could be reconditioned and what equipment could not be reconditioned but rather replaced when necessary.

Each CMP looked to identify and prevent the reconditioning of products that cannot be reconditioned and secondly, to ensure that reconditioned equipment is properly evaluated to ensure a level of safety equal to the original equipment listing/labeling. This was to serve as an assurance that when equipment is reconditioned, it must be properly marked or identified for suitability for the installers, maintainers, and the inspection community.

The provisions of new 210.15 is the first of these new statements throughout the Code in reference to reconditioned equipment. This new section prohibits reconditioning of GFCI devices, AFCI devices, and ground-fault protection equipment that are not allowed to be reconditioned due to the inherent safety characteristics and requirements for those products per their product standards.

A list of Code sections with equipment that is either permitted to be reconditioned or not permitted to be reconditioned is supplied here for the reader's reference.

Reconditioned Equipment Permission Statements for the 2020 NEC				
Code Section	CMP	Equipment	Yes/ No	SR/PC
210.15	CMP-2	GFCI devices, AFCI devices, and GFP equipment	No	SR 7657
240.62	CMP-10	Low-voltage fuseholders and low-voltage nonrenewable fuses	No	SR 7974, PC 981
240.88 (A)(1)	CMP-10	Molded-case circuit breakers	No	DSR 8011, PC 980
240.88 (A)(2)	CMP-10	Low- and medium-voltage power circuit breakers	Yes	DSR 8011, PC 980
240.88 (A)(3)	CMP-10	High-voltage circuit breakers	Yes	DSR 8011, PC 980
240.88 (B)(1)	CMP-10	Low-voltage power circuit breaker electronic trip units	No	DSR 8011, PC 980
240.88 (B)(2)	CMP-10	Electromechanical protective relays and current transformers	Yes	DSR 8011, PC 980
240.102	CMP-10	Medium-voltage fuseholders and medium-voltage nonrenewable fuses	No	SR 8048, PC 982
406.3(A)	CMP-18	Receptacles	No	SR 8187
406.7	CMP-18	Attachment plugs, cord connectors, and flanged surface devices	No	SR 8189
408.8(A)	CMP-9	Panelboards	No	SR 8172, PC 987
408.8(B)	CMP-9	Switchboards and switchgear, or sections of switchboards or switchgear	Yes	SR 8172, PC 987
410.7	CMP-18	Luminaires, lampholders, and retrofit kits	No	SR 8162
411.4	CMP-18	Listed low-voltage lighting systems or a lighting system assembled from listed parts	No	SR 8164
490.49	CMP-9	Switchgear, or sections of switchgear	Yes	SR 8222
695.10	CMP-13	Fire pump controllers and transfer switches	No	SR 7522, PC 983
700.5(C)	CMP-13	Automatic transfer switches (Emergency Systems)	No	SR7584, PC 984
701.5(C)	CMP-13	Automatic transfer switches (Legally Required Standby Systems)	No	SR 7586, PC 985
702.5	CMP-13	Transfer switches (Optional Standby Systems)	No	SR 7588, PC 986

Leviton Comment

While it's good that the NEC makes it clear what can and can't be reconditioned, when they identify equipment that can be reconditioned, they seem to overlook, or not address, who is permitted to do the reconditioning. Most would agree that if the original equipment manufacturer (OEM) reconditioned a device it would be to factory spec's and safe. But if an independent third party does the reconditioning who knows their qualifications and to what degree they reconditioned? In the case of submerged equipment, did they simply remove rust from terminals, or replace delicate circuitry?

Revision



210.52(C) Receptacle Outlets for Countertop or Work Surfaces

Change Summary

- Revision clarifies that the receptacle outlets installed for countertop or work surfaces [210.52(C)] are not permitted to satisfy the requirement for receptacle outlet placement (wall spacing) as provided in 210.52(A).

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210.52 Dwelling Unit Receptacle Outlets. (C) Countertops and Work Surfaces.

In kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units, receptacle outlets for countertop and work surfaces that are 300 mm (12 in.) or wider shall be installed in accordance with 210.52(C)(1) through ~~(C)(5)~~ (C)(3) and shall not be considered as the receptacle outlets required by 210.52(A).

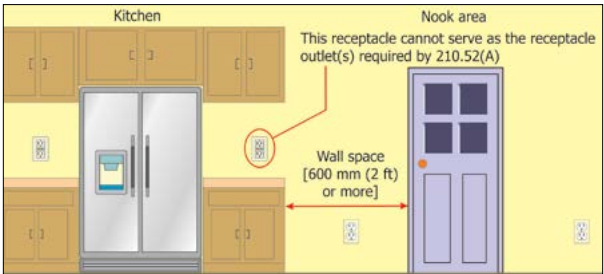
For the purposes of this section, where using multioutlet assemblies, each 300 mm (12 in.) of multioutlet assembly containing two or more receptacles installed in individual or continuous lengths shall be considered to be one receptacle outlet.

Expert Analysis

The requirements of 210.52(C) titled, “Countertops and Work Surfaces,” covers the NEC requirements for placement of 125-volt, 20-ampere receptacle outlets intended to serve countertop and work surfaces in kitchens, pantries, breakfast rooms, dining rooms, and

similar areas of dwelling units. For wall countertop or work surfaces, these receptacle outlets are typically required to be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space. These receptacle outlets are typically supplied by one of the 20-ampere rated small appliance branch circuits.

210.52(C) Countertops and Work Surfaces



A completely different requirement for receptacle outlet spacing can be found at 210.52(A). This requirement deals with 125-volt, 15- and 20-ampere receptacle outlets installed in every kitchen, family room, dining room, living room, parlor, library, den, sunroom, bedroom, recreation room, or similar room or area of dwelling unit in such a manner that no point measured horizontally along the floor line of any wall space is more than 1.8 m (6 ft) from a receptacle outlet.

As illustrated in the preceding paragraphs, receptacle outlet installations covered in 210.52(C) are separate from those covered by requirements in 210.52(A). This change clarifies that the receptacle outlets installed for the countertop or work surfaces are not permitted to satisfy the requirement for receptacle outlet placement as provided in 210.52(A).

Another change that occurred at 210.52(C) is a provision for multioutlet assemblies. In some cases, multioutlet assemblies are used as a means to meet the countertop receptacle placement or spacing requirements. A new sentence has been added to the end of 210.52(C) stating that each 300 mm (12 in.) of multioutlet assembly containing two or more receptacles installed in individual or continuous lengths are to be considered to be one receptacle outlet for the purpose of 210.52(C) and spacing requirement for countertops and work surfaces.

continued from previous page

Leviton Solution

When laying-out receptacle placement in countertop areas, don't forget to include USB receptacles.

Today's consumers demand these convenient devices for charging smartphones and other electronic equipment.

Adapter-free charging eliminates unsightly clutter contributing to a neat appearance on countertops,

Leviton's USB Charger Devices feature a smart chip that recognizes and optimizes the charging power of your electronic devices for fast and efficient charging.

The latest offering incorporates "Type C" ports which many newer phones call for. The Type C platform gives increased power and faster charges.

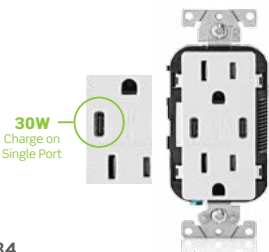
Leviton USB devices are available in many configurations and many colors, 15- and 20-Amp, 125-Volt.

Hospital Grade version is available.

Compare USB Wall Outlets/Chargers



	Dual Type-C with Power Delivery (PD) and Tamper-Resistant Outlets	Type A and Type-C with Tamper-Resistant Outlets	Dual Type A with Tamper-Resistant Outlets	4-Port Type A
USB Charger	6A	5.1A	3.6A	4.2A
Total Charging Power	30W	25+W	18W	24W
Single Port Charging Power	30W	15W	12W	12W
Outlet Power	15A	Available in 15A and 20A	Available in 15A and 20A	n/a
USB Cable Compatible	3.1, 3.0, 2.0, 1.1	3.1, 3.0, 2.0, 1.1	3.1, 3.0, 2.0, 1.1	3.1, 3.0, 2.0, 1.1
Wiring	Back and Side Wiring	Back and Side Wiring	Back and Side Wiring	Wire Leads



USB Wall Charger Dual Type-C™ with Power Delivery

With up to 2X the charging power (up to 30W*) of typical USB chargers, our USB In-Wall Charger Dual Type-C™ with Power Delivery is the most advanced, powerful in-wall charger on the market.

*On a single port



Revision

210.52(C)(1), (C)(2), and (C)(3) Receptacles in Wall Spaces, Island and Peninsular Countertops and Work Spaces

Change Summary

- Revision creates two separate List Items for wall space, and island and peninsular countertops and work surfaces. For island and peninsular countertop and work surfaces, the horizontal measurement was changed to a square foot calculation to determine the number of receptacles required. One receptacle outlet is required for the first 9 sq. ft of countertop and an additional receptacle outlet is required for each additional 18 sq. ft. or fraction thereof.

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210.52 Dwelling Unit Receptacle Outlets.

(C) Countertops and Work Surfaces. In kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units, receptacle outlets for countertop and work surfaces that are 300 mm (12 in.) or wider shall be installed in accordance with 210.52(C)(1) through ~~(C)(5)~~ (C)(3) and shall not be considered as the receptacle outlets required by 210.52(A).

For the purposes of this section, where using multioutlet assemblies, each 300 mm (12 in.) of multioutlet assembly containing two or more receptacles installed in individual or continuous lengths shall be considered to be one receptacle outlet.

(1) Wall Spaces ~~Countertop and Work Surface.~~ ~~A receptacle outlet shall be installed at each wall countertop and work surface that is 300 mm (12 in.) or wider.~~

Receptacle outlets shall be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space.

Exception: Receptacle outlets shall not be required on a wall directly behind a range, counter-mounted cooking unit, or sink in the installation described in Figure 210.52(C)(1).

(2) Island and Peninsular Countertops and Work Surfaces ~~Spaces.~~ Receptacle outlets shall be installed in accordance with 210.52(C)(2)(a) and (C)(2)(b).

(a) At least one receptacle outlet shall be provided for the first 0.84 m² (9 ft²), or fraction thereof, of the countertop or work surface. A receptacle outlet shall be provided for every additional 1.7 m² (18 ft²), or fraction thereof, of the countertop or work surface installed at each island countertop space with a long dimension of 600 mm (24 in.)

or greater and a short dimension of 300 mm (12 in.) or greater.

(b) At least one receptacle outlet shall be located within 600 mm (2 ft) of the outer end of a peninsular countertop or work surface. Additional required receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner. The location of the receptacle outlets shall be in accordance with 210.52(C)(3).

A peninsular countertop shall be measured from the connected perpendicular wall.

~~(3) Peninsular Countertop Spaces. At least one receptacle outlet shall be installed at each peninsular countertop long dimension space with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater. A peninsular countertop is measured from the connected perpendicular wall.~~

~~(5)~~ **(3) Receptacle Outlet Location.** Receptacle outlets shall be located in one or more of the following:

(1) On or Above Countertop or Work Surfaces:

On or above, but not more than 500 mm (20 in.) above, the countertop or work surface.

(2) In Countertop or Work Surfaces: Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces.

~~(3) Below Countertop or Works Surfaces: To comply with the following conditions (1) and (2), receptacle outlets shall be permitted to be mounted~~ Not more than 300 mm (12 in.) below the countertop or work surface. Receptacles installed below a countertop or work surface shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond its support base.

~~(1) Construction for the physically impaired~~

~~(2) On island and peninsular countertops or work surface where the surface is flat across its entire surface (no backsplashes, dividers, etc.) and there are no means to mount a receptacle within 500 mm (20 in.) above the countertop or work surface, such as an overhead cabinet~~ Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(1), Exception, or appliances occupying assigned spaces shall not be considered as these required outlets.

Informational Note No. 1: See 406.5(E) and 406.5(G) for installation of receptacles in countertops and 406.5(F) and 406.5(G) for installation of receptacles in work surfaces. See 380.10 for installation of multioutlet assemblies.

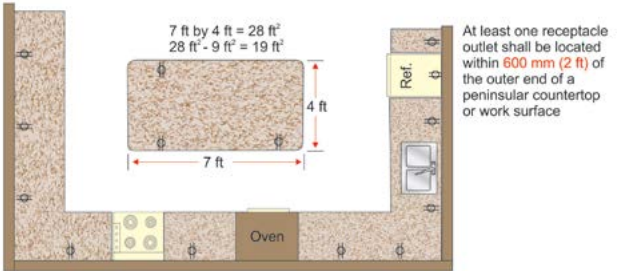
Informational Note No. 2: See Annex J and ANSI/ICC A117.1-2009, Standard on Accessible and Usable Buildings and Facilities.

Expert Analysis

210.52(C)(2) Island and Peninsulars

At least one receptacle outlet shall be provided for the **first 0.84 m² (9 ft²)**, or fraction thereof, of the countertop or work surface

A receptacle outlet shall be provided for **every additional 1.7 m² (18 ft²)**, or fraction thereof, of the countertop or work surface



Historically, once an island or peninsular countertop meet the minimum measurement requirements, only one receptacle outlet had been required at island and peninsular countertops regardless of the size of that island or peninsular. For this Code cycle, CMP-2 discussed the need for more than one receptacle outlet at large island countertops to serve the electrical needs in today's kitchens. That concept was the birth of the square footage concept that was adopted into the 2020 NEC.

For the 2020 NEC, at least one receptacle is required to be provided for the first 0.84 m² (9 ft²), or fraction thereof, of the countertop or work surface. An additional receptacle outlet is required for every additional 1.7 m² (18 ft²), or fraction thereof, of the countertop or work surface. At least one receptacle outlet must be located within 600 mm (2 ft) of the outer end of a peninsular countertop or work surface. On a large enough island or peninsular, the additional required receptacle outlets [other than the one required to be located within 600 mm (2 ft) of the outer end of a peninsular countertop or work surface] are permitted to be located as determined by the installer, designer, or building owner. This will allow needed flexibility for the location of these newly required receptacle outlets. The location of the required receptacle outlets must comply with 210.52(C)(3) (receptacle outlet locations).

What does all this mean to the installer or inspector?

The square footage of the island or peninsular countertop will determine the required number of receptacle outlets required. The following are examples

of island or peninsular countertops and their square footage and the required number of receptacle outlets:

Total Square Footage of Countertop	Minimum Number of Receptacle Outlets
8 sq. ft.	1
9 sq. ft.	1
More than 9 sq. ft. up to 27 sq. ft. (9 sq. ft. + 18 sq. ft. = 27 sq. ft.)	2
28 sq. ft. (first 9 sq. ft. [one], additional 18 sq. ft. [one] and addition fraction there of [1 sq. ft.][one])	3
48 sq. ft. (48 sq. ft. - 9 sq. ft. = 39 sq. ft.) (39 sq. ft. ÷ 18 sq. ft. = 2.17 sq. ft.)	4

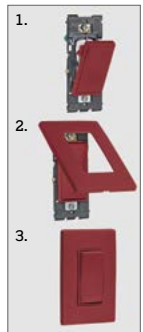
Note to Reader: The phrase “A peninsular countertop shall be measured from the connected perpendicular wall” was added to 210.52(C)(2) with a Tentative Interim Amendment (TIA) in July of 2019. The text regarding how peninsular countertops are measured, which was included in the 2017 NEC as the last sentence in 210.52(C)(3), was inadvertently deleted by FR 7537. The deletion of this text was also overlooked during the second draft meetings. Without this TIA this important text would not be included in the 2020 NEC.

Leviton Solution

When remodeling, homeowners that include islands and peninsular are often looking for a more decorative wiring device or a unique color. These customers can also change their mind on a whim or a popular new paint scheme. The solution... Levitons Renu® line of electrical devices. The Renu wallplate and faceplate can be easily removed by homeowners and swapped out with another color as their tastes change. TV remodeling shows inspire and compel homeowners to craft and update their home. Renu® addresses and provides options.



With 20 popular colors to select from, Renu® collection wallplates and faceplates can be snapped on or off to accentuate any design scheme — now and later, add seasonal accents, or simply refresh the look of a room at any time



Revision



210.52(E)(3) Receptacle Outlet for Balconies, Decks, and Porches

Change Summary

- The required receptacle outlet for balconies, decks, and porches is also required at decks that are installed in a freestanding manner where connection to the actual dwelling is not made at any point. The receptacle must be located in an accessible location from the balcony, deck, or porch and not more than 2.0 m (6½ ft) above the balcony, deck, or porch walking surface.

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210.52 Dwelling Unit Receptacle Outlets

(E) Outdoor Outlets. Outdoor receptacle outlets shall be installed in accordance with 210.52(E)(1) through (E)(3).

(3) Balconies, Decks, and Porches. Balconies, decks, and porches that are attached to within 102 mm (4 in.) horizontally of the dwelling unit and are accessible from inside the dwelling unit shall have at least one receptacle outlet accessible from the balcony, deck, or porch. The receptacle outlet shall not be located more than 2.0 m (6 ½ ft) above the balcony, deck, or porch walking surface.

Expert Analysis



In previous code cycles at least one 125-volt, 15- or 20-amp receptacle outlet has been required at balconies, decks, and porches “that are attached to the dwelling unit and are accessible from inside the dwelling unit.” Many decks are installed where connection to the actual dwelling unit building is not made at any point.

A literal reading of the 2017 NEC text would suggest that a receptacle is not required at this type of deck as it is technically “unattached.”

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For the 2020 NEC, this loophole was closed as language was put in place to require at least one receptacle outlet (accessible from the balcony, deck, or porch) on any balcony, deck, or porch that is within 102 mm (4 in.) horizontally of the dwelling unit. This distance of 102 mm (4 in.) was selected for this requirement to coincide with building code requirements.

Revision



210.65

Receptacle Outlets in Meeting Rooms

Change Summary

- Revisions recognize non-rectangular meeting rooms (such as round-shaped meeting rooms). Revision also provides flexibility to provide a floor receptacle outlet or an outlet to supply receptacles for hardwired furniture with receptacles.

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~~210.71~~ 210.65 Meeting Rooms.

(A) General. Each meeting room of not more than 93 m² (1000 ft²) in other than dwelling units shall have outlets for nonlocking-type, 125-volt, 15- or 20-ampere receptacles. The outlets shall be installed in accordance with 210.71~~65~~(B). Where a room or space is provided with movable partition(s), each room size shall be determined with the partition in the position that results in the smallest size meeting room.

Informational Note No. 1: For the purposes of this section, meeting rooms are typically designed or intended for the gathering of seated occupants for such purposes as conferences, deliberations, or similar purposes, where portable electronic equipment such as computers, projectors, or similar equipment is likely to be used.

Informational Note No. 2: Examples of rooms that are not meeting rooms include auditoriums, schoolrooms, and coffee shops.

(B) Receptacle Outlets Required. The total number of receptacle outlets, including floor outlets and receptacle outlets in fixed furniture, shall not be less than as determined in (1) and (2). ~~These receptacle outlets shall be permitted to be located as determined by the designer or building owner.~~

(1) Receptacle Outlets in Fixed Walls. The required number of receptacle outlets shall be installed ~~determined~~ in accordance with 210.52(A)(1) through (A)(4).

~~These receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner.~~

(2) Floor Receptacle Outlets. A meeting room with any

floor dimension that is at least 3.7 m (12 ft) wide or greater in any direction and that has a floor area of at least 20 m² (215 ft²) shall have at least one floor receptacle outlet located in the floor, or at least one floor outlet to serve receptacle(s), located at a distance not less than 1.8 m (6 ft) from any fixed wall for each 20 m² (215 ft²) or major portion of floor space.

Informational Note No. 1: See Section 314.27(B) for floor boxes used for receptacles located in the floor.

Informational Note No. 2: See Article 518 for assembly occupancies designed for 100 or more persons.

Expert Analysis

During the 2017 NEC revision cycle, new requirements were incorporated into a then new 210.71 calling for a certain number of nonlocking-type, 125-volt, 15- or 20-ampere receptacle outlets in non-dwelling unit meeting rooms under very specific conditions. For a meeting room or space that is provided with movable partition(s), each room size was to be determined with the partition in the position that results in the “smallest size meeting room.” If a meeting area was equipped with a movable partition and that partition (when opened or in place) would divide the total space into two spaces when employed, this would result in two separate meeting rooms and each side would need to be treated as its own separate meeting room. A simple way to look at planning installation is to say the location of said receptacle outlets can be determined by the installer, designer, or building owner, the minimum number of receptacles required is determined by the NEC.



For the 2020 NEC, these meeting room receptacle outlet rules moved forward with a few revisions and a new home at 210.65 rather than its original location at 210.71.

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The previous language at 210.71(B)(2) for floor receptacle outlets could have been interpreted to only apply to a square or rectangle-shaped meeting room. Revisions to 210.65(B)(2) clarifies length versus width concerns while addressing non-rectangular meeting rooms, such as those that are round. This list item for floor outlets now applies to a meeting room “with any floor dimension” that is 3.7 m (12 ft) or greater “in any direction” and that has a floor area of at least 20 m² (215 ft²). This revision also provides the flexibility to provide a floor receptacle outlet (as previously required) or a floor outlet to serve receptacle(s) providing flexibility to the installer and designer and to accommodate hardwired desk or furniture that could have built-in receptacle outlets. The requirement that these receptacles be located at a distance not less than 1.8 m (6 ft) from any fixed wall allows for emergency entrance/egress without having to maneuver around and over extension cords and flexible powers cords for laptop computers and the like.

Leviton Solution

Leviton offers floor boxes for residential and commercial applications including meeting rooms. Designed for ease of installation, easy access and good looks, the Leviton line of floor boxes is unmatched.



- **Solutions for all floor types:**
Tile, stone, wood, laminate carpet, concrete, vinyl
- **Applications include:**
Residential, multi dwelling units, restaurants, hotels, meeting rooms, shopping malls, offices
- Many finishes and configurations available





Revision/Deletion

215.9 15 and 20 Amp GFCI Feeder Limitations Lifted

Change Summary

- Revision provides correlation with GFCI protection requirements in 210.8 by removing the existing limitations of a feeder to provide GFCI protection to only 15 and 20-ampere receptacle branch circuits. Feeders are now permitted to be protected by a ground-fault circuit interrupter (GFCI) installed in a readily accessible location which will also provide the necessary GFCI protection to any branch circuit in lieu of the provisions for such interrupters as specified in 210.8 (GFCI protection for personnel) and 590.6(A) (GFCI protection for personnel for temporary wiring installations).

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215.9 Ground-Fault Circuit-Interrupter Protection for Personnel.

Feeders ~~supplying 15- and 20-ampere receptacle branch circuits~~ shall be permitted to be protected by a ground-fault circuit interrupter installed in a readily accessible location in lieu of the provisions for such interrupters as specified in 210.8 and 590.6(A).

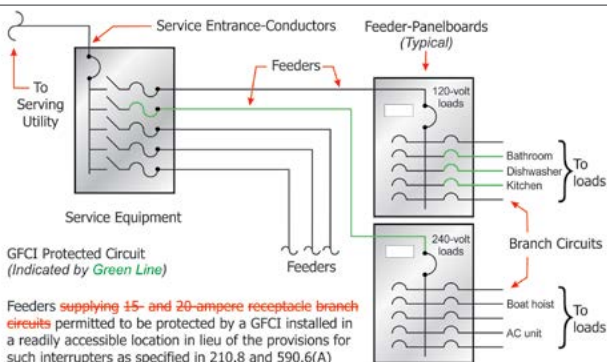
Expert Analysis

For the 2020 NEC, 215.9 was revised by removing the limitation of feeder GFCI protection to just feeders that supply “15- and 20-ampere receptacle branch circuits.” This revision provides correlation with recent expansion of GFCI protection requirements at 210.8, particularly the expansion of GFCI requirement at 210.8(A) to include receptacle outlets rated 125-volt through 250-volt and the expansion of 210.8(B) that started in the 2017 NEC to include all 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less.

This revision to remove the limitation of a feeder to provide GFCI protection to only feeders that supply “15- and 20-ampere receptacle branch circuits” will have an impact when a feeder supplies a branch circuit that supplies equipment that is hard-wired such as a boat hoists [555.9, which was 210.8(C)], dishwashers

[422.5(A)(7), which was 210.8(D)], crawl space lighting outlets [210.8(C), which was 210.8(E)], and beginning in the 2020 NEC, outdoor outlets at dwelling unit, which will include 240-volt outdoor air-conditioning units [see Analysis change at 210.8(F)]. The former wording at 215.9 would not have allow a GFCI device protecting a feeder to protect these hard-wired loads.

215.9 GFCI Protection for Feeders



New



230.67 Surge Protection Devices in Dwelling Units

Change Summary

- All dwelling unit services are now required to be provided with surge-protection. The surge protection device (SPD) must be an integral part of the service equipment or located immediately adjacent to the service equipment unless it is supplied at each next level distribution equipment downstream toward the load. This SPD is required to be either a Type 1 or Type 2 SPD. This requirement applies to residential service equipment being replaced as well.

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230.67 Surge Protection.

(A) Surge-Protective Device. All services supplying dwelling units shall be provided with a surge-protective device (SPD).

(B) Location. The SPD shall be an integral part of the service equipment or shall be located immediately adjacent thereto.

Exception: The SPD shall not be required to be located in the service equipment as required in (B) if located at each next level distribution equipment downstream toward the load.

(C) Type. The SPD shall be a Type 1 or Type 2 SPD.

(D) Replacement. Where service equipment is replaced, all of the requirements of this section shall apply.

Expert Analysis

A surge protection device (SPD) is a device designed to protect electrical equipment from voltage spikes. A SPD attempts to limit the voltage supplied to an electric device by either blocking or shorting to ground any unwanted voltages above a safe threshold. There are different types of SPD's designed for different applications and they are broken down by numbered category types. (See Leviton category breakdown provided below this analysis)

A new requirement pertaining to SPDs has been implemented for the 2020 NEC at 230.67. This new provision will require all services delivering power to dwelling units to be provided with a surge-protective device (SPD). This residential SPD must be an integral part of the service equipment or located immediately adjacent to the service equipment unless it is supplied at each next level distribution equipment downstream toward the load. This SPD is required to be either a Type 1 or Type 2 SPD. A SPD is also required where residential service equipment is replaced as well.

This new SPD requirement aligns with the recognized need for surge protection to protect sensitive electronics systems found in most appliances and equipment used in today's modern dwelling units. Additionally, the expanding use of distributed energy resources (DER) within electrical systems (such as photovoltaic, wind, batteries, fuel cells, etc.) often results in more opportunity for the introduction of surges into the system.

Electronic life-saving equipment such as fire alarm systems, GFCI's, AFCI's and smoke alarms, may be damaged when a surge occurs due to such things as lighting. Even small surges can cause damage over time and often goes undetected by the homeowner. It is a practical next step to require SPDs at dwelling units to provide a base level of surge protection.

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Leviton Comment

Article 230.67 calls for Surge Protection Devices (SPDs). Type 2 SPDs would typically be the type of device most often associated with this Code article.

Here we have provided an explanation of the different levels of surge protection and their applications:

Type 1 SPDs for the supply side of service entrance. Leviton offers several options including the 55240-ASA and secondary surge arrestors.



Type 2 SPDs are typically service entrance SPD panels or branch circuit SPD panels that are connected on the load side of the service disconnect overcurrent device (main service panel). Leviton offers several options including the 52120-7CS.



Type 3 SPDs are typically surge receptacles or cord connected point-of use devices. Leviton offers a complete assortment in duplex, quad and 6-plex in many styles and colors.



Type 4 SPDs are component assemblies consisting of one or more Type 5 components together with a disconnect (integral or external) or a means of complying with the limited current tests in UL 1449.



Type 5 SPDs Discrete component surge suppressors connected by its leads or provided with an enclosure with mounting means and wiring terminations.

Type 1 and Type 2 SPDs shunt external surges that originate from utilities or disturbances outside

the home or facility. Type 2 SPDs can protect for both internal and external surges when located at the branch. Type 3 SPDs can shunt surges that originated internally within the home or facility. So a comprehensive strategy for surge protection typically involves a Type 1 or Type 2 SPD and also a Type 3 SPD at point of use.

Revision



230.71 Maximum Number of Disconnects in Single Enclosure

Change Summary

- Revision eliminates more than one service disconnecting means in the same panelboard or other enclosure. Continues to retain the six service disconnect rule for services; however, the permission for up to six service disconnects is modified to require installation in separate enclosures only.

So the service disconnecting means for each service is still permitted to consist of not more than six switches or sets of circuit breakers, or a combination of not more than six switches and sets of circuit breakers, located in a group of separate enclosures, or in or on a switchboard or in switchgear. These up to six means of disconnect can no longer be mounted in a single enclosure.

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230.71 Maximum Number of Disconnects.

Each service shall have only one disconnecting means unless the requirements of 230.71(B) are met.

~~(A) General. The service disconnecting means for each service permitted by 230.2, or for each set of service-entrance conductors permitted by 230.40, Exception No. 1, 3, 4, or 5, shall consist of not more than six switches or sets of circuit breakers, or a combination of not more than six switches and sets of circuit breakers, mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard or in switchgear. There shall be not more than six sets of disconnects per service grouped in any one location.~~

For the purpose of this section, disconnecting means installed as part of listed equipment and used solely for the following shall not be considered a service

disconnecting means:

- (1) Power monitoring equipment
- (2) Surge-protective device(s)
- (3) Control circuit of the ground-fault protection system
- (4) Power-operable service disconnecting means

(B) Single-Pole Units Two to Six Service Disconnecting Means.

~~Two or three single-pole switches or breakers, capable of individual operation, shall be permitted on multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with identified handle ties or a master handle to disconnect all conductors of the service with no more than six operations of the hand.~~ Two to six service disconnects shall be permitted for each service permitted by 230.2 or for each set of service-entrance conductors permitted by 230.40, Exception No. 1, 3, 4, or 5. The two to six service disconnecting means shall be permitted to consist of a combination of any of the following:

- (1) Separate enclosures with a main service disconnecting means in each enclosure
- (2) Panelboards with a main service disconnecting means in each panelboard enclosure
- (3) Switchboard(s) where there is only one service disconnect in each separate vertical section where there are barriers separating each vertical section
- (4) Service disconnects in switchgear or metering centers where each disconnect is located in a separate compartment

Informational Note No. 1: See 408.36, Exception No. 1 and Exception No. 3, for service equipment in certain panelboards, and see 430.95 for service equipment in motor control centers. Metering centers are addressed in UL 67, Standard for Panelboards.

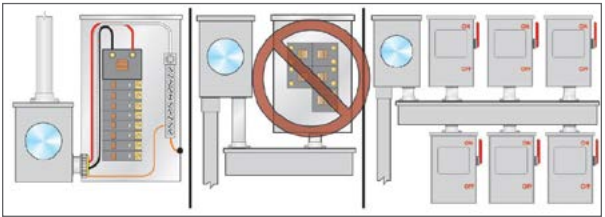
Informational Note No. 2: Examples of separate enclosures with a main service disconnecting means in each enclosure include but are not limited to motor control centers, fused disconnects, circuit breaker enclosures, and transfer switches that are suitable for use as service equipment.

Expert Analysis

All services are required to provide a means for disconnecting for all conductors installed in a building or other structure from the service-entrance conductors. Service disconnecting means must be installed in a readily accessible location and can be located outside the building or inside the building; but if located inside the building, the disconnecting means has to be located “nearest the point of entrance” from where the service conductors enter the building. Generally, buildings or structures are permitted to have only one service.

Several conditions exist at 230.2 that would allow the AHJ to permit more than one service per building or structure. A service disconnecting means is required for each service permitted by the Code. No more than six service disconnects per service may be grouped in any one location per the requirements of 230.71(A).

230.71(A) and (B) Maximum Number of Disconnects



Historically the service disconnecting means could be either a single disconnect or it is permitted to consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. This requirement allowing six means of disconnect in a single enclosure or in up to six separate enclosures has been a part of the Code since the 1937 edition of the NEC. This will no longer be true for the 2020 NEC. The service disconnect can still consist of up to six means of disconnect, but these multiple disconnects will now be required to be located in separate enclosures, they cannot be located within the same enclosure.

This revision takes into consideration the challenges created for electrical workers when encountering a panelboard with more than one service disconnecting means in the same enclosure. The six means of disconnect rule for a single enclosure makes it impossible to work in service equipment when applying electrical safe work practices in accordance with NFPA 70E (Standard for Electrical Safety in the Workplace). A single service disconnect within service equipment provides additional protection from electric shock hazards helping to facilitate the ability to create an electrically safe work condition by opening the single service disconnect where barriers are in place over the exposed energized conductors/terminals to eliminate any live exposed parts. Barriers are required to be provided to eliminate live exposed parts for switchboards, switchgear and panelboards in accordance with 408.3(A)(2).

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This revision at 230.71 retains the six means of disconnect rule for services, but now requires that these up to six means of disconnect be installed in separate enclosures.

New



230.85 Emergency Disconnect Required for Dwelling Units in a Readily Accessible Location

Change Summary

- New requirement added to require an emergency disconnect at a readily accessible outdoor location for dwelling units. The service disconnecting means can still be installed at a readily accessible location and located outside the building or inside nearest the point of entrance. However, an emergency disconnecting means (which could include the service disconnecting means) for a one- or two-family dwelling is now required to be installed and located on the outside of the structure. An initiation device for the rapid shutdown of a PV system is still required to be installed at a readily accessible location outside the building for one-family and two-family dwellings.

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230.85 Emergency Disconnects.

For one- and two-family dwelling units, all service conductors shall terminate in disconnecting means having a short-circuit current rating equal to or greater than the available fault current, installed in a readily accessible outdoor location. If more than one disconnect is provided, they shall be grouped. Each disconnect shall be one of the following:

(1) Service disconnects marked as follows: EMERGENCY DISCONNECT, SERVICE DISCONNECT

(2) Meter disconnects installed per 230.82(3) and marked as follows: EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT

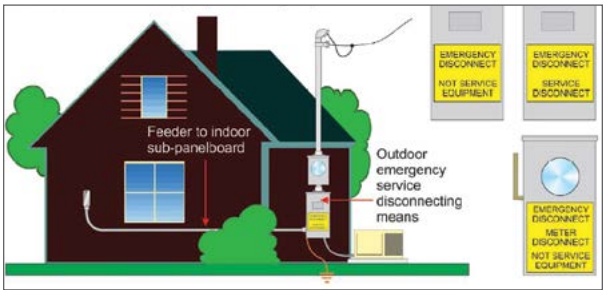
(3) Other listed disconnect switches or circuit breakers on the supply side of each service disconnect that are suitable for use as service equipment and marked as follows: EMERGENCY DISCONNECT, NOT SERVICE EQUIPMENT

Markings shall comply with 110.21(B).

Expert Analysis

For the 2020 NEC, requirements will be put in place demanding that an emergency disconnecting means for a one- or two-family dwelling be installed and located on the outside of the structure. This required outdoor emergency disconnect can consist of the service disconnect(s), a properly marked meter disconnect(s), or other listed disconnect switches or circuit breakers on the supply side of each service disconnect that are suitable for use as service equipment. All of these options must be properly marked to indicate that they are service disconnects, emergency disconnects, etc. with the marking in compliance with 110.21(B).

230.85 Exterior Emergency Disconnect(s) for Dwelling Units



This new requirement for a required outdoor emergency disconnecting means was primarily based upon providing first responders an outdoor accessible emergency or service disconnecting means in an emergency situation such as a fire, gas leak, structural damage, or flooding. Access to the service disconnecting means for fire department personnel first responders is very challenging when the service disconnect is installed in an indoor location of a dwelling unit area such as a basement. Additionally, with the increased use and availability of on-site generation of electrical power, such as photovoltaic (PV) power sources or energy storage devices, the lack of access to safely secure all electrical power generation devices to a residence is made even more challenging.

Will this outdoor disconnecting means increase unwanted juvenile or mischievous interruption of power to the dwelling unit? Hopefully, with the ability to place a lock on this outdoor disconnect and the occupant having access to the disconnect with a key should eliminate this concern.

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It is noteworthy to point out that a similar requirement was initiated for the 2017 NEC in Article 690 for photovoltaic (PV) systems as the rapid shutdown initiator device for a PV system is also required to be located on the outside of the building for one- and two-family dwellings.

This same basic requirement for an emergency disconnect at a readily accessible outdoor location for dwelling units was implemented for the following equipment in the following locations: 445.18(D) (Generators); 480.7(A) (Storage Batteries); 694.22(C)(1) (Wind Electric Systems); 706.15(A) (Energy Storage Systems).

Leviton Comment

Additional requirements regarding signage for dwelling optional stand-by generator disconnects can be found at Article 702.7(A) on page 126 of this pocket guide.

Leviton Solution

Appropriate for applications up to 100 Amps, Leviton offers a full line of Enclosed Safety Disconnect Switches including the PowerSwitch Enclosed Safety Disconnect Switch Product Line: DS and EDSR Series

- The DS Series of 30-Amp to 100-Amp, fused and non-fused enclosed switches
- The EDSR Series which brings a 30-Amp, non-fused safety disconnect switch and NEMA locking receptacle into the same enclosure for easier installation and maintenance
- The MDS30-AX, our 30-Amp, non-fused stainless steel enclosed disconnect switch

Heavy Duty Enclosed Safety Disconnect Switches cut power to the circuit for equipment servicing and are designed to withstand higher short circuit currents than manual motor controllers. Watertight and dust-tight, PowerSwitch Safety Disconnect Switches are the ideal choice for process environments with particulate laden air, outdoor exposure, or requiring water washdowns.



Leviton PowerSwitch group



Revision

312.8(B) Energy Management Equipment

Change Summary

- The Code language at 312.8(B) expands allowances for wiring space of enclosures for switches or overcurrent devices to contain “power monitoring equipment” and “energy management equipment” under specific conditions along with smaller conductors used exclusively for control or instrumentation circuits of such equipment.

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312.8 Switch and Overcurrent Device Enclosures.

(B) Power Monitoring or Energy Management Equipment.

The wiring space of enclosures for switches or overcurrent devices shall be permitted to contain power monitoring or energy management equipment where all of the following conditions are met: in accordance with 312.8(B)(1) through (B)(3).

(1) Identification. The power monitoring or energy management equipment is shall be identified as a field installable accessory as part of the listed equipment, or is a listed kit evaluated for field installation in switch or overcurrent device enclosures.

(2) Area. The total area of all conductors, splices, taps, and equipment at any cross section of the wiring space does shall not exceed 75 percent of the cross-sectional area of that space.

(3) Conductors. Conductors used exclusively for control or instrumentation circuits shall comply with either 312.8(B)(3)(a) or (B)(3)(b).

(a) Conductors shall comply with 725.49.

(b) Conductors smaller than 18 AWG, but not smaller than 22 AWG for a single conductor and 26 AWG for a multiconductor cable, shall be permitted to be used where the conductors and cable assemblies meet all of the following conditions:

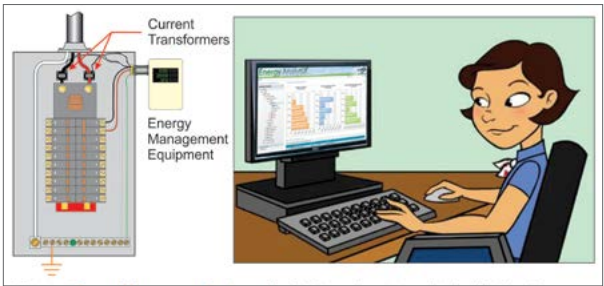
- (1) Are enclosed within raceways or routed along one or more walls of the enclosure and secured at intervals that do not exceed 250 mm (10 in.)
- (2) Are secured within 250 mm (10 in.) of terminations
- (3) Are secured to prevent contact with current carrying components within the enclosure
- (4) Are rated for the system voltage and not less than 600 volts
- (5) Have a minimum insulation temperature rating of 90°C

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Expert Analysis

In response to the demand for such equipment being installed in a cabinet containing switches or overcurrent devices, the 2017 NEC adopted new text at 312.8(B) to allow “power monitoring equipment” within the wiring space of enclosures for switches or overcurrent devices with specific conditions including the limit on the amount of space occupied by all conductors, splices, taps, devices, and equipment to the same 75 percent fill requirement that was previously located at 312.8(2) [now 312.8(A)(2)].

312.8(B) Power Monitoring or Energy Management Equipment

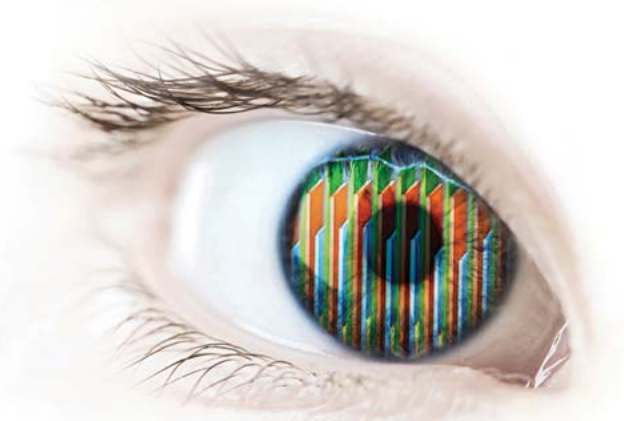


For the 2020 NEC, CMP-9 took this requirement one step further by adding the term “energy management equipment” to this wiring space requirement.

Both types of equipment present the same concern and is governed by the same product standards (UL Product Spec category XOBA). This category covers open-type current transformers intended for field installation within distribution and control equipment such as panelboards, switchboards, industrial control equipment, and energy-monitoring/management equipment, to measure current on a branch circuit. Energy Management Equipment is also addressed by UL Product Spec category PAZX.

A new list item was also added at 312.8(B)(3) for conductors used exclusively for control or instrumentation circuits of equipment installed within these cabinet enclosures containing switches or overcurrent devices. Sensors associated with power monitoring and energy management equipment operate at very low current levels and smaller conductors which can introduce concern with the mechanical strength of the wire and its ability to withstand the wiring space environment. The new text provides two options for conductors. The first option references 725.49.

continued on page 56



See What's Watt.

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continued from page 54

This section provides sizing and insulation requirements for Class 1 circuit conductors. The second option establishes use of smaller AWG conductors, along with specific construction and installation requirements to address suitability within the wiring space normally reserved for nominal power equipment such as overcurrent devices.

Leviton Solution

Equipment typically installed in cabinet enclosures for power monitoring typically include CTs (Current Transformers). The CTs encircle conductors and measure current flow and thus energy usage. The measurements are transmitted to a submeter where it is collected and turned into useful energy consumption data.

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Revision

314.16(B)(5) Box Fill Calculation Revised. Volume Allowance for EGCs and Equipment Bonding Jumpers

Change Summary

- An additional $\frac{1}{4}$ volume allowance is now required to be added to the existing volume allowance of a single conductor volume allowance based on the largest equipment grounding conductor or equipment bonding jumper entering the box. This new $\frac{1}{4}$ volume allowance will be counted for each EGC installed in the box for more than four EGCs or equipment bonding conductors. This change eliminates the need to specifically address the EGCs for isolated ground receptacles permitted by 250.146(D).

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314.16 Number of Conductors in Outlet, Device, and Junction Boxes, and Conduit Bodies.

Boxes and conduit bodies shall be of an approved size to provide free space for all enclosed conductors. In no case shall the volume of the box, as calculated in 314.16(A), be less than the fill calculation as calculated in 314.16(B). The minimum volume for conduit bodies shall be as calculated in 314.16(C).

The provisions of this section shall not apply to terminal housings supplied with motors or generators.

Boxes and conduit bodies enclosing conductors 4 AWG or larger shall also comply with the provisions of 314.28.

Outlet and device boxes shall also comply with 314.24.

(B) Box Fill Calculations. The volumes in paragraphs 314.16(B)(1) through (B)(5), as applicable, shall be added together. No allowance shall be required for small fittings such as locknuts and bushings. Each space within a box installed with a barrier shall be calculated separately.

(5) Equipment Grounding Conductor Fill.

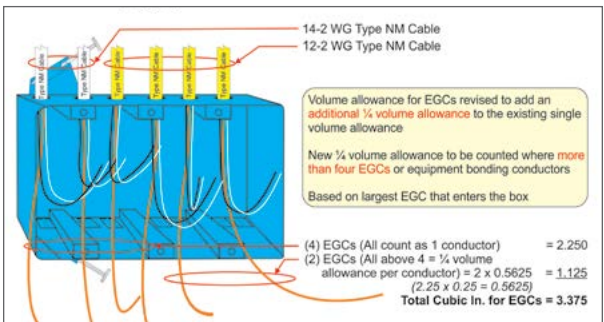
Where ~~one or more~~ up to four equipment grounding conductors or equipment bonding jumpers enter a box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest equipment grounding conductor or equipment bonding jumper ~~present in~~ entering the box. ~~Where an additional set of equipment grounding conductors, as permitted by 250.146(D), is present in the box, an additional~~ A $\frac{1}{4}$ volume allowance shall be made for each additional equipment grounding conductor or equipment bonding jumper that enters the box, based on

the largest equipment grounding conductor in the additional set or equipment bonding conductor.

Expert Analysis

Volume of a box is the total volume in cubic millimeters or cubic inches of the assembled sections. This total volume (space) determines the number and size of conductors and wiring devices permitted to be contained in the box. Conductors, internal clamps, support fittings, and devices such as switches and receptacles take up space within the box. So, the Code assigns to each conductor, clamp, support fitting, device and equipment grounding conductor an associated volume allowance. This volume allowance is listed in cubic inches or cubic centimeters. Table 314.16(B) list the volume allowance as a function of conductor size. For example, according to Table 314.16(B), each 12 AWG conductor in a box takes up 36.9 cm³ (2.25 in.³) of free space within that box. When performing a box fill

314.16(B)(5) Box Fill Calculations — EGC Conductor Fill



calculation, the volume allowance for each conductor, clamp, support fitting, device, and equipment grounding conductor is added together. The box must have a volume that equals or exceeds the total volume required for the contained items.

A single volume allowance has been required for all equipment grounding conductors within a box since the 1971 NEC. This single volume deduction was based on the largest equipment grounding conductor or equipment bonding jumpers present in the box. This was for all equipment grounding conductors or equipment bonding jumper regardless of the number of equipment grounding conductors or equipment bonding jumpers installed.

For the 2020 NEC, the single volume allowance or deduction will apply to the first four equipment grounding conductors or equipment bonding jumpers. Any equipment grounding conductor or equipment bonding jumper installed above four will require an additional $\frac{1}{4}$ volume allowance to the existing volume allowance of a single conductor volume allowance based on the largest equipment grounding conductor or equipment bonding jumper entering the box. In multiple gang boxes, taking only one volume allowance based on the largest EGC is not adequate in many cases resulting in significant undue crowding of conductors and not enough free space to allow heat to dissipate from the contained conductors. This change also eliminates the need to specifically address the equipment grounding conductors for isolated ground receptacles permitted by 250.146(D).

This revision to the required free space in a box for equipment grounding conductors and equipment bonding jumpers will address is the issue of complying with both 314.16(B)(5) and 300.14. The requirements of 300.14 generally require at least 150 mm (6 in.) of free conductor, measured from the point in the box where it emerges from its raceway or cable sheath, to be provided at each outlet, junction, and switch point for splices or the connection of luminaires or devices. Requiring all equipment grounding conductors to meet 300.14 (at least 150 mm (6 in.) of free conductor for each conductor) and applying only a single volume allowance was problematic in past editions of the Code in device boxes with multiple equipment grounding conductors and often resulted in overcrowded conditions.

Revision



314.27(C) Outlet Boxes for Support of Ceiling-Suspended (Paddle) Fan

Change Summary

- Revision will now generally require all outlet boxes mounted in a location acceptable for the installation of a ceiling-suspended (paddle) fan in the ceilings of habitable rooms of dwelling units to be listed for the sole support of ceiling-suspended (paddle) fan or an outlet box complying with the applicable requirements of 314.27 and providing

access to structural framing capable of supporting of a ceiling-suspended (paddle) fan bracket or equivalent. This requirement is applicable only in locations acceptable for the installation of a ceiling-suspended (paddle) fan.

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314.27 Outlet Boxes

(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.

Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

~~Where spare, separately switched, ungrounded conductors are provided to a ceiling-mounted outlet box, Outlet boxes mounted in the ceilings of habitable rooms of dwelling occupancies in a location acceptable for the installation of a ceiling-suspended (paddle) fan in one-family, two-family, or multifamily dwellings, the outlet box or outlet box system shall be listed for sole support of a ceiling-suspended (paddle) fan shall~~ comply with one of the following:

- (1) Listed for the sole support of a ceiling-suspended (paddle) fans
- (2) An outlet box complying with the applicable requirements of 314.27 and providing access to structural framing capable of supporting of a ceiling-suspended (paddle) fan bracket or equivalent.

Expert Analysis

Many new homes were and still are being built with multiple ungrounded conductors provided to the ceiling-mounted luminaire outlet box with most of these “spare” or unused conductors provided to accommodate future installation of a ceiling fan.

314.27(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets



Applicable only in locations acceptable for the installation of a ceiling-suspended (paddle) fan

New for the 2020 NEC is a requirement that all outlet boxes mounted in the ceilings of habitable rooms of dwelling units [in a location acceptable for the installation of a ceiling-suspended (paddle) fan] be listed for the sole support of a ceiling-suspended (paddle) fan or an outlet box complying with the applicable requirements of 314.27 and providing access to structural framing capable of supporting of a ceiling-suspended (paddle) fan bracket or equivalent must be installed. This requirement will predicate the installation of an outlet box listed for the sole support of a ceiling-suspended (paddle) fan at most dwelling unit ceiling-mounted luminaire locations regardless of the existence of a “spare” separately switched ungrounded conductor or not.

Revision



404.22 Electronic Control Switches

Change Summary

- Revision removes the word “lighting” from the phrase “electronic lighting control switches” as these switches may supply non-lighting loads. Electronic control switches (not just electronic lighting control switches) are required to be listed. Electronic control switches are generally not permitted to introduce current on the equipment grounding conductor during normal operation. The future effective date of January 1, 2020 for not introduce current on the equipment grounding conductor remains in the 2020 NEC.

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404.22 Electronic Lighting Control Switches

Electronic ~~lighting~~ control switches shall be listed. Electronic ~~lighting~~ control switches shall not introduce current on the equipment grounding conductor during normal operation. The requirement to not introduce current on the equipment grounding conductor shall take effect on January 1, 2020.

Exception: *Electronic lighting control switches that introduce current on the equipment grounding conductor shall be permitted for applications covered by 404.2(C), Exception. Electronic lighting control switches that introduce current on the equipment grounding conductor shall be listed and marked for use in replacement or retrofit applications only.*

Expert Analysis

A new section under Part II of Article 404 for the “Construction Specifications” was added for the 2017 NEC dealing with electronic lighting control switching devices. This was a companion piece to 404.2(C), which generally requires a grounded circuit conductor to be installed at switch locations for lighting loads that are supplied by a grounded general-purpose branch circuit. This 2017 NEC section addressed the fact that electronic lighting control switches must be listed and “shall not introduce current on the equipment grounding conductor during normal operation” with a future effective date on January 1, 2020. The intent was to prevent current being intentionally introduced onto the equipment grounding conductor system as a result of the installation of electronic switching devices such as an occupancy sensor.

For the 2020 NEC, the word “lighting” is being removed from the phrase “electronic lighting control switches” in the title of 404.22 and in the parent text as the switches in question may supply non-lighting loads and they are not limited to just lighting loads. These electronic control devices may be used for fan speed control, receptacle control, appliance control, etc. The applicable product standards such as UL 1472 (Solid-State Dimming Controls) describes these devices as simply “electronic control switches”.

Leviton Comment

Devices that typically and historically “leak” a small amount of current to ground when there is no neutral present are occupancy and vacancy sensors. This is because these devices require a small amount of power to complete a circuit in order to sense movement and be in a “ready state”. If there is no neutral to complete the circuit, the ground serves the purpose. The exception in the code article above only permits this “leakage” in retrofit applications and only with devices listed for this ground usage application.

The significance of this article expanding beyond “lighting switches” and including all switches is because many new switching devices, like home automation also require a neutral for operation, so the NEC has included them in this requirement. The Leviton line of home automation devices do require a neutral. In the “Off” position these devices require energy and a completed

circuit to communicate with the cloud and be in a ready state.

Leviton Solution

Making Your Home Smarter and Safer. Every home can and should be a smart home. Homeowners can enjoy the freedom of controlling light switches, table lamps, small appliances and more from a smartphone or tablet. Anytime. Anywhere.

Turn lights on/off at scheduled times, like the front porch light on at 7PM and off at 7AM. Going on vacation? Create a “lived-in” look and randomize the lighting scheme. Or, with a simple touch on a smartphone, control lights — from anywhere!

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Decora Smart™ family of devices

Revision and New



406.4(D)(4) & (7)

Exception Disallowing AFCI Receptacles Deleted and Installation Requirements of Controlled Receptacles

Change Summary

- Previous Exception No. 1 to AFCI replacements was deleted as it is no longer relevant. Products that comply with the main requirement are now available.
- Automatically controlled receptacles are required to be replaced with equivalently controlled receptacles. Markings for these receptacles are still in place at 404.3(E). A new 406.4(D)(7) was added requiring automatically controlled receptacles to be replaced with equivalently controlled receptacles.

continued on next page

406.4 General Installation Requirements.

Receptacle outlets shall be located in branch circuits in accordance with Part III of Article 210. General installation requirements shall be in accordance with 406.4(A) through (F).

(D) Replacements. Replacement of receptacles shall comply with 406.4(D)(1) through (D)(6) (7), as applicable. Arc-fault circuit-interrupter type and ground-fault circuit-interrupter type receptacles shall be installed in a readily accessible location.

(4) Arc-Fault Circuit-Interrupter Protection.

Where If a receptacle outlet is located in any areas specified in 210.12(A), or (B), or (C) is replaced, a replacement receptacle at this outlet shall be one of the following:

- (1) A listed outlet branch-circuit type arc-fault circuit-interrupter receptacle
- (2) A receptacle protected by a listed outlet branch-circuit type arc-fault circuit-interrupter type receptacle
- (3) A receptacle protected by a listed combination type arc-fault circuit-interrupter type circuit breaker

Exception No. 1: Arc-fault circuit-interrupter protection shall not be required where all of the following apply:-

- (1) The replacement complies with 406.4(D)(2)(b).
- (2) It is impracticable to provide an equipment grounding conductor as provided by 250.130(C).
- (3) A listed combination type arc-fault circuit-interrupter circuit breaker is not commercially available.
- (4) GFCI/AFCI dual function receptacles are not commercially available.

Exception No. 2: Section 210.12(D), Exception, shall not apply to replacement of receptacles.

(7) Controlled Receptacles. Automatically controlled receptacles shall be replaced with equivalently controlled receptacles. If automatic control is no longer required, the receptacle and any associated receptacles marked in accordance with 406.3(E) shall be replaced with a receptacle and faceplate not marked in accordance with 406.3(E).

Expert Analysis

For the 2020 NEC, Exception No. 1 to 406.4(D)(4) was deleted as it is no longer needed or applicable. Commercially obtainable devices (such as a dual-function AFCI/ GFCI receptacle outlet) are readily available that can satisfy the main rule rendering the exception irrelevant. This exception therefore would never be able to be applied, making it removable. It should be noted that these receptacle replacement AFCI requirements now apply to 210.12(C) (Guest Rooms, Guest Suites, and Patient Sleeping Rooms in Nursing Homes and Limited-Care Facilities). The question has been asked more than once in the past few years if

these occupancies are covered by this rule along with dwelling units and dormitory units.

406.4(D)(7) Replacement of Automatically Controlled Receptacles



For the 2017 NEC, 406.3(E) was revised to provide necessary clarity for the identification of controlled receptacles by providing the user with further information that the receptacle outlet can be activated or deactivated by an energy management system or other means of automatic control. One of these revisions was to require the word “Controlled” be placed on the controlled receptacle along with the symbol identified in Figure 406.3(E).

For the 2020 NEC, a new List Item (7) was added to 406.4(D) dealing with replacement of controlled receptacles. If a receptacle that is managed by an energy management system is replaced, the automatically controlled receptacles will now be required to be replaced with equivalently controlled receptacles. If a remodel or renovation results in the automatically controlled receptacle no longer being required to be automatically controlled by an energy management system, the receptacle and any associated receptacle markings in accordance with 406.3(E) would be required to be replaced with a receptacle and faceplate not marked in accordance with 406.3(E). This addresses a marking concern related to the removal of the control feature.

Leviton Solution

The Leviton SmartlockPro® Dual Function AFCI/GFCI Outlet offers a National Electrical Code (NEC) compliant option for AFCI/GFCI protection in residential kitchens and laundry areas for new construction, modifications/ extensions and replacement receptacles. They are also ideal as a replacement for ungrounded outlets, satisfying NEC requirements for both AFCI and GFCI protection. The Dual Function AFCI/GFCI is available in 15- and 20-Amp with 20-Amp Feed-Through. They are Tamper-

Resistant, are back and side wired and include a self-grounding clip included. Available in several colors.

To meet the requirements for identifying receptacles that will be automatically de-energized by a mechanical switch or as part of an overall plug load control program, Leviton offers a complete line of receptacles with the “Controlled Receptacle Marking Symbol” and the word “CONTROLLED” on the receptacle face.

Available in 15- and 20-Amp ratings and in many colors for both standard duplex and Decora® configurations.



Cat. No.
AGTR2-W



Leviton 'Controlled' Receptacles

New



406.5(G)(2) Receptacle Mounting Under Sinks

Change Summary

- Receptacle outlets are still prohibited from being installed in a face-up position in or on countertop surfaces or work surfaces unless the receptacle device is listed for countertop or work surface applications. New provisions were added to prohibit a receptacle from being installed in the face-up position under a sink.

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406.5 Receptacle Mounting.

Receptacles shall be mounted in identified boxes or assemblies. The boxes or assemblies shall be securely fastened in place unless otherwise permitted elsewhere in this Code. Screws used for the purpose of attaching

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receptacles to a box shall be of the type provided with a listed receptacle, or shall be machine screws having 32 threads per inch or part of listed assemblies or systems, in accordance with the manufacturer's instructions.

(G) Receptacle Orientation.

(1) Countertop and Work Surfaces. Receptacles shall not be installed in a face-up position in or on countertop surfaces or work surfaces unless listed for countertop or work surface applications.

(2) Under Sinks. Receptacles shall not be installed in a face-up position in the area below a sink.

Expert Analysis

In previous code cycles receptacle outlets have been prohibited for being installed in the face-up position in or on countertop surfaces or work surfaces and in the face-up position in seating areas or similar surfaces. The concern with receptacle outlets installed in the face-up position is with liquid spillage into the receptacle itself.



For the 2020 NEC, provisions were added to prohibit receptacle outlets from being installed in a face-up position in the area below a sink. It is a common sight to see plumbing pipes connecting to a sink (supply and drain) leaking from time-to-time under a sink area such as a kitchen sink. If a receptacle for such things as a garbage disposer is installed in the face-up position under the sink, that receptacle is subject to water entering the polarized slots of the receptacle creating a hazardous condition.



Revision and New

406.9(C) Receptacle Limitations in Bathrooms

Change Summary

- Receptacles are now prohibited from being installed within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or shower stall threshold with this identified zone being all-encompassing and will include the space directly over the tub or shower stall. In bathrooms with dimensions less than the required zone, receptacle(s) are permitted to be installed opposite the bathtub rim or shower stall threshold on the farthest wall within the room.

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406.9 Receptacles in Damp or Wet Locations.

(C) Bathtub and Shower Space. Receptacles shall not be installed within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or directly over a bathtub or shower stall threshold.

The identified zone is all-encompassing and shall include the space directly over the tub or shower stall.

Exception: In bathrooms with less than the required zone the receptacle(s) shall be permitted to be installed opposite the bathtub rim or shower stall threshold on the farthest wall within the room.

Expert Analysis

For the 2020 Code cycle, new rules will be implemented to prohibit receptacles from being installed within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or shower stall threshold with this identified zone being all-encompassing and including the space directly over the tub or shower stall. To remedy the situation where the bathroom is dimension-wise, simply too small to accommodate this 900 mm (3 ft) horizontal measurement, an exception was added stating that in bathrooms with less than the required zone, the receptacle(s) shall be permitted to be installed opposite the bathtub rim or shower stall threshold on the farthest wall within the room.

To add to the complexity of this rule for receptacle outlets in a bathroom, current language at 552.41(F) (1) for park trailers limits a 120-volt receptacle outlet from being “installed in or within reach [750 mm (30 in.)]

of a shower or bathtub space.” Other factors involve 210.52(D), which demands at least one receptacle outlet be installed in dwelling unit bathrooms within 900 mm (3 ft) of the outside edge of each basin. Under the rules of previous Code cycles, a receptacle could be installed between a bathroom sink and the tub and meet the requirements of 210.52(D). Under the new 2020 NEC language at 406.9(C), the same described bathroom could not satisfy 210.52(D) while complying with 406.9(C) (without perhaps applying the exception).

406.9(C) Bathtub and Shower Space



It should be noted that this 900 mm (3 ft) horizontal and 2.5 m (8 ft) vertical “zone” is most often associated with dwelling units, but a closer study of this requirement here at 406.9(C) and 410.10(D) for luminaires and ceiling fans will reveal that these requirements are not exclusive to dwelling units only.

Revision and New



406.12 Tamper-Resistant Receptacles

Change Summary

- In addition to the areas requiring TR receptacle requirements brought forward from the 2017 NEC (with revisions), common areas of multifamily dwellings and common areas of guest rooms and guest suites of hotels and motels were also added and clarified as to TR receptacle requirements. Attached and detached garages and accessory buildings to dwelling units were clarified as areas needing to meet TR receptacle requirements. A new List Item (8) was added to the TR receptacle requirements pertaining to assisted living facilities.

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406.12 Tamper-Resistant Receptacles.

All 15- and 20-ampere, 125- and 250-volt nonlocking-type receptacles in the areas specified in 406.12(1) through (7) (8) shall be listed tamper-resistant receptacles.

- (1) Dwelling units, ~~in all areas~~ including attached and detached garages and accessory buildings to dwelling units, and common areas of multifamily dwellings specified in 210.52 and 550.13
- (2) Guest rooms and guest suites of hotels, ~~and motels,~~ and their common areas
- (3) Child care facilities
- (4) Preschools and elementary education facilities
- (5) Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices, and outpatient facilities
- (6) Subset of assembly occupancies described in 518.2 to include places of awaiting transportation, gymnasiums, skating rinks, and auditoriums
- (7) ~~Dormitories~~ Dormitory units
- (8) Assisted living facilities

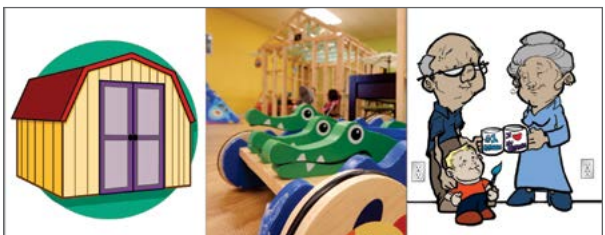
Informational Note No. 1: This requirement would include receptacles identified as 5-15, 5-20, 6-15, and 6-20 in ANSI/NEMA WD 6-2016, Wiring Devices — Dimensional Specifications.
Informational Note No. 2: Assisted living facilities are Institutional Use Group I-1 per IBC 2015.

Exception to (1), (2), (3), (4), (5), (6), and (7) and (8): Receptacles in the following locations shall not be required to be tamper resistant:
 (1) Receptacles located more than 1.7 m (5 1/2 ft) above the floor
 (2) Receptacles that are part of a luminaire or appliance
 (3) A single receptacle, or a duplex receptacle for two appliances, located within the dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord-and-plug-connected in accordance with 400.10(A)(6), (A)(7), or (A)(8)(4) Nongrounding receptacles used for replacements as permitted in 406.4(D)(2)(a)

Expert Analysis

For the 2020 NEC, 406.12 received more revision and a new List Item (8) was added covering TR receptacles for assisted living facilities. One of the first revisions at 406.12 was to clarify that attached and detached garages and accessory buildings to dwelling units are indeed subject to the same TR receptacle requirements

406.12 Tamper-Resistant Receptacles



of the main dwelling unit themselves. Common areas of multifamily dwellings and common areas of guest rooms and guest suites of hotels and motels were also added and clarified as to TR receptacle requirements. With past editions of the Code, some installers and inspectors alike have erroneously interpreted 406.12 to not include these accessory areas and common areas in areas covered by TR receptacle requirements.

At 406.12(4), the word “elementary” was removed leaving the term “preschools and education facilities” as places requiring TR receptacles. With many educational facilities being built and used as “multi-use” it is difficult for the AHJ to determine what age group of students will be utilizing the space.

The word “Dormitories” was changed to “Dormitory units” at 406.12(7) to match the newly defined term now found in Article 100: “a building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities.”

A new List Item (8) was added to the TR receptacle requirements pertaining to assisted living facilities. These units for the elderly are residential units and the same level of personal protection is needed for the elderly residents who reside in these units. It is also not uncommon for small children and grandchildren to visit these facilities. This fact alone is reason enough to facilitate the need for TR receptacles in these living quarters.

Leviton Solution

Leviton tamper-resistant receptacles, have proven effective in preventing electrical injuries resulting from foreign objects being inserted into receptacles. Available residential and commercial grade in 15- and 20-Amp, 125-Volt, Duplex and Decora® in several colors.



Cat. No. TR5320



Cat. No. GFNT1-W



Cat. No. T6525

New



406.13 Single-Pole Separable-Connectors

Change Summary

- A new section is being introduced to Article 406 at 406.13 pertaining to single-pole connectors.

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406.13 Single-Pole Separable-Connector Type.

Single-pole separable connectors shall be listed and labeled and shall comply with 406.13(A) through (D).

(A) Locking or Latching Type. Single-pole separable connectors shall be of either the locking or latching type and marked with the manufacturer's name or identification and voltage and ampere ratings.

(B) Identification. Connectors designated for connection to the grounded circuit conductor shall be identified by a white-colored housing; connectors designated for connection to the grounding circuit conductor shall be identified by a green-colored housing.

(C) Interchangeability. Single-pole separable connectors shall be permitted to be interchangeable for ac or dc use or for different current ratings or voltages on the same premises, provided they are listed for ac/dc use and marked in a suitable manner to identify the system to which they are intended to be connected.

(D) Connecting and Disconnecting. The use of single-pole separable connectors shall be performed by a qualified person and shall comply with at least one of the following conditions:

(1) Connection and disconnection of connectors are only possible where the supply connectors are interlocked to the source, and it is not possible to connect or disconnect connectors when the supply is energized.

(2) Line connectors are of the listed sequential-interlocking type so that load connectors are connected in the following sequence and that disconnection is in the reverse sequence:

- Equipment grounding conductor connection
- Grounded circuit conductor connection, if provided
- Ungrounded conductor connection

(3) A caution notice that complies with 110.21(B) is provided on the equipment employing single-pole separable connectors, adjacent to the line connectors, indicating that connections are to be performed in the following sequence and that disconnection is in the reverse sequence:

- Equipment grounding conductor connectors
- Grounded circuit-conductor connectors, if provided

(c) Ungrounded conductor connectors

Informational Note: A single-pole locking-type separable connector is investigated in accordance with ANSI/UL 1691-2014, Single Pole Locking- Type Separable Connectors.

Expert Analysis

A “Single-Pole Separable Connector” is defined as “a device that is installed at the ends of portable, flexible, single conductor cable that is used to establish connection or disconnection between two cables or one cable and a single-pole, panel-mounted separable connector”. This new section covers the listing and labeling of single-pole separable connectors. Further provisions will address the type of single-pole separable-connector used as either the locking or latching type and marking requirements with the manufacturer’s name or identification and voltage and ampere ratings. Proper identification of the grounded circuit conductor (white-colored housing) and connectors designated for connection to the equipment grounding conductor shall be identified by a green-colored housing. Interchangeability for ac or dc use or for different current ratings or voltages are addressed as well. The new text will also identify the proper connection and disconnection sequence necessary for the safe use of these devices. It is becoming a common industry practice to provide paralleled inputs of single-pole separable connectors on equipment so that paralleled sets of single conductor feeders may be used for powering high current equipment. In addition, it is common to find multiple power systems, originating from multiple power sources present at a location.

Leviton Solution

Leviton offers a full line of single pole devices including the highly durable Rhino-Hide® product assortment. The Rhino-Hide® family of connectors are designed for use in the most rugged environments. From single pole connectors used for high amperage power distribution to more traditional NEMA configured wiring applications, you’ll find a Rhino-Hide® connection device suitable for your needs. Rhino-Hide® 49 Series Male and Female Connectors and Panel Receptacles are engineered to exceptional standards for high-amperage power delivery in applications like land-based and offshore

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Rhino-Hide® Single-Pole Connectors

Revision



408.4(A) Approved Locations for Circuit Directory for a Panelboard

Change Summary

- Every circuit and circuit modification is still required to be legibly identified as to its clear, evident, and specific purpose or use. This identification is now required to be included in a circuit directory that is located on the face, inside of, or in an approved location adjacent to the panel door in the case of a panelboard.

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408.4 Field Modification Required.

(A) Circuit Directory or Circuit Identification.

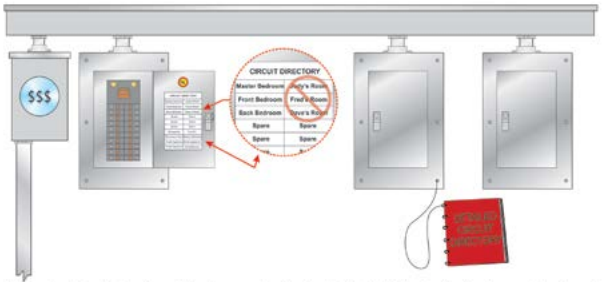
Every circuit and circuit modification shall be legibly identified as to its clear, evident, and specific purpose or use. The identification shall include an approved degree of detail that allows each circuit to be distinguished from all others. Spare positions that contain unused overcurrent devices or switches shall be described accordingly. The identification shall be included in a circuit directory that is located on the face or, inside of, or in an approved location adjacent to the panel door in the case of a panelboard and at each switch or circuit breaker in a switchboard or switchgear. No circuit

shall be described in a manner that depends on transient conditions of occupancy.

Expert Analysis

All panelboard circuits and any circuit modifications are required to be legibly identified as to its clear, evident, and specific purpose or use. The circuit identification must have an approved degree of detail to distinguish each circuit from all others. Spare positions that contain unused overcurrent devices need to be indicated as well. Circuits should not be described with descriptions of transient conditions of occupancy. In other words, a circuit can't be identified as “Bill’s room” or “Mary’s office.” This identification has historically been required to be located on a circuit directory on the face or inside the panelboard doors [see 408.4(A)].

408.4(A) Circuit Directory or Circuit Identification



Every circuit and circuit modification required to be legibly identified as to its clear, evident, and specific purpose or use
 Identification required to be included in a circuit directory that is located on the face, inside of, or in an approved location adjacent to the panel door in the case of a panelboard

For the 2020 NEC, the location of this required circuit directory has been expanded to include “an approved location adjacent to the panel door in the case of a panelboard.” This adjacent location would have to be “approved” by the authority having jurisdiction (AHJ). This adjacent location could include a prominently labeled notebook of circuit directories for adjacent panelboards that might even include graphics.

There is only so much “real estate” inside of a panelboard cover or door. The existing text may frustrate some installers and inspectors due to a lack of adequate space. A lot of information is required to be addressed at this inside cover location. This required information could include schematics, specifications and instructions, inspection stickers for many different permits and

trades, arc fault ratings of the equipment, and lists of circuits controlled by energy management systems. Often, the installer will rely on a preprinted circuit directory template to satisfy 408.4(A). These preprinted circuit directories rarely have enough space on them to clearly indicate everything a particular branch circuit supplies.


This new allowance of an adjacent location for the circuit directory supports the concept that the more detail that is provided in a circuit directory the better in terms of meeting the safety objectives of 408.4. Expanding the options slightly in the case of a panelboard by allowing an adjacent location meets this safety objective as well.

Leviton Solution

The Leviton Load Center makes labeling circuits clean, easy and professional.

By downloading the FREE My Leviton App you can access the Leviton Load Center utility template where you can name all your circuits and easily print out on label sheets. The label sheets are available at office supply stores and many other retailers. Simply peel the label and place on the appropriate spot on the Load Center.

- SMARTER
THAN EVER
- TRACK ENERGY COST
AND CONSUMPTION
- MANUFACTURED TO
A HIGHER STANDARD
- SAFER
- WHAT HOMEOWNERS
WANT TODAY
- REMOTE
NOTIFICATIONS
- EASIER TO INSTALL



With optional Internet connectivity, an all plug-on design for easy installation and safety features that exceed the UL standard, the Leviton Load Center offers unparalleled energy management of your home's electrical system.

As the leader in home electrical safety, Leviton delivers the only residential circuit breaker on the market today that exceeds UL requirements for ground-fault

protection, preventing the circuit breaker from being reset if ground-fault protection is lost. This important safety feature helps protect against electric shock and electrocution for a safer living environment.

The most advanced load center on the market is also the easiest to install. Only Leviton circuit breakers feature an all plug-on design, saving time and increasing productivity.

The all-white indoor enclosure with optional observation window is just the beginning. Leviton circuit breakers incorporate user-friendly diagnostics, such as color indicators in each rocker handle that indicate operating status, and easy-to-read LED's that display fault type (AF/GF) when tripped.

How To Make A Leviton Load Center Smart:

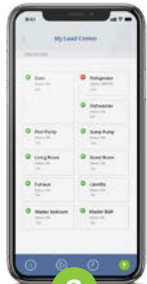


1
Install the Hub



2

Add Smart Circuit Breakers



3

Connect with My Leviton App



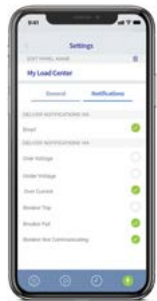
Energy Use

- View real-time energy consumption: total aggregate, individual circuit, or trends by day, week, month, and year
- Calculate our approximate total energy cost per month



Control

- Remotely turn OFF any circuit breaker*
 - View system status in real time and detect if critical loads need to be addressed
- *Not applicable to Main breaker. All circuit breakers must be manually turned back ON*



Alerts & Updates

- Know when and why a circuit breaker trips
- Be informed if a load is ON or not drawing power for an extended time
- Via remote firmware updates, get the latest protection capabilities and newest features

New



408.6

Short-Circuit Ratings on Switchboards, Switchgear, and Panelboards

Change Summary

- A new 408.6 was added to Article 408 requiring switchboards, switchgear, and panelboards to have a short-circuit current rating not less than the available fault current. This requirement goes further to require the available fault current and the date the calculation was performed to be field marked on the enclosure at the point of supply (for other than one- and two-family dwelling units).

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408.6 Short-Circuit Current Rating.

Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. In other than one- and two-family dwelling units, the available fault current and the date the calculation was performed shall be field marked on the enclosure at the point of supply. The marking shall comply with 110.21(B)(3) 110.21(B)(3).

Expert Analysis

For the 2020 NEC, all switchboards, switchgear, and panelboards (including panelboards at dwelling units) are required to have a short-circuit current rating not less than the available fault current. The enforcement community has a difficult time enforcing proper fault current ratings on such equipment as switchboards, switchgear, and panelboards without the knowledge of the available fault current. The equipment is usually properly marked with the short-circuit current rating by the manufacturer, but there is typically no information on the jobsite as to the available fault current at the equipment.

These new requirements will make it much easier to assure that equipment is being properly protected. The NEC clearly addresses short-circuit current ratings for specialized equipment such as industrial control panels in 409.22, elevators in 620.16 and industrial machinery in 670.5. The Code should also include this requirement for switchboards, switchgear, and panelboards. The marking requirement in 110.24(A)

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assumes that service equipment should be rated at or above the available fault current, but it is not clearly indicated. This requirement is not on the forefront of most installing electricians and this new rule in 408.6 provides field inspectors with a clearly stated, enforceable requirement.

Deletion



408.36, Ex. No. 1 Overcurrent Protection in Panelboards

Change Summary

- Exception No. 1 to 408.36 was deleted as the exception was rendered obsolete with the 2020 NEC revision of 230.71(B) which allows up to six means of disconnect for a service, but the multiple disconnecting means must now be located in separate enclosures (no longer permitted to be located in the same enclosure).

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408.36 Overcurrent Protection (Panelboards)

In addition to the requirement of 408.30, a panelboard shall be protected by an overcurrent protective device having a rating not greater than that of the panelboard. This overcurrent protective device shall be located within or at any point on the supply side of the panelboard.

Exception No. 1: Individual protection shall not be required for a panelboard used as service equipment with multiple disconnecting means in accordance with 230.71. In panelboards protected by three or more main circuit breakers or sets of fuses, the circuit breakers or sets of fuses shall not supply a second-bus structure within the same panelboard assembly.

Exception No. 2 1: Individual protection shall not be required for a panelboard protected on its supply side by two main circuit breakers or two sets of fuses in other than service equipment, having a combined rating not greater than that of the panelboard. A panelboard constructed or wired under this exception shall not contain more than 42 overcurrent devices. For the purposes of determining the maximum of 42 overcurrent devices, a 2-pole or a 3-pole circuit breaker shall be considered as two or three overcurrent devices, respectively.

Exception No. 3 2: For existing panelboards, individual protection shall not be required for a panelboard used as service equipment for an individual residential occupancy.

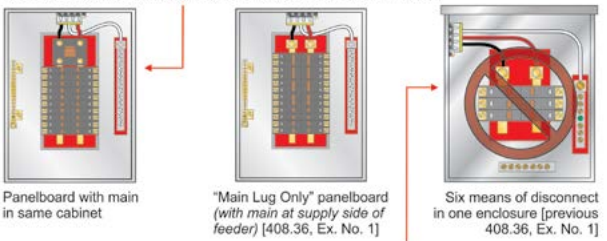
Expert Analysis

Panelboards are typically required to be protected by an overcurrent protective device having a rating not greater than that of the panelboard. By general rule, this overcurrent protective device is required to be located within or at any point on the supply side of the panelboard. There were three exceptions to this rule

with the first exception saying individual protection was not required for a panelboard used as service equipment with multiple disconnecting means in accordance with 230.71. Section 230.71 is where we get the “six means of disconnect” rule for service equipment. This rule has historically stated that a service disconnecting means can “consist of not more than six switches or sets of circuit breakers, or a combination of not more than six switches and sets of circuit breakers, mounted in a single enclosure, or in a group of separate enclosures.” Revisions occurred at 230.71 this Code cycle. These up to six means of disconnect can no longer be mounted in a single enclosure. The service disconnecting means for each service is still permitted to consist of not more than six switches or sets of circuit breakers, or a combination of not more than six switches and sets of circuit breakers, but they now have to be located in a group of separate enclosures, or in or on a switchboard or in switchgear.

408.36 Overcurrent Protection for Panelboards

Panelboards generally required to be provided with individual overcurrent protection having a rating not greater than that of the panelboard with this overcurrent protection located within the panelboard itself or at any point on the supply side of the panelboard



408.36 Ex. No. 1 was deleted with revision of 230.71(B) which allows up to six means of disconnect for a service, but the multiple disconnecting means must now be located in separate enclosures (*no longer permitted to be located in the same enclosure*)

New



408.43 Panelboard Orientation

Change Summary

- New section added to prohibit panelboards from being installed in a face-up position..

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408.43 Panelboard Orientation.

Panelboards shall not be installed in the face-up position.

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Expert Analysis

A new 408.43 was added to Article 408 that will now prohibit a panelboard to be installed in the face-up position. This new prohibition was a result of a laundry bulkhead that was a listed assembly under UL Product Spec category AUUZ [(Appliance Outlet Centers) Commercial Appliance Outlet Centers]. The electrical panelboard was installed in a face up position at 1.37 m (54 in.) above the floor. The mounting of an electrical panelboard in a face up position does not provide a safe working environment necessary for electrical safety of installers/maintainers when servicing the panelboard. The likelihood for contaminants accumulating on the overcurrent devices and panelboard bussing is increased significantly, creating a hazard. Section 240.81 tells the user of the Code that circuit breakers are required to clearly indicate whether they are in the open “off” or closed “on” position and where circuit breaker handles are operated vertically rather than rotationally or horizontally, the “up” position of the handle is required to be the “on” position. This would also be in issue this circuit breakers installed in a panelboard mounted in the face-up position.

408.43 Panelboard Orientation



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New

410.69 Identification of Control Conductor Insulation — Luminaires, Lampholders and Lamps

Change Summary

- New section added to prevent lighting control conductors from being installed using the same color schemes as the branch circuit grounded conductors and the equipment grounding conductor with a future effective date of January 1, 2022.

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410.69 Identification of Control Conductor Insulation.

Where control conductors are spliced, terminated, or connected in the same luminaire or enclosure as the branch-circuit conductors, the field-connected control conductor shall not be of a color reserved for the grounded branch-circuit conductor or the equipment grounding conductor.

This requirement shall become effective January 1, 2022.

Informational Note: See 200.6 for identification of grounded conductor and 250.119 for identification of equipment grounding conductor.

Exception: A field-connected gray-colored control conductor shall be permitted if the insulation is permanently re-identified by marking tape, painting, or other effective means at its termination and at each location where the conductor is visible and accessible. Identification shall encircle the insulation and shall be a color other than white, gray, or green.

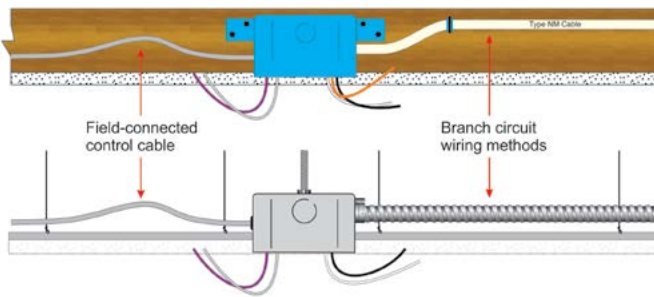
Expert Analysis

Traditional lighting systems (typically 120-volt or 277-volt ac) are typically controlled by an “on/off” snap switch or dimmer. It is becoming more and more commonplace to control lighting with low voltage lighting control conductors and devices. This wiring is typically low voltage (Class 2, 12–24-volt dc), providing a pathway for communication of analog or digital signals, such as incoming sensor input data (lighting levels, occupancy sensing conditions, etc.). This low voltage control wiring is typically installed outside branch circuit raceways or alongside cable wiring systems, but is typically installed within the same boxes or enclosures as the nominal voltage wiring.

Multiple shock incidents that have occurred and been reported involving the low voltage lighting control conductors being inadvertently spliced or connected to the grounded (neutral) conductor for the nominal voltage wiring system.

New section 410.69 was added to the 2020 NEC titled, “Identification of Control Conductor Insulation.” This new section will prohibit field-connected control conductor from utilizing the same color identification scheme that is reserved for the grounded branch-circuit conductor (white or gray) or the equipment grounding conductor (green, green with a yellow strip, etc.) where control conductors are spliced, terminated, or connected in the same luminaire or enclosure as the branch-circuit conductors. A new informational note was also added to point the user of the Code toward 200.6 for identification of the grounded conductor and 250.119 for identification of an equipment grounding conductor. The identification of the control conductors using colors typically identified with the branch circuit ungrounded conductors was not affected by this new provision.

410.69 Identification of Control Conductor



Before the electrical industry can start to process this change, the industry will need to establish a new standard to replace the historic “purple and gray” conductors that have been used universally. A future effective date of January 1, 2022 has been incorporated into this new requirement to enable manufacturers to comply and sell-off existing inventory.

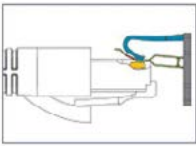
An exception was also added for this rule permitting a field-connected gray-colored control conductor if the insulation is permanently re-identified by marking tape, painting, or other effective means at its termination and at each location where the conductor is visible and accessible. This re-identification is required to “encircle the insulation” and the color used must be any color other than white, gray, or green.

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Leviton Network Solutions

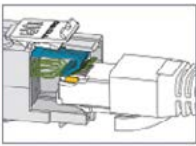
Proven End-to-End Systems that Deliver

As power over ethernet (POE) becomes more commonplace for lighting and control applications, the use of high quality cable, connectors and jacks are recommended. The Leviton product offering provides many benefits as our systems meet the need for higher bandwidth and power, while limiting temperature rise in large cable bundles. They are designed and tested to be compliant with all current IEEE PoE standards, Power over HDBaseT™, and IEC 60512-99-001, and are tested to exceed PoE standards up to 100W.



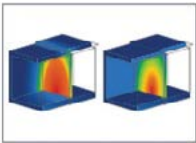
Prevent Arcing Damage

Atlas-X1™ and eXtreme® jacks feature PoE-optimized tine geometry that prevents the contact point between the plug and jack from potential damage due to electrical arcing that can occur with PoE.



Secure, Reliable Connection

Patented Retention Force Technology offers additional protection against arcing damage, providing constant contact force at the jack/plug interface, preventing inadvertent intermittent disconnects. RFT is available on Atlas-X1 and eXtreme jacks.



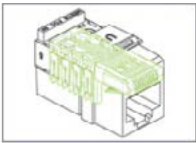
Better Heat Dissipation

Atlas-X1 is the industry's only UTP jack to feature a solid metal body, which dissipates heat 53% more efficiently than plastic alternatives for greater system performance and longevity.



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UTP cable with Leviton-patented Helix technology features a segmented metallic isolation wrap, which radiates heat better than traditional UTP cable, minimizing the cables' temperature rise — ideal for PoE applications.



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Our GigaMax® jack features a lead frame design which increases power-carrying capacity and efficiency, while providing improved durability. Learn more.



End-to-End Systems that Deliver, Smart Building Ready

Whether you're powering lights or building controls, our systems are designed to support next gen devices needing high power and low bandwidth. In partnership with Berk-Tek, the Berk-Tek Leviton alliance co-develops systems that support high-power PoE.



New

410.118

Luminaire Access to Other Boxes

Change Summary

- Luminaires recessed in ceilings, floors, or walls are now prohibited from being used to access outlet, pull, or junction boxes or conduit bodies unless the box or conduit body is an integral part of the listed luminaire.

NEC® Text

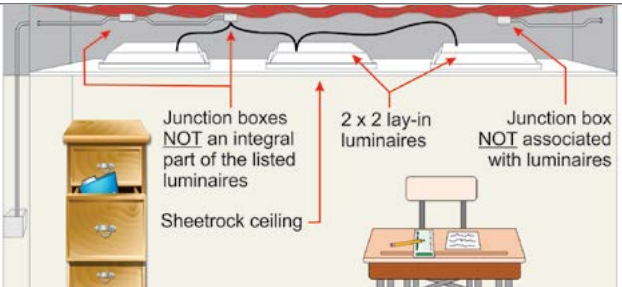
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410.118 Access to Other Boxes.

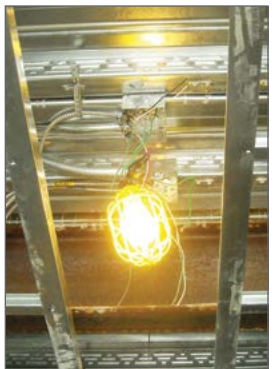
Luminaires recessed in ceilings, floors, or walls shall not be used to access outlet, pull, or junction boxes or conduit bodies, unless the box or conduit body is an integral part of the listed luminaire.

Expert Analysis

410.118 Access to Other Boxes



Can a luminaire be installed in such a manner as to be the only access point to junction boxes located above or behind said luminaire? Answer: 2017 NEC...maybe? 2020 NEC... NO! The new provisions of 410.118 will exclude luminaires recessed in ceilings, floors, or walls from being used to access outlet, pull, or junction boxes or conduit bodies (unless the box or conduit body is an integral part of the listed luminaire). The intent of this new Code language is to clarify that a luminaire cannot be used to access junction boxes that are not associated with wiring for that luminaire as an integral part of said luminaire.



New



Article 410, Part XVI Horticultural Lighting Equipment

Change Summary

- A new Part XVI was added to Article 410 for “Special Provisions for Horticultural Lighting Equipment.”

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Article 410, Part XVI Special Provisions for Horticultural Lighting Equipment

410.170 General. Luminaires complying with Parts, I, II, III, IV, V, VI, VII, IX, X, XI, and XII of this article shall be permitted to be used for horticultural lighting. Part XVI shall additionally apply to lighting equipment specifically identified for horticultural use.

Informational Note: Lighting equipment identified for horticultural use is designed to provide a spectral characteristic needed for the growth of plants and can also provide supplemental general illumination within the growing environment.

410.172 Listing.

410.174 Installation and Use.

410.176 Locations Not Permitted.

(A) General Lighting.

(B) Installed Location.

410.178 Flexible Cord.

410.180 Fittings and Connectors.

410.182 Grounding.

410.184 Ground-Fault Circuit-Interrupter Protection.

410.186 Support.

410.188 Hazardous (Classified) Locations.

(See NEC for complete text).

Expert Analysis

Article 410, Part XVI
Special Provisions for Horticultural Lighting Equipment



With the advent of special plant growth LED sources and discharge lamps, and the increase of indoor plant growing facilities, horticultural lighting equipment is a rapidly expanding technology.

This new Part XVI will cover such things as listing requirements, installation and use, locations not permitted, general lighting requirements, flexible cord provisions, fittings and connectors, grounding requirements, GFCI protection provisions, supporting requirements and requirements for installations in hazardous (classified) locations. While Article 547 has requirements for agricultural buildings, horticultural lighting installations have special considerations not previously addressed by the Code. These new Code requirements were needed to ensure safe installations and to facilitate inspection procedures. These types of luminaires are evaluated under the UL Product Spec category of “IFAU” (Horticultural Luminaires).

Revision and New



422.5(A)

GFCI Requirements for Appliances

Change Summary

- The “provided for public use” condition has been removed from GFCI requirements for both automotive vacuum machines and tire inflation machines. Sump pumps has been added to the list of appliances requiring GFCI protection. Bottle fill stations was added to GFCI requirements for drinking water coolers. GFCI requirements for dishwashers rated at 150 volts or less to ground and 60 amperes or less, single- or 3-phase located at both dwelling unit and non-dwelling unit locations. Dishwasher text moved from 210.8(D) to 422.5(A)(7).

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422.5 Ground-Fault Circuit-Interrupter (GFCI) Protection for Personnel.

(A) General. Appliances identified in 422.5(A)(1) through (A)(5)(7) rated 250 150 volts or less to ground and 60 amperes or less, single- or 3-phase, shall be provided with Class A GFCI protection for personnel. Multiple Class A GFCI protective devices shall be permitted but shall not be required.

- (1) Automotive vacuum machines ~~provided for public use~~
- (2) Drinking water coolers and bottle fill stations
- (3) Cord-and-plug-connected high-pressure spray

- washing machines=~~cord-and-plug-connected~~
- (4) Tire inflation machines ~~provided for public use~~
- (5) Vending machines
- (6) Sump pumps
- (7) Dishwashers

Informational Note: Section 210.8 specifies requirements for GFCI protection for the branch-circuit outlet where the covered location warrants such protection.

Expert Analysis

One of the first revisions to look at occurred in the parent text of 422.5(A) where the type of GFCI protection addressed by this section was clarified as being “Class A” GFCI protection (protection of people).

Changes occurred at 422.5(A)(2) where “bottle fill stations” was added to the existing GFCI requirements for drinking water coolers.

New for the 2020 NEC 422.5(A)(6) will now require GFCI protection for all sump pumps rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase sump pumps (hard wired or cord-and-plug connected). In previous editions of the Code, a sump pump might have been required to be GFCI protected, but only because of its location (in an unfinished basement, etc.), not because it was a “sump pump.”

422.5(A) GFCI Protection for Appliances



The requirements for GFCI protection for a dishwasher was relocated from Article 210 to new 422.5(A)(7). Article 210 is dedicated to the requirements for branch circuits. Users of the Code are better served by having the all the GFCI requirements for appliances located in the article that covers appliances (Article 422).

At its previous location at 210.8(D), GFCI protection was required for outlets that supply dishwashers installed in “dwelling unit locations.” This GFCI rule would now also encompass dishwashers rated at 150 volts or less

to ground and 60 amperes or less, single- or 3-phase located at a non-dwelling unit location, such as a restaurant, school cafeteria, etc.

Finally, a new informational note was added at the end of 422.5(A) pointing the users of the Code to 210.8 for specific requirements for GFCI protection for appliance branch-circuit outlets installed in locations where GFCI protection is warranted.

Leviton Solution

For areas where more power is required for appliances and tools, Leviton's 20-Amp GFCI is a great solution. The device is rated at 20-Amp, 125-Volt with 20-Amp Feed-Through. It is Tamper-Resistant and offers back and side wiring with self-grounding clip included. Available in non-TR versions and available in several popular colors.



Cat. No. GFTR2-W

Revision



422.16(B)(2)

Flexible Cords Requirements for Built-in Dishwashers and Trash Compactors

Change Summary

- Dishwashers are still permitted to be cord-and-plug connected and the receptacle outlet is still required to be located in the space adjacent to the space occupied by the dishwasher with a maximum length of a cord for a built-in dishwasher of 2.0 m (6.5 ft). A flexible cord installed for this purpose passing through an opening is required to be protected against damage by a bushing, grommet, or other approved means. The flexible cord is required to contain an equipment grounding conductor and be terminated with a grounding-type attachment plug.

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422.16 Flexible Cords.

(B) Specific Appliances

(2) Built-in Dishwashers and Trash Compactors. Built-in dishwashers and trash compactors shall be permitted to be cord-and-plug-connected with a flexible cord identified as suitable for the purpose in the installation instructions

of the appliance manufacturer where all of the following conditions are met:

~~(1)~~ The flexible cord shall be terminated with a grounding-type attachment plug.

Exception: A listed dishwasher or trash compactor distinctly marked to identify it as protected by a system of double insulation shall not be required to be terminated with a grounding-type attachment plug.

~~(1)~~~~(2)~~ For a trash compactor, the length of the cord shall be 0.9 m to 1.2 m (3 ft to 4 ft) measured from the face of the attachment plug to the plane of the rear of the appliance.

~~(2)~~~~(3)~~ For a built-in dishwasher, the length of the cord shall be 0.9 m to 2.0 m (3 ft to 6.5 ft) measured from the face of the attachment plug to the plane of the rear of the appliance.

~~(3)~~~~(4)~~ Receptacles shall be located to protect against physical damage to the flexible cord.

~~(4)~~~~(5)~~ The receptacle for a trash compactor shall be located in the space occupied by the appliance or adjacent thereto.

~~(5)~~~~(6)~~ The receptacle for a built-in dishwasher shall be located in the space adjacent to the space occupied by the dishwasher. Where the flexible cord passes through an opening, it shall be protected against damage by a bushing, grommet, or other approved means.

~~(6)~~~~(7)~~ The receptacle shall be accessible.

~~(7)~~ The flexible cord shall have an equipment grounding conductor and be terminated with a grounding-type attachment plug.

Exception: A listed dishwasher or trash compactor appliance distinctly marked to identify it as protected by a system of double insulation shall not be required to be terminated with a grounding-type attachment plug.

Expert Analysis

422.16(B)(2) Built-In Dishwashers



The 2020 NEC clarifies that the flexible cord for built-in dishwashers not only terminate with a grounding-type attachment plug, but also requires the cord to contain an equipment grounding conductor.

During the 2017 NEC revision cycle, 422.16(B)(2) was revised to only permit the receptacle outlet for

a cord-and-plug-connected built-in dishwasher to be located “in the space adjacent to the space occupied by the dishwasher.” To accommodate this potential extended length of the cord for connection to a receptacle outlet in the adjacent cabinet space, the maximum length of a cord was extended from the previous maximum length of 1.2 m (4 ft) to 2.0 m (6.5 ft) measured from the face of the attachment plug to the plane of the rear of the appliance. When this change occurred last Code cycle, some in the electrical community argued that running a flexible cord through a drilled hole in a cabinet wall to the adjacent cabinet space made the flexible cord subject to physical damage and violated the “Uses Not Permitted” for a flexible cord at 400.12(2) and (7).

To help extinguish this argument, new Code language was added at 422.16(B)(2)(5) stipulating the flexible cord should be protected against damage by a “bushing, grommet, or other approved means.” A plastic furniture-type grommet found at most home improvement centers that allows a flexible cord to pass through a desktop to the area below the desk would seem to be the ideal or intended solution here.

Revision



422.16(B)(4)

Flexible Cords and Microwave Oven/Range Hood Combinations

Change Summary

- Revision clarifies that the same conditions are applicable to cord-and-plug-connected, over-the-range microwave ovens incorporating range-hood as a range hood. The title of 422.16(B)(4) was changed to “Range Hoods and Microwave Oven/Range Hood Combinations.” Range hoods and over-the-range microwave ovens with integral range hoods are permitted to be cord-and-plug-connected with a flexible cord identified as suitable for use on range hoods in the installation instructions of the appliance manufacturer and these appliances must meet five specific conditions.

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422.16 Flexible Cords.

(B) Specific Appliances.

(4) Range Hoods and Microwave Oven/Range Hood Combinations. Range hoods and over-the-range microwave ovens with integral range hoods shall be permitted to be cord-and-plug-connected with a flexible cord identified as suitable for use on range hoods in the installation instructions of the appliance manufacturer, where all of the following conditions are met:

(1) The flexible cord is terminated with a grounding-type attachment plug.

Exception: A listed range hood distinctly marked to identify it as protected by a system of double insulation shall not be required to be terminated with a grounding-type attachment plug.

(1)(2) The length of the cord is not less than 450 mm (18 in.) and not over 1.2 m (4 ft).

(2)(3) Receptacles are located to protect against physical damage to the flexible cord.

(3)(4) The receptacle is supplied by an individual branch circuit.

(4) The receptacle is accessible.

(5) The flexible cord shall have an equipment grounding conductor and be terminated with a grounding-type attachment plug.

Exception: A listed range hood appliance distinctly marked to identify it as protected by a system of double insulation shall not be required to be terminated with a grounding-type attachment plug.

Expert Analysis

Revisions were made at 422.16(B)(4) to clarify without any doubt that a range hood that is incorporated into a microwave oven is indeed subject to all of the requirements spelled out by this section of the Code. For the 2020 NEC the title of 422.16(B)(4) was changed from simply “Range Hoods” to “Range Hoods and Microwave Oven/Range Hood Combinations”.



Beginning with the 2005 NEC, range hoods have been permitted to be cord- and plug-connected. This includes appliances that are a combination microwave oven and range hoods. The installation instructions for said appliance will typically identify the types of

flexible cords that are suitable for the application. Flexible cords supplied with listed appliances are considered to be suitable for the application. The flexible cord must terminate in a grounding-type attachment plug that now includes an equipment grounding conductor. In order for a range hood or a range hood/microwave oven combination to utilize a cord-and-plug connection, five specific conditions must ALL be met (see NEC or Code language provided here for these conditions). One of these conditions demands that in order to cord-and-plug connect one of these appliances, the receptacle must be supplied by “an individual branch circuit.” This would apply to a simple range hood or a range hood/microwave oven combination.

This requirement for an individual branch circuit is to account for an ordinary range hood being replaced with a range hood/microwave oven combination, which can demand up to 8 to 12 amps and have become common in dwelling units.

New



445.18(D)

Emergency Generator Shutdown in One- and Two-Family Dwelling Units

Change Summary

- An emergency shutdown device is now required to be located at a readily accessible outdoor location at dwelling units when an optional standby generator is installed. This requirement is not applicable for cord-and-plug-connected portable generators.

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445.18 Disconnecting Means and Emergency Shutdown of Prime Mover.

(A) Disconnecting Means.

(B) Emergency Shutdown of Prime Mover.

(C) Remote Emergency Shutdown.

(D) Emergency Shutdown in One- and Two-Family Dwelling Units. For other than cord-and-plug-connected portable generators, an emergency shutdown device shall be located outside the dwelling unit at a readily accessible location.

(E) Generators Installed in Parallel.

continued on next page

continued from previous page

Expert Analysis

Is an emergency backup generator required to be installed at a dwelling unit? Of course, the answer to that question is NO. If an optional standby generator is installed at a dwelling unit (or most places), then NEC rules are mandatory for installation; in particular, rules in Article 445. New for the 2020 NEC, an emergency shutdown device is now required to be located “outside the dwelling unit” at a readily accessible location. This requirement is not applicable for cord-and-plug-connected portable generators. This requirement is also limited to one- and two-family dwelling as the title of 445.18(D) suggests.

This new requirement was primarily based upon providing first responders an accessible outdoor emergency shutdown device in an emergency situation such as a fire, gas leak, structural damage, or flooding.

445.18(D) Emergency Shutdown Device at Dwelling Units



This new requirement for an outdoor emergency generator shutdown device is a companion requirement for an emergency disconnecting means (which could include the service disconnecting means) for a one- or two-family dwelling be installed and located on the outside of the structure (see 230.85).

This required outdoor emergency disconnect can consist of the service disconnect(s), a properly marked meter disconnect(s), or other listed disconnect switches or circuit breakers on the supply side of each service disconnect that are suitable for use as service equipment. All of these options must be properly marked to indicate that they are service disconnects, emergency disconnects, etc. with the marking in compliance with 110.21(B) as indicated at 230.85.

This same basic requirement for an emergency disconnect at a readily accessible outdoor location

for dwelling units was implemented for other types of equipment: 480.7(A) (Storage Batteries), 694.22(C)(1) (Wind Electric Systems), and 706.15(A) (Energy Storage Systems).

Revision



511.12 GFCI Requirements for Commercial Garages

Change Summary

- Section 511.12 now requires GFCI protection for personnel to be provided as required in 210.8(B). Section 210.8(B)(8) calls for all 125-volt, single-phase, 15- and 20-ampere receptacles installed in garages, service bays, and similar areas (other than vehicle exhibition halls and showrooms) to have GFCI protection for personnel (*not just those receptacles where electrical diagnostic equipment, electrical hand tools, or portable lighting equipment are to be used*).

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511.12 Ground-Fault Circuit-Interrupter Protection for Personnel.

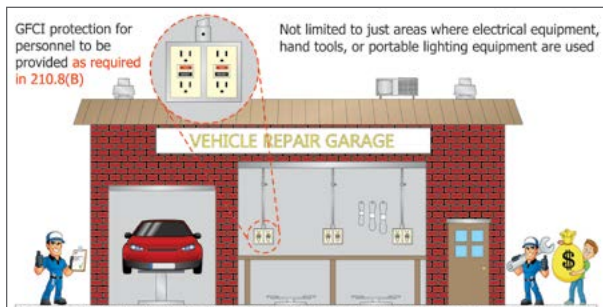
~~All 125-volt, single-phase, 15- and 20-ampere receptacles installed in areas where electrical diagnostic equipment, electrical hand tools, or portable lighting equipment are to be used shall have~~ Ground-fault circuit-interrupter protection for personnel **shall be provided as required in 210.8(B).**

Expert Analysis

For the 2020 NEC, revisions to 511.12 simply state that “ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(B).” The limitation of GFCI protection for receptacle “installed in areas where electrical diagnostic equipment, electrical hand tools, or portable lighting equipment are to be used” was deleted. This simple reference to 210.8(B) will allow CMP-14 (Article 511) to not have to “chase the tail” of CMP-2 (Article 210) every time CMP-2 makes a change to the GFCI requirements at 210.8(B). Now, whenever CMP-2 incorporates a change to GFCI requirements at 210.8 that would effect a change in GFCI requirements in Article 511, that same change would automatically become part of the GFCI requirement of Article 511 as well due to this reference to 210.8(B). By simply

pointing 511.12 back to 210.8(B), these two sections will be in alignment.

511.12 GFCI Protection at Commercial Repair and Storage Garages



This same alignment of GFCI protection for all 125-volt, single-phase, 15- and 20-ampere receptacles for aircraft hangers occurred at 513.12 with a reference to 210.8(B)(8).

New



517.31(C)(1)(a) Raceways, Cables, and Enclosures of the Life Safety and Critical Branch

Change Summary

- Raceways, cables, and enclosures of the life safety and critical branch of the essential electrical systems of a health care facility are now clearly required be “readily identified” as a component of the essential electrical system. Boxes and enclosures (including transfer switches, generators, and power panels) are to be “field- or factory-marked and identified” as a component of the essential electrical system. Raceways and cables are required to be field- or factory-marked as a component of the essential electrical system. These identifying markings are to be installed at intervals not to exceed 7.6 m (25 ft).

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517.31 Requirements for Essential Electrical System.

(A) Separate Branches. (see NEC of complete text)

(B) Transfer Switches. (see NEC of complete text)

(C) Wiring Requirements.

(1) Separation from Other Circuits. The life safety branch and critical branch of the essential electrical system shall be kept entirely independent of all other wiring and equipment and shall not enter the same raceways, boxes, or cabinets with each other or other wiring. [99:6.7.5.2.1]

(a) Raceways, cables, or enclosures of the life safety and critical branch shall be readily identified as a component of the essential electrical system (EES). Boxes and enclosures (including transfer switches, generators, and power panels) shall be field- or factory-marked and identified as a component of the EES. Raceways and cables shall be field- or factory-marked as a component of the EES at intervals not to exceed 7.6 m (25 ft).

(b) Conductors of the life safety branch or critical branch shall not enter the same raceways, boxes, or cabinets with each other or any other wiring system. It shall be permitted for the branch conductors to occupy common equipment, raceways, boxes, or cabinets of other circuits not part of the life safety branch and critical branch where such wiring complies with one of the following:

(1) Is in transfer equipment enclosures

(2) Is in exit or emergency luminaires supplied from two sources

(3) Is in a common junction box attached to exit or emergency luminaires supplied from two sources

(4) Is for two or more circuits supplied from the same branch and same transfer switch

(c) The wiring of the equipment branch shall be permitted to occupy the same raceways, boxes, or cabinets of other circuits that are not part of the essential electrical system.

(d) Where Category 2 (general care) locations are served from two separate transfer switches on the essential electrical system in accordance with 517.18(A), Exception No. 3, the Category 2 (general care) circuits from the two separate systems shall be kept independent of each other.

(e) Where Category 1 (critical care) locations are served from two separate transfer switches on the essential electrical system in accordance with 517.19(A), Exception No. 2, the critical care circuits from the two separate systems shall be kept independent of each other.

Expert Analysis

The life safety branch and critical branch of the essential electrical system of a health care facility are required to be kept independent of all other wiring and equipment. The “Critical Branch” is defined as “a system of feeders and branch circuits supplying power for task illumination, fixed equipment, select receptacles, and select power circuits serving areas and functions related to patient

care that are automatically connected to alternate power sources by one or more transfer switches during interruption of the normal power source.” The “Life Safety Branch” is defined as “a system of feeders and branch circuits supplying power for lighting, receptacles, and equipment essential for life safety that is automatically connected to alternate power sources by one or more transfer switches during interruption of the normal power source.”

517.31(C)(1)(a) Identification of Essential Electrical Systems



The life safety branch and critical branch are two of the three separate branches that make up a Type 1 essential electrical system of a health care facility. Type 1 essential electrical systems are comprised of three separate branches capable of supplying a limited amount of lighting and power service that is considered essential for life safety and effective facility operation during the time the normal electrical service is interrupted for any reason. These three separate branches are the life safety, critical, and equipment branches.

There are two types of essential electrical systems. These two types are a “Type 1 essential electrical system” and “Type 2 essential electrical system.” These two different types of essential electrical systems are based on the level of risk associated with a potential power failure. A Type 1 essential electrical system is the most restrictive and is required for Category 1 patient care spaces. The specific rules pertaining to a Type 1 or Type 2 essential electrical systems are covered in NFPA 99 (Health Care Facilities Code) (see NFPA 99, 6.7.5 and 6.7.6). Type 1 systems are required for Category 1 (critical care) spaces. Type 1 systems are permitted to serve Category 2 (general care), Category 3 (basic care), and Category 4 (support) spaces.

For the 2020 NEC new Code language was added at 517.31(C)(1)(a) that clearly states that raceways, cables,



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or enclosures of the life safety and critical branch of the essential electrical systems of a health care facility is required be “readily identified” as a component of the essential electrical system (EES). In addition to the raceways, cables, or enclosures, this requirement goes on to demand that boxes and enclosures (including transfer switches, generators, and power panels) be “field- or factory-marked and identified” as a component of the essential electrical system. Raceways and cables are required to be field- or factory-marked as a component of the essential electrical system. These identifying markings are to be installed at intervals not to exceed 7.6 m (25 ft). This added identification marking requirement correlates 517.31 with the identification requirements for emergency systems in 700.10.

Revision



547.5(G)

GFCI Protection in Agricultural Buildings

Change Summary

- Revision eliminates GFCI protection for receptacles rated above 125-volt, single-phase, 20-ampere (240-volt and 3-phase receptacles) at agricultural buildings. GFCI protection is only required for 125-volt, 15- and 20-ampere receptacles installed in areas having an equipotential plane, outdoors, damp or wet locations, and dirt confinement areas for livestock.

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547.5 Wiring Methods. (*Agricultural Buildings*)

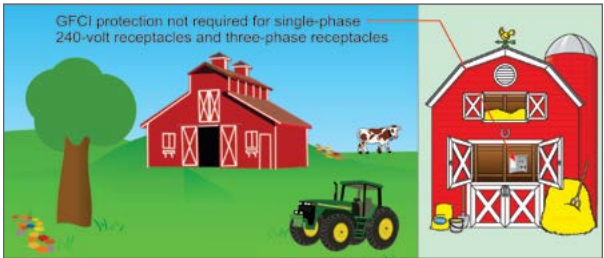
(G) Receptacles. ~~All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations listed in (1) through (4) shall have~~ Ground-fault circuit-interrupter protection shall be provided as required in 210.8(B). GFCI protection shall not be required for other than 125-volt, 15- and 20-ampere receptacles installed within the following areas:

- (1) Areas having an equipotential plane
- (2) Outdoors
- (3) Damp or wet locations
- (4) Dirt confinement areas for livestock

Expert Analysis

For the 2020 NEC, a new provision was added to 547.5(G) stating that GFCI protection is not required for other than 125-volt, 15- and 20-ampere receptacles installed within certain areas of an agricultural building. This new limitation on GFCI provisions will apply to areas having an equipotential plane, outdoors, damp or wet locations, and dirt confinement areas for livestock.

547.5(G) GFCI Protection at Agricultural Buildings



According to the substantiation for this change, the use of equipment such as portable air compressors, welders, milk pumps, feed augers and conveyors often causes unintended or unwanted tripping of GFCI protective devices, which can cause property damage.

Leviton Solution

When it comes to outdoor GFCI protection, it's smart to choose SmartlockPro® GFCIs. Our large selection includes outdoor grade Weather-Resistant versions that are also tamper-resistant. Constructed with UV stabilized thermoplastic for high cold impact resistance, the devices feature stainless steel straps and mounting screws. For the increased power that agricultural environments demand, Leviton's 20-Amp GFCI's are up to the test.



Cat. No.
GFWT2-KW

Important: Covers must be used with WR GFCI receptacles in damp or wet locations per NEC Section 406.9.



Revision

547.9

Distribution Point Required for Livestock Agricultural Buildings and Structures

Change Summary

- Any agricultural building or structure (intended for livestock) located on the same premises is now required to be supplied from a distribution point. More than one distribution point on the same premises is also permitted. The service disconnecting means and overcurrent protection for each set of feeders or branch circuits are required to be located at the distribution point. The service disconnecting means is required to be installed in accordance with Part VI of Article 230. The feeders or branch circuits supplied to buildings or structures shall comply with the provisions of 250.32 and Article 225, Parts I and II.

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547.9 Electrical Supply to Building(s) or Structure(s) from a Distribution Point.

A distribution point shall be permitted to supply Any agricultural building or structure for livestock located on the same premises shall be supplied from a distribution point. More than one distribution point on the same premises shall be permitted. The overhead electrical supply shall comply with 547.9(A) and (B), or with 547.9(C). The underground electrical supply shall comply with 547.9(C).

Any existing agricultural building or structure for other than livestock and any existing buildings and structures not under the scope of Article 547 shall be permitted to be supplied in accordance with 250.32(B)(1) Exception No. 1.

(A) Site-Isolating Device. (See NEC for complete Code text)

(B) Service Disconnecting Means and Overcurrent Protection at the Building(s) or Structure(s).

(See NEC for complete Code text)

(C) Service Disconnecting Means and Overcurrent Protection at the Distribution Point. Where The service disconnecting means and overcurrent protection for each set of feeders or branch circuits are shall be located at the distribution point, the. The service disconnecting means shall be installed in accordance with Part VI of Article 230. The feeders or branch circuits supplied to buildings or structures shall comply with the provisions of 250.32 and Article 225, Parts I and II.

Informational Note: Methods to reduce neutral-to-earth voltages

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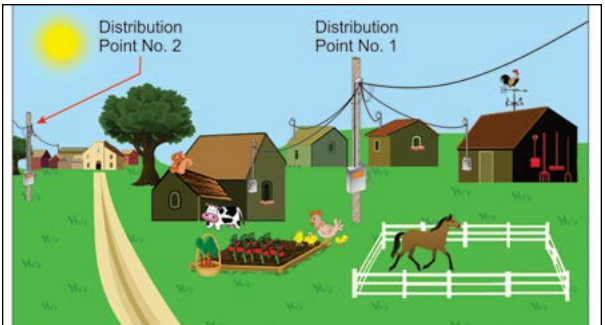
in livestock facilities include supplying buildings or structures with 4-wire single-phase services, sizing 3-wire single-phase service and feeder conductors to limit voltage drop to 2 percent, and connecting loads line-to-line.

(D) Identification. Where a site is supplied by more than one distribution point, a permanent plaque or directory shall be installed at each of these distribution points denoting the location of each of the other distribution points and the buildings or structures served by each.

Expert Analysis

Many agricultural farms and locations consist of multiple buildings that are directly related to the overall agricultural operation. The requirements of 547.9 are to ensure there is a means to shut off all electrical power to the multiple buildings on the agricultural premises at a single location. At many agricultural farms across the USA, this single location will typically be located at the service point or “meter pole” or the “center yard pole.” The NEC refers to this point as the “distribution point.”

547.9 Electrical Supply from a Distribution Point



For the 2020 NEC, revisions to the parent text of 547.9 and to 547.9(C) will now “require” agricultural buildings and structures that are for livestock to be supplied from a common distribution point. This change will mandate that an agricultural building or structure that are for stocking, housing, maintaining, or feeding livestock will be supplied by a grounded four wire distribution to reduce stray voltages that may affect livestock. Revisions to 547.9(C) will now make this section clearer in mandating that branch circuits and feeders to agricultural buildings be supplied through a distribution point and overcurrent protection is required for all underground feeder and branch circuit installations. The four- wire distribution system is utilized here

mainly for the purpose of helping with stray voltage on the farm. By having the fourth conductor (two ungrounded conductors, a grounded neutral conductor, and an equipment grounding conductor), the grounded (neutral) conductor is isolated from the equipment grounding conductor (not bonded) at other buildings past the first means of disconnect, to help eliminate circulating or stray currents.

The revised text at 547.9(C) also clarifies that for existing agricultural buildings and structures (other than livestock buildings such as for grain handling, poultry and fish containment systems) and for existing buildings or structures other than those covered under the scope of Article 547 (a house or machine shed on the premises) may be supplied in accordance with 250.32(B)(1)Ex. No. 1 permitting a three wire distribution for existing feeders to existing buildings.

Revision



550.13(B) GFCI Protection at Mobile and Manufactured Homes

Change Summary

- GFCI protection at mobile and manufactured homes is now required to comply with the GFCI protection provisions at 210.8(A). GFCI protection at mobile and manufactured homes is not required for other than 125-volt, 15- and 20-ampere receptacles installed within a mobile or manufactured home in compartments accessible from outside the unit, bathrooms, kitchens (where receptacles are installed to serve countertop surfaces), receptacles installed within 1.8 m (6 ft) from the top inside edge of a sink, and for dishwashers.

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550.13 Receptacle Outlets.

(B) Ground-Fault Circuit-Interrupters (GFCI).

All 125-volt, single-phase, 15- and 20-ampere receptacle outlets installed in the locations specified in 550.13(B) (1) through (5) shall have GFCI protection for personnel.

Ground-fault circuit-interrupter protection shall be provided as required in 210.8(A). GFCI protection shall not be required for other than 125-volt, 15- and 20-ampere

receptacles installed within a mobile or manufactured home in the following areas:

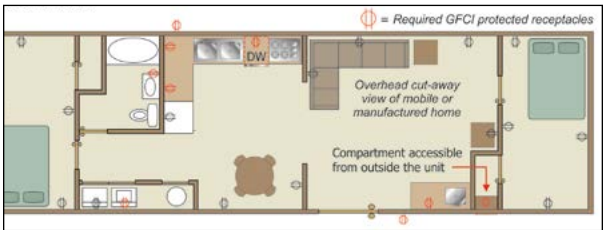
- (1) ~~Outdoors, including~~ Compartments accessible from outside the unit
- (2) Bathrooms, including receptacles in luminaires
- (3) Kitchens, where receptacles are installed to serve countertop surfaces
- (4) Sinks, where receptacles are installed within 1.8 m (6 ft) of the outer edge of the sink
- (5) Dishwashers

Informational Note: For information on protection of dishwashers, see 422.5.

Expert Analysis

GFCI protection at mobile and manufactured homes is now required to comply with the GFCI protection provisions at 210.8(A).

550.13(B) GFCI Required for Mobile and Manufactured Homes



There is a qualifier added to these GFCI provisions. For the 2020 NEC, GFCI protection at mobile and manufactured homes is not required for other than 125-volt, 15- and 20-ampere receptacles in bathrooms, kitchens (where receptacles are installed to serve countertop surfaces), receptacles installed within 1.8 m (6 ft) from the top inside edge of a sink, dishwashers and in compartments accessible from outside the unit.

Revision and New



551.71(A) & (F)

WR and GFCI Protection at RV Parks

Change Summary

- All RV sites must be equipped with at least one WR (Weather-resistant) 20 amp, 125 volt receptacle, but TR not required. All 125-volt, single-phase, 15- and 20-ampere receptacles at RV parks are required to

have listed ground-fault circuit-interrupter (GFCI) protection for personnel.

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Part VI. Recreational Vehicle Parks

551.71 Type Receptacles Provided

(A) 20-Ampere. Every recreational vehicle site with electrical supply shall be equipped with recreational vehicle site supply equipment with at least one 20-ampere, 125-volt weather-resistant receptacle. This receptacle, when used in recreational vehicle site electrical equipment, shall not be required to be tamper-resistant in accordance with 406.12.

(F) GFCI Protection.

All 125-volt, single-phase, 15- and 20-ampere receptacles shall have listed ground-fault circuit interrupter protection for personnel. The GFCI devices used in RV site electrical equipment shall not be required to be weather or tamper resistant in accordance with 406.9 and 406.12.

Informational Note: The percentage of 50 ampere sites required by 551.71 could be inadequate for seasonal recreational vehicle sites serving a higher percentage of recreational vehicles with 50 ampere electrical systems. In that type of recreational vehicle park, the percentage of 50 ampere sites could approach 100 percent

Expert Analysis

The most significant change here is at 551.71(A) where the NEC now wants the 20 amp, 125 volt receptacle to be weather-resistant, however not tamper resistant.

Leviton Comment

Interesting how standard receptacles must be WR, but GFCI receptacles don't need to be WR. The NEC also ignores 30A and 50A receptacles relating to GFCI protection. We believe they intended to address this, but never made it to print.

Leviton Solution

For RV connection, Leviton offers receptacles to comply with requirements of Article 551.71

Weather-Resistant GFCI Receptacles

Receptacles at RV sites can take a beating. Leviton's SmartlockPro® Weather-Resistant (WR) GFCI receptacles are up to the challenge. They are UL Listed weather-resistant to comply with Section 551.70(A) of the National Electrical Code®. Constructed with UV stabilized thermoplastic for high cold impact resistance, the devices feature stainless steel straps and mounting screws. Rain or shine, Leviton offers products to meet all your outdoor needs.

Important: Covers must be used with WR GFCI receptacles in damp or wet locations per NEC Section 406.9(B)(1).



Cat. No. GFWR2
20-Amp, 125-Volt,
Weather-Resistant
Self-Test Receptacle



Cat. No. 7313
30-Amp, 125-Volt,
Industrial Grade Flush
Mount Receptacle



Cat. No. 279
50-Amp 125/250-Volt,
Industrial Grade Flush
Mount Receptacle

New



555.35 GFPE and GFCI Protection in Marinas, Boatyards, Floating Buildings, and Commercial and Noncommercial Docking Facilities

Change Summary

- **Ground-Fault Protection of Equipment (GFPE) and Ground-Fault Circuit-Interrupter (GFCI) Protection:** GFP protection divided into three parts:
 - 555.35(A)** addresses shore power receptacles (not to exceed 30 mA),
 - 555.35(B)** addresses 15- and 20-ampere receptacles for other than shore power [GFCI protection (4 to 6 mA)], and
 - 555.35(C)** addresses feeder and branch-circuit conductors that are installed on docking facilities (not to exceed 100 mA). Language added to require leakage current measurement devices.

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555.35 Ground-Fault Protection of Equipment (GFPE) and Ground-Fault Circuit-Interrupter (GFCI) Protection.

(A) Ground-Fault Protection. For other than floating buildings, ground-fault protection for docking facilities shall be provided in accordance with 555.35(A)(1) through (A)(3).

(1) Receptacles Providing Shore Power. Receptacles installed in accordance with 555.33(A) shall have individual GFPE set to open at currents not exceeding 30 milliamperes.

(2) GFCI Protection for Personnel. All 125-volt, single-phase, 15- and 20-ampere receptacles for other than shore

power shall be protected in accordance with 555.33(B)(1) and (B)(2).

(3) Feeder and Branch-Circuit Conductors with GFPE.

Feeder and branch-circuit conductors that are installed on docking facilities shall be provided with GFPE set to open at currents not exceeding 100 milliamperes. Coordination with downstream GFPE shall be permitted at the feeder overcurrent protective device.

Exception to (3): Transformer secondary conductors of a separately derived system that do not exceed 3 m (10 ft) and are installed in a raceway shall be permitted to be installed without ground-fault protection. This exception shall also apply to the supply terminals of the equipment supplied by the transformer secondary conductors.

(B) Leakage Current Measurement Device. Where more than three receptacles supply shore power to boats, a leakage current measurement device shall be available and be used to determine leakage current from each boat that will utilize shore power.

Informational Note No. 1: Leakage current measurement will provide the capability to determine when an individual boat has defective wiring or other problems contributing to hazardous voltage and current. The use of a test device will allow the facility operator to identify a boat that is creating problems. In some cases a single boat may cause an upstream GFPE device protecting a feeder to operate even though multiple boats are supplied from the same feeder. The use of a test device will help the facility operator prevent a particular boat from contributing to hazardous voltage and current in the marina area.

Informational Note No. 2: An annual test of each boat with the leakage current measurement device is a prudent step toward determining if a boat has defective wiring that may be contributing hazardous voltage and current. Where the leakage current measurement device reveals that a boat is contributing hazardous voltage and current, repairs should be made to the boat before it is permitted to utilize shore power.

Expert Analysis

For the 2020 NEC, the ground-fault protection (GFP) requirements of marinas, boatyards, and docking facilities was extensively revised. These GFP requirements (previously located at 555.3) were divided into three parts to provide clarity for these important ground-fault requirements. Section 555.35(A)(1) addresses shore power receptacles with individual GFPE not to exceed 30 milliamperes (mA). Section 555.35(A)(2) addresses 15- and 20-ampere receptacles for other than shore power with Class A GFCI protection (4 to 6 mA) being provided in accordance with 210.8 through a reference to 555.33(B)(1). Section 555.35(A)(3) will address feeder and branch-circuit conductors providing power to a slip and installed on docking facilities to be provided with GFPE set to open at

currents not exceeding 100 mA with coordination with downstream GFPE permitted at the feeder overcurrent protective device.

555.35 GFPE and GFCI Protection at Marinas, Boatyards, Etc.



An exception was added which would exempt transformer secondary conductors of a separately derived system [not exceed 3 m (10 ft)] installed in a raceway from this GFPE protection as it would be difficult to provide ground-fault protection on the conductors from the transformer to the first panelboard where the transformer resides on the docking facility. It was noted in the substantiation that 50 percent of the electric shock drownings (ESD) incidents could be avoided by the 30 mA protection at the shore power receptacles whereas the existing overall 30 mA ground-fault protection for the entire marina was too low for most marinas. Informational notes were also added to address the concerns regarding vessel testing to alleviate potential leakage current that contributes to ESD as test data has shown that a great deal of the stray current in the water around marinas comes from the boats (vessels) themselves. While the NEC rules cannot demand that the vessels be tested for current leakage, language will be put in place to require leakage current measurement devices to be in place and available at marinas and boatyards where more than three receptacles supply shore power to boats.

Leviton Solution

Marine environments can be hard on all electrical equipment, wiring devices are no exception. The Leviton line of Extra-Heavy Duty Weather and Tamper-Resistant GFCI receptacles exceed all standards pertaining to GFCI devices, truly making Leviton the smart choice when it comes to personnel protection. Designed with the installer in mind, the devices include features that reduce the chance of miswire and provide dependable and secure connections. GFCIs installed outdoors should be protected by an appropriate weather-proof cover.



Cat. No. G5362-WTI

New



600.5(B) and 600.6(A)(4) Electric Signs and Outline Lighting Branch Circuits and Disconnects

Change Summary

- Section 600.6(A)(2) still requires a permanent field-applied marking identifying the location of the disconnecting means at a sign. In addition to that marking rule, the disconnecting means for a sign, outline lighting system, or controller is now required to be marked to identify the sign, outline lighting system, or controller it controls. An exception exists for external disconnect mounted on the sign, etc. If located remote, disconnect required to be installed at an accessible location available to first responders and service personnel.

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600.5 Branch Circuits. (Electric Signs and Outline Lighting)

(A) Required Branch Circuit. (see NEC for complete text)

(B) Marking. A disconnecting means for a sign, outline lighting system, or controller shall be marked to identify the sign, outline lighting system, or controller it controls.

Exception: An external disconnecting means that is mounted on the sign body, sign enclosure, sign pole, or controller shall not be required to identify the sign or outline lighting system it controls.

~~(B)~~ **(C) Rating.** (see NEC for complete text)

~~(C)~~ **(D) Wiring Methods.** (see NEC for complete text)

600.6 Disconnects.

(A) Location. The disconnecting means shall be permitted to be located in accordance with 600.6(A)(1), (A)(2), and (A)(3), and (A)(4):

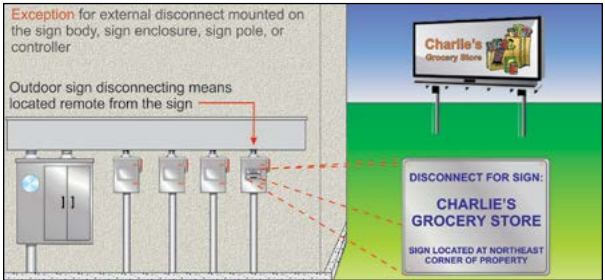
(4) Remote Location. The disconnecting means, if located remote from the sign, sign body, or pole, shall be mounted at an accessible location available to first responders and service personnel. The location of the disconnect shall be marked with a label at the sign location and marked as the disconnect for the sign or outline lighting system. The label shall comply with 110.21(B).

Expert Analysis

For other than an exit sign or a cord-and-plug connected sign, each sign or outline lighting system is required to be controlled by an externally operable switch or circuit breaker that opens all ungrounded conductors and controls no other loads. This disconnecting means is

required to be located at either; (1) the point the feeder circuit or branch circuit(s) enters the sign (2) within sight of the sign or out of the line of sight of the sign capable of being locked in the open position in accordance with 110.25, (3) within sight of the sign controller (if applicable), or (4) a remote location (new for the 2020 NEC).

600.5(B) Marking Requirements at Disconnect



For the 2020 NEC, the disconnecting means for a sign, outline lighting system, or controller is now required to be marked to identify the sign, outline lighting system, or controller it controls. An exception to this identification rule was also added, which will exempt an external disconnecting means that is mounted on the sign body, sign enclosure, sign pole, or controller.

This new marking requirement at 600.5(B) can be tied to a new remote location provision at 600.6(A)(4). This new provision calls for the sign disconnecting means, if located remote from the sign, sign body, or pole, to be installed at an accessible location available to first responders and service personnel. This new provision goes on to say the location of the disconnect shall be marked with a label at the sign location and marked as the disconnect for the sign or outline lighting system with this label complying with 110.21(B) for label provisions.

Leviton Solution Outdoor Switching

Leviton offers a unique solution for outdoor switching with catalog number COVER-S. This switch cover can actuate any traditional 15-Amp to 40-Amp toggle switch including Manual Motor Starters.

- Provides NEMA (4, 4X and 12) and IEC (IP 66) watertight protection for indoor and outdoor environments in critical application areas that are routinely subject to

moisture, vapor, dirt, mud and other contaminant exposure, including high-pressure washdown when used with the Wetguard® Box System

- Leviton offers a variety of covers, including this industry exclusive toggle switch cover, blank cover plates and covers to 15-Amp, 20-Amp and 30-Amp single receptacles
- Easily operated with wet and/or gloved hands, and provides OSHA compliant lockout/tagout capabilities



Cat. No.
COVER-S



Leviton Wetguard® FD Boxes

Revision



625 and 625.1 Electric Vehicle Power Transfer Systems

Change Summary

- With the addition of power export equipment and bidirectional current flow equipment, a change to the title and scope of Article 625 was needed for clarity.

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Article 625 Electric Vehicle ~~Charging~~ Power Transfer System

625.1 Scope. This article covers the electrical conductors and equipment external to ~~connecting an electric vehicle to premises wiring that connect an electric vehicle to a supply of electricity by conductive, inductive, or wireless power transfer (contactless inductive charging) means, and the installation of equipment and devices related to electric-vehicle charging~~ for the purposes of charging, power export, or bidirectional current flow.

Expert Analysis

For the 2020 NEC the title of the article is being updated to “Electric Vehicle Power Transfer Systems” and the scope is being changed to reflect these

revisions as well. Power export equipment and bidirectional current flow equipment provisions are being added to a couple of definitions [Electric Vehicle Power Export Equipment (EVPE) and Electric Vehicle Supply Equipment (EVSE)]. These terms are also being added at 625.41 (Overcurrent Protection), 625.43 (Disconnection Means), and 625.48 (Interactive Systems). Power export equipment and bidirectional current flow equipment can cover a wide range of devices, including but not limited to: an inverter regardless of off-board or on board, an EVSE that works for reverse power flow from a vehicle, an AC outlet regardless of off-board or on-board, a dc 12 volt outlet, and a USB socket as a 5 volt power outlet.

Revision



625.44 Electric Vehicle Power Connection Methods

Change Summary

- The connection methods for connecting portable EV charging equipment to the premises wiring system has been expanded to include certain 250- volt rated receptacle outlets.

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Article 625.44 Equipment Connection.

Equipment EVSE and WPTE shall be connected to the premises wiring system in accordance with one of the following: methods in 625.44(A) through (C).

(A) Portable Equipment. Portable equipment shall be connected to the premises wiring systems system by one or more of the following methods:

- (1) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 125 volts, single phase, 15 or 20 amperes
- (2) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 250 volts, single phase, 15 or 20 amperes
- (3) A nonlocking, 2-pole, 3-wire or 3-pole, 4-wire grounding-type receptacle outlet rated at 250 volts, single phase, 30 or 50 amperes
- (4) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated at 60 volts dc maximum, 15 or 20 amperes

The length of the power supply cord, if provided, between the receptacle outlet and the equipment shall be in accordance with 625.17(A)(3).

(B) Stationary Fastened-in-Place Equipment.

Stationary equipment intended to be Equipment that is

~~fastened in place in such a way as to permit ready removal for interchange, facilitation of maintenance or repair, or repositioning shall be connected to the premises wiring system by one of the following methods:~~

~~(1) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated 125 ~~volt~~ volts or 250 ~~volt~~ volts, single phase, up to 50 amperes~~

~~(2) A nonlocking, 3-pole, 4-wire grounding-type receptacle outlet rated 250 ~~volt~~ volts, three phase, up to 50 amperes~~

~~(3) Any of the receptacle outlets in 625.44(A)(1) or (2)~~

~~A nonlocking, 3-pole, 4-wire grounding-type receptacle outlet rated 250 volts, single phase, 30 or 50 amperes~~

~~(4) A nonlocking, 2-pole, 3-wire grounding-type receptacle outlet rated 60 volts dc maximum, 15 or 20 amperes~~

~~The length of the power supply cord, if provided, between the receptacle outlet and the equipment shall be in accordance with 625.17(A)(3).~~

(C) Fixed Equipment. All other equipment EVSE and WPTE shall be permanently wired and fixed in place to the supporting surface.

Expert Analysis

For the 2020 NEC, further revision occurred at 625.44 to allow portable equipment to be connected to the premises wiring system using a nonlocking, 2-pole, 3-wire, 250-volt, single phase, 15 or 20 amperes grounding-type receptacle outlet or a nonlocking, 2-pole, 3-wire or 3-pole, 4-wire grounding-type receptacle outlet rated at 250 volts, single phase, 30 or 50 amperes. Prior to the revision, portable EV charging equipment connected to the premises wiring system was limited to nonlocking, 2-pole, 3-wire grounding-type receptacle outlets rated at 125 volt, single phase, 15 or 20 amperes or nonlocking, 2-pole, 3-wire grounding-type receptacle outlets rated 60 volt dc maximum, 15 or 20 amperes. The title of 625.44(B) was changed from “Stationary Equipment” to “Fastened-in-Place Equipment.”

Leviton Solution

Leviton offers receptacle solutions for both portable and fixed EVSE equipment. Built of durable thermoplastic, Leviton Power Receptacles come equipped with heavy-gauge, double-wire copper alloy contacts. Available in many NEMA configurations to meet your customers EVSE requirements.

Pictured below is one of Leviton's portable EVSE units and the products needed for cord-and-plug connected installation.



Cat. No.
EVBL2-P12
Evr-Green®
Mini Level 2
Electric Vehicle
Charging Station



Cat. No.
5372
30 Amp,
250 Volt,
Receptacle



Cat. No.
83026
2-Gang
Flush Mount
Receptacle
Wallplate



Cat. No.
EVHOL
Holster for
Level 2 Electric
Vehicle Charging
Stations

New



625.54 GFCI Protection for Receptacle Outlets Used for EV Charging

Change Summary

- All receptacle outlets installed for the connection of EV charging will be required to be provided with GFCI protection for personnel (regardless of the receptacle outlet's location).

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625.54 Ground-Fault Circuit-Interrupter Protection for Personnel.

In addition to the requirements in 210.8, all receptacles installed for the connection of electric vehicle charging shall have ground-fault circuit-interrupter protection for personnel.

Expert Analysis

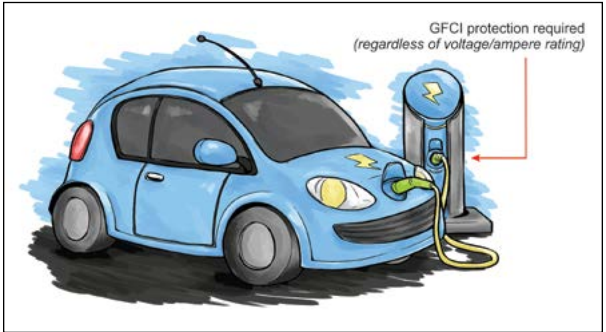
Beginning with the 2020 NEC, all receptacle outlets installed for the connection of electric vehicle charging will be required to be provided with GFCI protection for personnel (regardless of the receptacle outlet's location). Concerns were raised with personnel plugging and unplugging something like a 250-volt cord cap into a receptacle outlet in a wet or damp environment. By requiring GFCI protection to receptacle outlets employed for EV charging, this will address these concerns.

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A close look at the new GFCI provisions of 625.54 reveals that GFCI protection for receptacle outlets used for EV charging is “in addition to the requirements in 210.8.” EV charging receptacles that fall outside the voltage and ampere parameters of 210.8(A) and (B) will also require GFCI protection. These new GFCI requirements were established to clarify that GFCI protection for personnel for all cord and plug connected electric vehicle power transfer equipment is mandatory.

625.54 GFCI Protection for EV Charging Equipment



Leviton Solution

Leviton offers 15 and 20 amp, 125 volt GFCI receptacles. For higher amperage and voltages a breaker based solution is required. Leviton offers a complete line of electric vehicle supply equipment (EVSE) and support services. Whether you are the owner of an electric vehicle, a commercial or retail business owner, utility company or landlord, there’s an Evr-Green® product solution for you.

The Evr-Green® products are extremely simple to use, enables quick charging of any SAE J1772™ compatible Plug-In Electric Vehicle, and uses a minimum amount of wall space for mounting.



**New**

625.56 Receptacles Installed in a Wet Location for Electric Vehicle (EV)

Change Summary

- New requirement added to require all receptacles installed in a wet location for EV charging to be installed in an enclosure that provides weatherproof protection with or without an attachment plug cap inserted.

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625.56 Receptacle Enclosures.

All receptacles installed in a wet location for electric vehicle charging shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed. An outlet box hood installed for this purpose shall be listed and shall be identified as extra duty. Other listed products, enclosures, or assemblies providing weatherproof protection that do not utilize an outlet box hood shall not be required to be marked extra duty.

Expert Analysis

The provisions found at 406.9(B) call for all receptacles rated 15 and 20 amperes, 125 and 250 volts installed in a wet location to be provided with an enclosure that is weatherproof whether the attachment plug cap of a piece of utilization equipment is inserted or not.

For the 2020 NEC a new 625.56 has been added to Article 625 requiring all receptacles installed in a wet location for EV charging to possess an enclosure that is “weatherproof with the attachment plug cap inserted or removed.” Notice there is no voltage or amperage rating limitation to this new Article 625 rule. As with the related provisions of 406.9(B), this new Article 625 provision goes on to say that an outlet box hood installed for this purpose is required to be listed and be identified as “extra duty,” while allowing other listed products, enclosures, or assemblies providing weatherproof protection that do not utilize an outlet box hood to not be required to be marked “extra duty.”

This new receptacle enclosure requirement at 625.56 will bring some consistency between Article 406 and Article 625 while delivering the same degree of protection to Article 625 EV charging receptacle outlets

as is afforded to 15- and 20-ampere rated receptacle outlets installed in a wet location elsewhere in the Code.

Leviton Solution

Leviton Extra Duty While-In-Use Covers

Built to withstand the elements and tough enough to comply with 406.9(B)(1) for “Extra-Duty”

- Accommodates Decora® GFCI devices. Adapter plates are included for duplex and single receptacles
- Heavy-duty gasket protects from moisture and adds to ease of installation
- Includes two inserts to cover cord openings to prevent insects and debris from entering the cover
- Safety lock feature



Leviton Extra Duty While-In-Use covers

New and Revision



680.21(C) & (D) GFCI Protection for Motors Used in Swimming Pools

Change Summary

- Outlets supplying all pool motors on branch circuits rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase, shall be provided with Class A GFCI protection. An exception permits listed low-voltage motors not requiring grounding (with ratings not exceeding the low-voltage contact limit) supplied by listed transformers or power supplies to be installed without GFCI protection.

A new requirement was added that specifies GFCI protection implementation for motors at older pools when they are replaced.

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680.21 Motors.

(C) GFCI Protection. Outlets supplying all pool pump motors connected to single-phase, 120-volt through 240-volt on branch circuits, rated 150 volts or less to ground and 60

amperes or less, single- or 3-phase, whether by receptacle or by direct connection, shall be provided with Class A ground-fault circuit-interrupter protection for personnel.

Exception: Listed low-voltage motors not requiring grounding, with ratings not exceeding the low-voltage contact limit that are supplied by listed transformers or power supplies that comply with 680.23(A)(2), shall be permitted to be installed without GFCI protection.

(D) Pool Pump Motor Replacement. Where a pool pump motor in 680.21(C) is replaced for maintenance or repair, the replacement pump motor shall be provided with ground-fault circuit-interrupter protection.

Expert Analysis

For the 2020 NEC, outlets supplying all pool motors (not just pool pump motors) on branch circuits rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase, shall be provided with Class A GFCI protection. Prior to this revision, GFCI protection was only required for “single-phase, 120-volt through 240-volt” rated pool pump motors. This revision incorporates single-phase and 3-phase motors, which would include single-phase 120/240 volt, single-phase 208Y/120 volt, and 3-phase 208Y/120 volt motors. All of these voltage ratings would result in systems of 120 volts to ground, which is within the specifications for a Class A GFCI device and is within the range of the new maximum 150 volts to ground limitations of 680.21(C).

680.21(D) Pool Pump Motor Replacement



A subtle but significant change to this GFCI provision was to open this requirement up to all permanently installed pool motors, not just pool pump motors. A blower motor for air injection into hot tubs and other applications has no direct connection to the water or does not “pump” water, yet the end-user of this aquatic environment deserves GFCI protection for this motor as much as GFCI protection for a pool pump motor.

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It should also be noted that previous Code language at 680.21(C) called for GFCI protection of a pool pump motor “whether by receptacle or by direct connection.” This specific phrase has been deleted, but pay close attention to the use of the term “outlet.” GFCI protection is still required for a pool motor whether the motor is connected by receptacle outlet or by direct “hard-wire” connection.

A new exception was also added to 680.21(C) allowing listed low-voltage motors not requiring grounding (with ratings not exceeding the low-voltage contact limit) supplied by listed transformers or power supplies to be installed without GFCI protection.

New 2020 NEC article 680.21(D) titled, “Pool Pump Motor Replacement” has been added requiring GFCI protection for a new pool pump motor that is replacing an existing pump motor as part of maintenance or repair activities.

New



680.22(A)(5) Pool Equipment Room Receptacle

Change Summary

- At least one GFCI-protected 125-volt, 15- or 20-ampere receptacle on a general-purpose circuit is now required to be located within a pool equipment room. All other receptacles supplied by branch circuits rated 150 volts or less to ground within a pool equipment room are required to be GFCI protected.

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680.22 Lighting, Receptacles, and Equipment (A) Receptacles.

(5) Pool Equipment Room. At least one GFCI-protected 125-volt, 15- or 20- ampere receptacle on a general-purpose circuit shall be located within a pool equipment room, and all other receptacles supplied by branch circuits rated 150 volts or less to ground within a pool equipment room shall be GFCI protected.

Expert Analysis

It is not uncommon to find swimming pool and similar installation type equipment located in a designated pool equipment room, particularly at hotels and other commercial occupancies.

For the 2020 NEC a new provision was added at 680.22(A)(5) calling for at least one GFCI-protected 125-volt, 15- or 20- ampere receptacle on a general-purpose circuit to be located within a pool equipment room. If more than one receptacle outlet is supplied or any other receptacles supplied by branch circuits rated 150 volts or less to ground within a pool equipment room, GFCI protection will also be mandated for those receptacle outlets as well.

Leviton Solution

To comply with this article a WR (Weather Resistant) GFCI receptacle is suggested. In addition, article 680.14 calls for wiring methods in corrosive environments to be listed and identified for use in such areas. The article identifies metal conduit, rigid polyvinyl chloride conduit and reinforced thermosetting resin conduit as solutions.



Leviton Wetguard® Devices

Leviton's Wetguard® line of water and corrosion resistant enclosures and devices are compatible with these types of conduit and complete the corrosion resistant installation. They are designed for applications where electrical connections are exposed to wet and corrosive conditions. They have IEC and NEMA watertight and dust-tight enclosure ratings and offer many significant advantages over competitive brands. A patented multi-point sealing system forms a barrier against dirt and moisture providing the ultimate protection that you should expect from a watertight device. The Wetguard® line features corrosion-resistant electroless nickel-coated brass blades, contacts, terminal screws and wiring clamps, and stainless steel assembly screws. They are resistant to water, acids, alkalies, and many automotive and industrial lubricants and solvents. The plug and

connector husk is molded to a bondable nylon body, providing a device that withstands physical abuse. In addition, the patented compression nut strain relief system ensures the integrity of the electrical connection and watertight seal.

New



680.59 GFCI Protection for Nonsubmersible Fountain Pumps

Change Summary

- In addition of the requirements of 680.51(A) for submersible pumps, outlets supplying all permanently installed nonsubmersible pump motors rated 250 volts or less and 60 amperes or less, single- or 3-phase, are now required to be provided with GFCI protection.

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680.59 GFCI Protection for Permanently Installed Nonsubmersible Pumps.

Outlets supplying all permanently installed nonsubmersible pump motors rated 250 volts or less and 60 amperes or less, single- or 3-phase, shall be provided with ground-fault circuit-interrupter protection.

Expert Analysis

The Code language at 680.51(A) states that “luminaires, submersible pumps, and other submersible equipment, unless listed for operation at low voltage contact limit or less and supplied by a transformer or power supply that complies with 680.23(A)(2), shall be protected by a ground-fault circuit interrupter.”

680.59 GFCI Protection for Nonsubmersible Fountain Pumps



For the 2020 NEC, a new 680.59 titled, “GFCI Protection for Permanently Installed Nonsubmersible Pumps” was added to the end of Part V of Article 680. This new section states that “outlets supplying all permanently installed nonsubmersible pump motors rated 250 volts or less and 60 amperes or less, single- or 3-phase, shall be provided with ground-fault circuit-interrupter protection.” With the term “outlet” being used here, this would call for GFCI protection of a hard-wired or cord-and-plug connected permanently installed nonsubmersible pump for a fountain.

Revision



682.15 GFCI Rules Pertaining to Natural and Artificially Made Bodies of Water

Change Summary

- All GFCI rules pertaining to natural and artificially made bodies of water were moved to one location [682.15(A)]. New provisions were also added at 682.15(B) requiring ground-fault protection (GFP) not exceeding 30 mA for feeder and branch-circuit conductors installed on piers.

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682.15 Ground-Fault Circuit-Interrupter (GFCI) Protection.

~~Fifteen- and 20-ampere single-phase, 125-volt through 250-volt receptacles installed outdoors and in or on floating buildings or structures within the electrical datum plane area shall be provided with GFCI protection for personnel.~~

The GFCI requirements in this article, unless otherwise noted, shall be in addition to the requirements in 210.8. Ground-fault protection shall be provided in accordance with 682.15(A) and (B). The GFCI protection device shall be located not less than 300 mm (12 in.) above the established electrical datum plane.

(A) Outlets. Outlets supplied by branch circuits not exceeding 150 volts to ground and 60 amperes single-phase, shall be provided with ground-fault circuit-interrupter protection for personnel.

(B) Feeder and Branch Circuits on Piers. Feeder and branch-circuit conductors that are installed on piers shall be provided with ground-fault protection not exceeding 30 mA. Coordination with downstream ground-fault protection shall be permitted at the feeder overcurrent protective device.

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Exception No. 1: Transformer secondary conductors of a separately derived ac system, operating at voltages exceeding 15 volts ac, that do not exceed 3 m (10 ft) and are installed in a raceway shall be permitted to be installed without ground-fault protection. This exception shall also apply to the supply terminals of the equipment supplied by the transformer secondary conductors.

Exception No. 2: Low-voltage circuits not requiring grounding, not exceeding the low-voltage contact limit as defined in 680.2, and supplied by listed transformers or power supplies that comply with 680.23(A)(2) shall be permitted to be installed without ground-fault protection.

Expert Analysis

For the 2020 NEC, all GFCI rules pertaining to natural and artificially made bodies of water were moved to one location at 682.15(A). New provisions were also added at 682.15(B) calling for ground-fault protection (GFP) not exceeding 30 mA for feeder and branch-circuit conductors that are installed on piers.

682.15 GFP for Natural and Artificially Made Bodies of Water



It should be noted that the previous GFCI protection requirements at 682.15 pertained to 15- and 20-ampere single-phase, 125-volt through 250-volt receptacle outlets only. These revised GFCI provisions at 682.15(A) pertain to direct connected or “hard-wired” equipment as well as receptacle outlets for cord-and-plug connected equipment.

New



702.7(A) Sign Indicating Optional Standby Power Source

Change Summary

- A sign is now required to be placed at the service-entrance equipment for commercial and industrial installations that indicates the type and location of each on-site optional standby power source. For one- and two-family dwelling units, a sign is required to be placed at the emergency

disconnecting means required by 230.85 that indicates the location of each permanently installed on-site optional standby power source disconnect or means to shut down the prime mover as required in 445.18(D).

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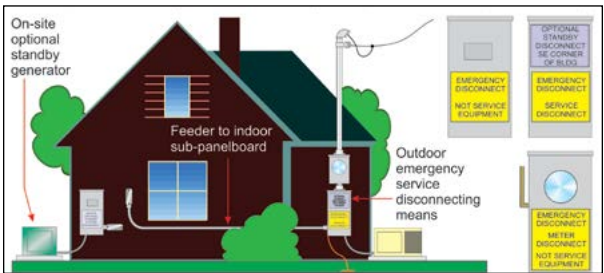
702.7 Signs.

(A) Standby. A sign shall be placed at the service-entrance equipment for commercial and industrial installations that indicates the type and location of each on-site optional standby power source. For one- and two-family dwelling units, a sign shall **not** be required for individual-unit equipment for standby illumination placed at the disconnecting means required in 230.85 that indicates the location of each permanently installed on-site optional standby power source disconnect or means to shut down the prime mover as required in 445.18(D).

Expert Analysis

An optional standby system is a system intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system.

702.7(A) Sign for On-Site Optional Standby Systems



For the 2020 NEC, the service disconnecting means for optional standby systems can still be installed at a readily accessible location outside the building or inside nearest the point of entrance. However, an emergency disconnecting means (which could include the service disconnecting means) for a one- or two-family dwelling is now required to be installed and located on the outside of the structure. This required outdoor emergency disconnect can consist of (1) the service disconnect(s), (2) a properly marked meter disconnect(s), or (3) other listed disconnect switches or circuit breakers on the supply side of each service disconnect that are suitable for use as service equipment.

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At 702.7(A), new provisions have been instituted to require the on-site optional standby system signage at one- and two-family dwelling units to be placed at the disconnecting means required at 230.85 that indicate the location of each permanently installed on-site optional standby power source disconnect.

Revision



725.48(B)(1) Class 1 Circuits and Power-Supply Circuits

Change Summary

- Revision permits Class 1 circuits to share enclosure space with conductors of electric light, power, non-power-limited fire alarm and medium power network-powered broadband communications circuits as long as separated by a barrier.

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725.48 Conductors of Different Circuits in the Same Cable, Cable Tray, Enclosure, or Raceway.

Class 1 circuits shall be permitted to be installed with other circuits as specified in 725.48(A) and (B).

(A) Two or More Class 1 Circuits.

(see NEC for complete Code text)

(B) Class 1 Circuits with Power-Supply Circuits.

Class 1 circuits shall be permitted to be installed with power-supply conductors as specified in 725.48(B)(1) through (B)(4).

(1) In a Cable, Enclosure, or Raceway. Class 1 circuits and power-supply circuits shall be permitted to occupy the same cable, enclosure, or raceway **without a barrier** only where the equipment powered is functionally associated. Class 1 circuits shall be permitted to be installed together with the conductors of electric light, power, non-power-limited fire alarm, and medium power network-powered broadband communications circuits where separated by a barrier.

Expert Analysis

For the 2020 NEC, in an effort to match the already-in-place allowances for Class 2 and Class 3 circuits, Code language was put in place to allow Class 1 circuits to be installed together with the conductors of electric light, power, non-power limited fire alarm, and medium power network-powered broadband communications circuits “where separated by a barrier.” An example of this would



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be when the power supply conductors and Class 1 control circuit conductors are run in the same conduit to control panel and operate the same piece of equipment, such as a motor controller.

Revision



770.24 Optical Fiber Cable

Change Summary

- Optical fiber cables are now required to be installed and protected from physical damage in accordance with the entirety of 300.4 and 300.11.

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770.24 Mechanical Execution of Work.

Optical fiber cables shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by hardware, including straps, staples, cable ties, hangers, or similar fittings, designed and installed so as not to damage the cable. The installation shall also conform with ~~to 300.4(D) through (G)~~ and 300.11. Nonmetallic cable ties and other nonmetallic cable accessories used to secure and support cables in other spaces used for environmental air (plenums) shall be listed as having low smoke and heat release properties in accordance with 300.22(C).

Informational Note No. 1: Accepted industry practices are described in ~~ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling; ANSI/NECA/FOA 301-2009, Standard for Installing and Testing Fiber Optic Cables; and other ANSI-approved installation standards: ANSI/TIA-568.0-D-2015, Generic Telecommunications Cabling for Customer Premises, and ANSI/TIA 568.3-D-2016; and Optical Fiber Cabling and Components Standard.~~

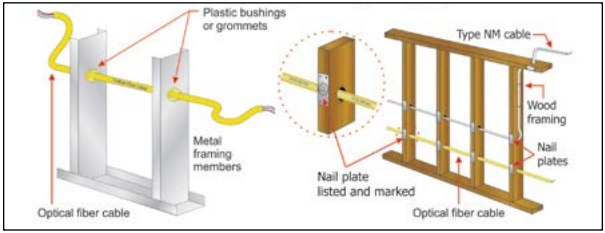
Informational Note No. 2: See 4.3.11.2.6.5 and 4.3.11.5.5.6 of NFPA 90A-2012 ~~2018~~, Standard for the Installation of Air-Conditioning and Ventilating Systems, for discrete combustible components installed in accordance with 300.22(C).

Informational Note No. 3: Paint, plaster, cleaners, abrasives, corrosive residues, or other contaminants may result in an undetermined alteration of optical fiber cable properties.

Expert Analysis

For the 2020 NEC, the requirements of 770.24 were revised to require optical fiber cable to be installed and protected from physical damage to conform with all of 300.4 in its entirety and 300.11. Optical fiber

770.24 Mechanical Execution of Work for Optical Fiber cable



cables are not limited to communications installations and need protection against physical damage regardless of whether they can be a shock hazard or not. Just because optical fiber cable is not carrying any current, the equipment being supplied by this optical fiber cable in several situations is critical to life and safety. Therefore, the installation of these optical fiber cables should conform to all of 300.4. Optical fiber cables are used for life safety applications such as for fire alarm systems, some building system controls and industrial process controls. Any type of damage to the optical fiber cable can cause failure to the use and operation of the cable and/or systems they are part of such as the fire alarm system.

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New



800.27 Temperature Limitation of Wire and Cables

Change Summary

- New section added to specify that no communication wire or cable be used in such a manner that its operating temperature exceeds that of its rating.

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800.27 Temperature Limitation of Wire and Cables.
No wire or cable shall be used in such a manner that its operating temperature exceeds that of its rating.

Expert Analysis

When the previous requirements of 800.3 were moved to new Article 800 in the 2020 NEC, it was felt that this temperature limitation requirement deserved its own section in Article 800, so the previous temperature limitations of 800.3(H) were moved to a new 800.27 and titled “Temperature Limitation of Wires and Cables.” This section states that “no wire or cable shall be used in such a manner that its operating temperature exceeds that of its rating.” The requirements of 800.179 states that plenum, riser, general-purpose, and limited-use cables shall have a temperature rating of not less than 60°C (140°F). Another issue with the previous provisions of 800.3(H) and the reference to previous 310.15(A)(3) is the fact that 310.15(A)(3) literally

applied to conductors (not necessary to cables). This new text at 800.27 makes it clear that the temperature limitations in Chapter 8 apply to cables and not just conductors.

800.27 Temperature Limitation of Wires and Cables



This new text simplifies the Code by including the temperature limitation requirement directly in Article 800, rather than have a cross-reference in Article 800 to the temperature limitation requirements of Article 310. Without a reference to “Other Articles,” these temperature limitation requirements no longer belonged under 800.3 without the cross-reference.

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