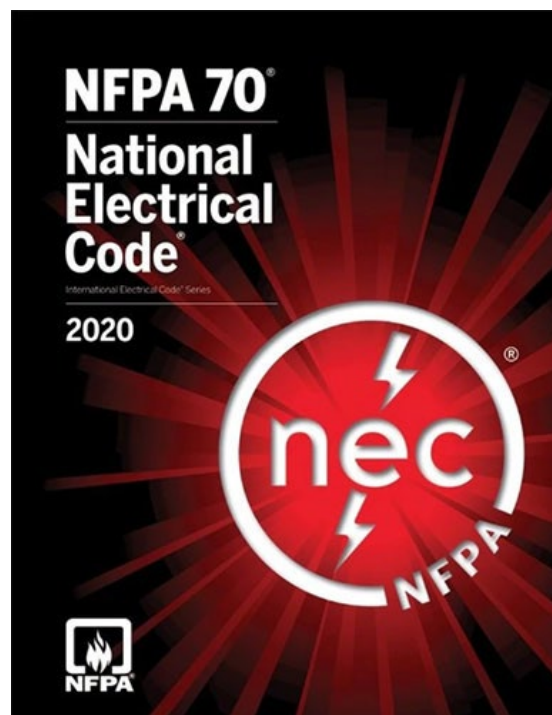


PDHExpress.com



NEC 2020 Code Changes for one and two family residential and commercial electrical installations



6 PDH

**Professional Development Hours (PDH) or
Continuing Education Hours (CE)
Online PDH or CE course**

The National Electrical Code (NEC) undergoes updates every three years. The International Association of Electrical Inspectors (IAEI) publishes its "Analysis of Changes" on the same three-year schedule. This publication reflects updates, revisions, and changes to the 2020 NEC. IAEI is represented on every NEC Code Making Panel (CMP) with two representatives—a Principal and an Alternate—on each panel. For the 2020 NEC revision cycle, seven IAEI members served as Chairpersons on the 18 CMPs. The National Fire Protection Association has completed the 2020 NEC making process, and it is time to review significant code changes for one- and two-family residential and commercial electrical installations.

NEC ADOPTIONS BY STATE

State Adoptions as of April 2024

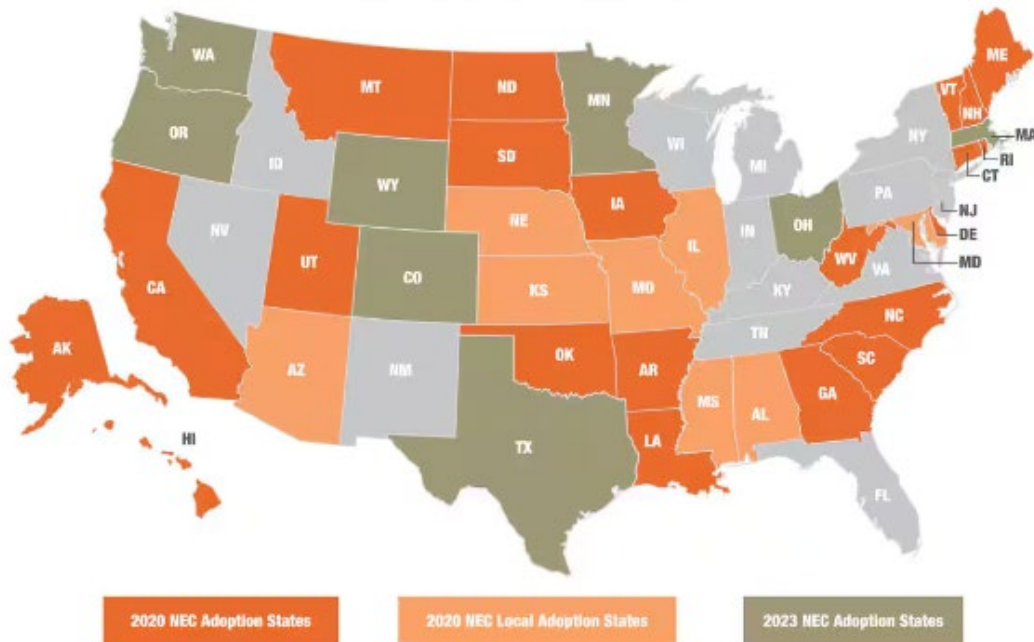


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(Courtesy of Eaton)

The NEC is updated every three years and receives numerous Public Inputs and Public Comments, which are reviewed for approval by a two-thirds majority of the code-making panel for any changes to the relevant article. In this cycle, 3,730 Public Inputs were considered by the 18 Code-Making Panels.

The following are some significant changes along with Eaton product solutions to help aid in the installation and inspection processes. As always, consult with your AHJ or manufacturer for proper guidance or interpretation of the product and/or code compliant installation.

As stated in article 90.1(A) of the NEC, "The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity. This Code is not intended as a design specification nor an instructional manual for untrained persons." It is also important to consult with the Authority Having Jurisdiction (AHJ) and/or the manufacturer to ensure a safe and code-compliant installation. According to article 90.4 on Enforcement, "This Code is intended to be suitable for mandatory application by governmental bodies that exercise legal jurisdiction over electrical installations, including signaling and communication systems, and for use by insurance inspectors. The authority having jurisdiction for enforcement of the Code has the responsibility for making interpretations of the rules, deciding on the approval of equipment and materials, and granting the special permission contemplated in a number of the rules. By special permission, the authority having jurisdiction may waive specific requirements in this Code or permit alternative methods where it is assured that equivalent objectives can be achieved by establishing and maintaining effective safety. This Code may require new products, constructions, or materials that may not yet be available at the time the Code is adopted. In such cases, the authority having jurisdiction may permit the use of the products, constructions, or materials that comply with the most recent previous edition of this Code adopted by the jurisdiction."

Dwelling Unit Area Reference Chart for AFCI and GFCI Requirements

| Location | NEC 2008 | NEC 2011 | NEC 2014 | NEC 2017 | NEC 2020 |
|--|-------------------|-------------------|-------------------|-------------------|--------------------|
| Family Rooms | AFCI | AFCI | AFCI | AFCI | AFCI |
| Dining Rooms | AFCI | AFCI | AFCI | AFCI | AFCI |
| Kitchens - 125V Receptacles | GFCI | GFCI | AF/GF | AF/GF | AF/GF |
| Kitchens - 250V Receptacles | TM | TM | TM | TM | GFCI ¹ |
| Bedrooms | AFCI | AFCI | AFCI | AFCI | AF/GF ¹ |
| Living Rooms | AFCI | AFCI | AFCI | AFCI | AFCI |
| Garage – 125V Receptacles | GFCI | GFCI | GFCI | GFCI | GFCI |
| Garage – 250V Receptacles | TM | TM | TM | TM | GFCI |
| Sunrooms | AFCI | AFCI | AFCI | AFCI | AFCI |
| Parlors | AFCI | AFCI | AFCI | AFCI | AFCI |
| Libraries | AFCI | AFCI | AFCI | AFCI | AFCI |
| Dens | AFCI | AFCI | AFCI | AFCI | AFCI |
| Recreation Rooms | AFCI | AFCI | AFCI | AFCI | AFCI |
| Closets | AFCI | AFCI | AFCI | AFCI | AFCI |
| Hallways | AFCI | AFCI | AFCI | AFCI | AF/GF ¹ |
| Laundry Areas – 125V | GFCI ³ | GFCI ³ | AF/GF | AF/GF | AF/GF |
| Laundry Areas – 250V | TM | TM | TM | TM | GFCI |
| Basements | GFCI ² | GFCI ² | GFCI ² | GFCI ² | AF/GF |
| Bathrooms | GFCI | GFCI | GFCI | GFCI | GFCI |
| Dishwasher | TM | TM | AFCI | AF/GF | AF/GF |
| Outdoor Outlets ⁴ (i.e. A/C unit) | TM | TM | TM | TM | GFCI |
| Sump Pump | TM | TM | TM | TM | GFCI |
| Outdoor Receptacles – 125V | GFCI | GFCI | GFCI | GFCI | GFCI |
| Outdoor Receptacles – 250V | TM | TM | TM | TM | GFCI |

TM = Thermal-Magnetic Breaker

AF / AFCI = Arc-Fault Circuit-Interrupter

GF / GFCI = Ground-Fault Circuit-Interrupter

1: GFCI protection required if receptacle outlet is within 6ft of edge of sink (i.e. bedroom bathroom; hallway bathroom, etc.)

2: Unfinished basements

3: Where the receptacle is installed within 6ft of the outside edge of the sink

4: Example of outdoor outlet loads (150V to ground or less; 50A or less; single-phase) are Air Conditioner unit, Septic Aerator, etc. Refer to the appropriate section of the **NEC** for further details on the specific requirements.

Electrical Connections

2017 NEC Requirement:

Installation. Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

2020 NEC Change:

Terminal Connection Torque.

Tightening torque values for terminal connections shall be as indicated on equipment or in installation instructions provided by the manufacturer. An approved means shall be used to achieve the indicated torque value.

Informational Note No.1: Examples of approved means of achieving the indicated torque values include torque tools or devices such as shear bolts or breakaway-style devices with visual indicators that demonstrate that the proper torque has been applied.

Informational Note No. 2: The equipment manufacturer can be contacted if numeric torque values are not indicated on the equipment or if the installation instructions are not available. Informative Annex I of UL Standard 486A-486B, Standard for Safety-Wire Connectors, provides torque values in the absence of manufacturer's recommendations.

Informational Note No. 3: Additional information for torquing threaded connections and terminations can be found in Section 8.11 of *NFPA 70B-2019*, Recommended Practice for Electrical Equipment Maintenance.

RATIONALE OF CHANGE:

Proper electrical terminations such as torquing has been a requirement in the *NEC* for many years. Equipment such as disconnects, panelboards, circuit breakers, receptacles, switches, etc. have torquing requirements per the manufacturer's listing and labeling as noted in article 110.3(B). The changes have brought clarity on how to determine the torquing value for the installer as well as aid in the inspection process for the inspector.

Product solutions

Eaton provides product and service solutions for new residential construction for single-family and multi-family homes, as well as upgrades and replacements for existing homes. Electrical terminations have torque requirements that are important to adhere to for safe electrical installations. That value can be found either on the product, the packaging, instruction sheet (stuffer sheet) or by contacting the manufacturer directly.

Breakers



Circuit Breaker
BR120
(most popular)

Circuit Breaker
CHF120

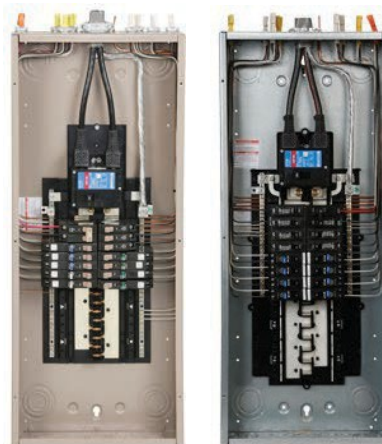
Wiring Devices



Decorator
Switch
7501

Decorator
Receptacle
TR1107

Plug-on Neutral Loadcenters



CH Loadcenter
CHP32B200X6

BR Loadcenter
BRP30B200

| TORQUE WIRE PRESSURE SCREW(S) AS FOLLOWS: | | | |
|---|----------------------------|-----------------------|-----------------------------|
| WIRE SIZE, AL-CU AWG/KCMIL | NEUTRAL & GROUND BAR LB-IN | GROUND (G1) LUG LB-IN | NEUTRAL (N1) MAIN LUG LB-IN |
| #14-10 | 20 | — | — |
| #8 | 25 | — | — |
| #6-4 | 35 | 45 | 45 |
| #3-2/0 | — | 50 | 50 |

Torque chart

Preface to the section 210.8

Ground-Fault Circuit-Interrupter (GFCI)

Since the inception of Ground-Fault Circuit-Interrupter (GFCI) protection into the **NEC**, it has continued expansion to additional branch circuits. The purpose of GFCI is for the protection of personnel from electrical shock. A GFCI is defined by the **NEC** as follows:

Ground-Fault Circuit-Interrupter (GFCI).

A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a ground-fault current exceeds the values established for a Class A device.

Informational Note: Class A ground-fault circuit-interrupters trip when the ground-fault current is 6 mA or higher and do not trip when the ground-fault current is less than 4 mA. For further information, see UL 943, Standard for Ground-Fault Circuit-Interrupters.

Electrical safety should be viewed as a proactive measure, however, new requirements for GFCI protection are too often driven by unfortunate incidents that have led to fatalities. It is important to recognize that the **NEC** is a minimum requirement for the installation for GFCI and also to follow the manufacturer's instructions of the equipment or appliance as well as the GFCI product itself.

Furthermore, the installation of GFCI products as required in section 210.8 shall be installed in a readily accessible location. The definition is as follows:

Accessible, Readily Accessible).

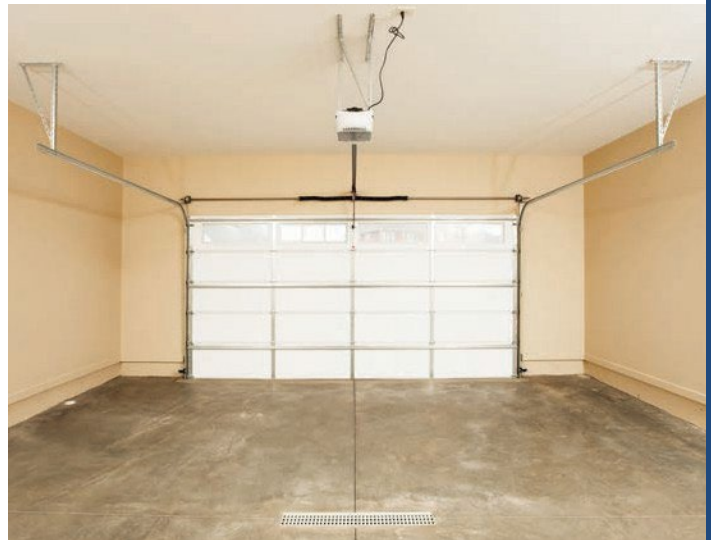
Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to take actions such as to use tools (other than keys), to remove obstacles, or to resort to portable ladders, and so forth.

Informational Note: Use of keys is a common practice under controlled or supervised conditions and a common alternative to the ready access requirements under such supervised conditions as provided elsewhere in the **NEC**.

The GFCI Circuit Breaker located in the panelboard is considered to be readily accessible as a normal installation while the GFCI receptacle may involve some design/location decisions (i.e. behind equipment or in the ceiling for a garage door opener would not be). During the final inspection of new installations, the installation maybe readily accessible, but check with your AHJ on interpretations if an installation is in question.



GFCI receptacle for a dishwasher located in the rear of the cabinet behind the water line. Most likely, this would not be considered to be readily accessible. Always check with your AHJ.



Would a GFCI receptacle located in the garage ceiling next to the door opener be considered readily accessible?



For more information visit our website:
Circuit Protection: Eaton.com/residential
Receptacles: Eaton.com/wiringdevices

2017 NEC Requirement:

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (E). 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.

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

2020 NEC Change:

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

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 window.

See Related **NEC** Sections below for additional information.

RATIONALE OF CHANGE:

GFCI requirements have expanded and the measurement taken is the shortest path that remains. However, the language of passing through a door or doorway has been removed. This change helps bring clarity on the debate whether or not a kitchen cabinet door is a door or not. Also, the removal of doorway will further this requirement for a receptacle outlet located within 6ft of the inside edge of a sink. An example would be a bathroom sink and the receptacle outlet in the bedroom or hallway that is located within the 6ft measurement. This requirement has been modified over the past few code cycles and has now settled on language that should bring clarity to the requirement.



Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Breakers



GFCI Breaker
CHF120GF

GFCI Breaker
BRP120GF

GFCI Receptacles



GFCI
TRSGF15W

GFCI w/nightlight
TRSGFNL20LA

GFCI w/switch
TRSGFS15W

Audible Alarm GFCI
TRSGFA20LA

equipment in Chapters 4, 5, and 6

Related NEC Sections

- 215.9 GFCI protection for personnel on feeders
- 422.5(A) GFCI requirements for appliances
- 555.9 GFCI requirements for boat hoists
- Additional GFCI requirements for specific circuits and

Dwelling Units

2017 NEC Requirement:

All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified in

210.8(A)(1) through (10) shall have ground-fault circuit-interrupter protection for personnel.

2020 NEC Change:

All 125-volt through 250-volt 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.

RATIONALE OF CHANGE:

The requirements for GFCI have expanded with the change to 250-volt receptacles and removing the amperage limitations. It also states that is supplied by single-phase branch circuits rated 150 volts or less to ground. There were unfortunate incidents of reported fatalities in the public input stage that warranted this expansion. There are now 11 locations identified in the section. This change will bring additional GFCI protection to receptacle outlets such as the electric clothes dryer in the laundry area and the electric cooking range in the kitchen (if within 6ft of the sink).



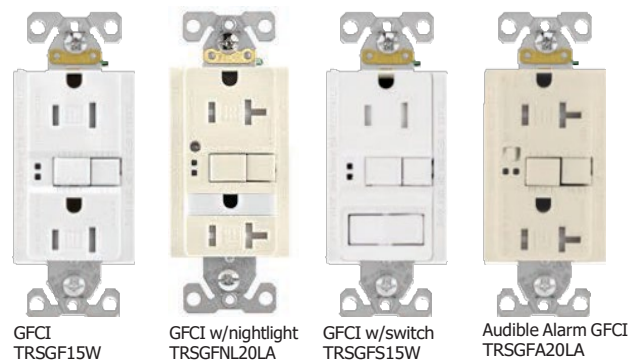
Product solutions

Eaton's ground fault current interrupters (GFCIs) provide superior safety over a standard electrical outlet in areas where electricity may come into contact with water. GFCIs are required in any application near water such as kitchen countertops, bathrooms, swimming pools, hot tubs, and outdoor receptacles. They immediately break the circuit when electrical current leakage is detected, reducing the risk of shock and electrocution.

GFCI Breakers



GFCI Receptacles



Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



210.8(A)(5) GFCI Protection

Dwelling Units Basements

2017 NEC Requirement:

Unfinished portions or areas of the basement not intended as habitable rooms.

2020 NEC Change:

Basements

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.

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

RATIONALE OF CHANGE:

This is part of the change that includes the 125-volt through 250-volt receptacles requirement. Expanding to all of the basement was driven by the way basements are being finished today with various types of conductive flooring finishes (i.e. tiled, acid staining concrete, etc.) that when moisture is present, a potential shock hazard may still exist. Even ceilings in basement maybe left uncovered and painted (for that "industrial" look) with exposed wiring methods.



Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Breakers



GFCI Breaker
CHFP120GF

GFCI Breaker
BRP120GF

Circuit Breaker
GFTCB250

Circuit Breaker
CHN250GF

GFCI Receptacles



GFCI
TRSGF15W

GFCI w/nightlight
TRSGFNL20LA

GFCI w/switch
TRSGFS15W

Audible Alarm GFCI
TRSGFA20LA

Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring devices for other colors available):

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



Related NEC Sections

- 210.52(G)
- 760.41(B) & 760.121(B) for power supply requirements for fire alarm systems

For more information visit our website:
Circuit Protection: Eaton.com/residential
Receptacles: Eaton.com/wiringdevices

210.8(A)(11) GFCI Protection

Dwelling Units Indoor damp and wet locations

2017 NEC Requirement:

No previous direct requirement. Some areas that are damp or wet areas such as bathrooms, laundry rooms, kitchens, etc. are covered, but nothing that directly required damp or wet areas.

2020 NEC Change:

New item #11 was added to cover indoor damp and wet locations to the requirement for GFCI protection in dwelling units. As required in part A, this covers all 125-volt through 250-volt receptacles installed in these types of locations. Some of these additional areas or locations could be considered as mud room or pet wash area for a dwelling unit. Ultimately, the Authority Having Jurisdiction will make the determination on damp or wet locations. The definitions in article 100 will provide guidance for these types of locations.

Location, Damp

Locations protected from weather and not subject to saturation with water or other liquids but subject to moderate degrees of moisture.

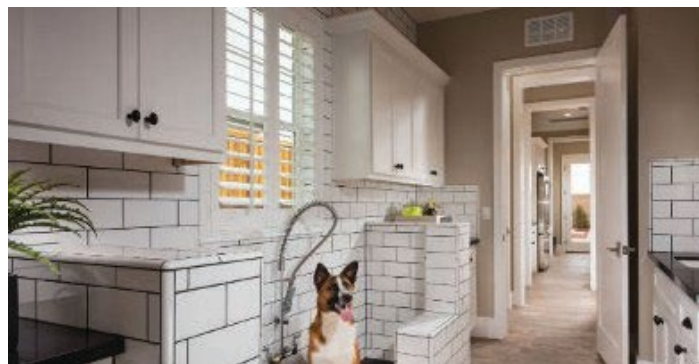
Informational Note: Examples of such locations include partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold-storage warehouses.

Location, Wet

Installations underground or in concrete slabs or masonry in direct contact with the earth; in locations subject to saturation with water or other liquids, such as vehicle washing areas; and in unprotected locations exposed to weather.

RATIONALE OF CHANGE:

It is important to understand that there may be damp and wet locations in dwelling units that have not been covered by the previous requirements thus resulting in clarification by adding the new item #11 to specifically identify damp and wet locations. These locations in dwelling units can be areas such as mud rooms, pet wash areas, damp areas that may not be within 6 feet of the edge of a sink.



Product solutions

Eaton's combined AFCI/GFCI technology provides fire and electrical safety in one device. Available in both receptacles and breakers. The fast-acting design shuts off power in the event of an arc-fault or ground-fault, potentially saving lives and protecting property. As the only manufacturer to offer this technology in a receptacle and a breaker, Eaton has a solution to get you code compliant no matter the project.

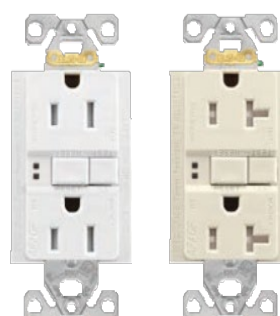
AF/GF Breakers



AF/GF Breaker
CHP115DF

AF/GF Breaker
BRP115DF

AF/GF Receptacles



AF/GF
TRAFGF15W

AF/GF
TRAFGF20LA

Basic colors available for 15A & 20A AF/GF receptacles

(visit Eaton.com/wiring devices for other colors available):

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), V (Ivory), W (White)



210.8(B) GFCI Protection

Other Than Dwelling Units

REVISION

2017 NEC Requirement:

All single-phase receptacles rated 150 volts to ground or less, 50 amperes or less and three-phase receptacles rated 150 volts to ground or less, 100 amperes or less installed in the following locations shall have ground-fault circuit-interrupter protection for personnel.

2020 NEC Change:

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 the locations specified in 210.8(B)(1) through (B)(12).

RATIONALE OF CHANGE:

The evolution of GFCI protection for the last several code cycles continues to encompass the circuit requirements in the general language to provide clarity for specific circuit parameters and for the areas where GFCI protection is required in the areas listed in (B)(1) through (B)(12). It is noteworthy that part A and part B are beginning to have more correlation as electricity does not distinguish between use in dwellings units versus other than dwelling units. As in part A for dwelling units, part B for other than dwelling units also expands the requirement for all 125-volt through 250-volt receptacles whether supplied by single or three-phase branch circuits with specific circuit parameters and locations.



Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

Special Purpose GFCI



Special Purpose Ground Fault Circuit Interrupter SPGFCI

| Catalog | Description |
|-------------|---|
| PGFS43105E0 | 4 wire 120/208 VAC, 30 Amp, CSA |
| PGFS83105E0 | 3 wire 208 VAC, 30 Amp, CSA |
| PGFS43108E0 | 4 wire 120/208 VAC, 30 Amp, UL943 Class A |
| PGFS83108E0 | 3 wire 208 VAC, 30 Amp, UL943 Class A |
| PGFS86108E0 | 3 wire 208 VAC, 60 Amp, UL943 Class A |

GFCI Breakers



GFCI Breaker CHFP120GF

GFCI Breaker BRP120GF

GFCI Receptacles



GFCI TRSGF15W

GFCI w/nightlight TRSGFNL20LA

Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



Related NEC Sections



210.8(B)(2) GFCI Protection

Other Than Dwelling Units Kitchens or areas

2017 NEC Requirement:

Kitchens

2020 NEC Change:

Kitchens or areas with a sink and permanent provisions for either food preparation or cooking

Kitchen

An area with a sink and permanent provisions for food preparation and cooking.

RATIONALE OF CHANGE:

Language was introduced to clarify that other areas for cooking or food preparation have the same potential for shock hazards as a kitchen whether or not permanent cooking provisions are present. There are many establishments that have areas that may not be classified as a kitchen such as coffee shops, convenience stores, ice cream shops, etc. The potential for electric shock does not segregate from a residential or a commercial establishment. It is imperative that GFCI protection is provided whether it is an elaborate commercial kitchen or just a preparation area.



Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Breakers



GFCI Breaker
CHFP120GF

GFCI Breaker
BRP120GF

GFCI Receptacles



GFCI
TRSGF15W

GFCI w/nightlight
TRSGFNL20LA

GFCI w/switch
TRSGFS15W

Audible Alarm GFCI
TRSGFA20LA

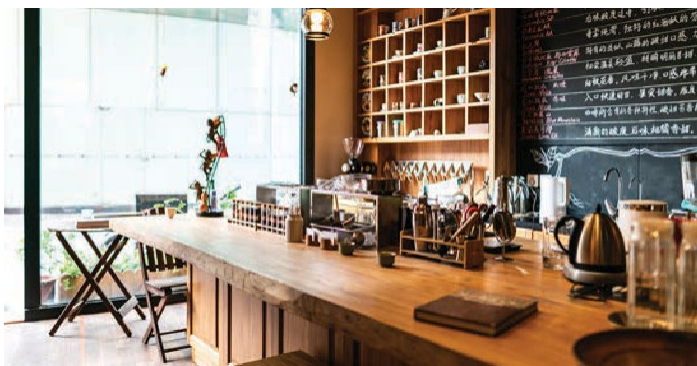
Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



For more information visit our website:
Circuit Protection: Eaton.com/residential



210.8(B)(6) GFCI Protection

REVISION

Other Than Dwelling Units Indoor damp and wet locations

2017 NEC Requirement:

Indoor wet locations

2020 NEC Change:

Indoor damp and wet locations

Location, Damp.

Locations protected from weather and not subject to saturation with water or other liquids but subject to moderate degrees of moisture. (CMP-1)

Informational Note: Examples of such locations include partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold-storage warehouses.

Location, Wet.

Installations underground or in concrete slabs or masonry in direct contact with the earth; in locations subject to saturation with water or other liquids, such as vehicle washing areas; and in unprotected locations exposed to weather.

RATIONALE OF CHANGE:

The requirement for damp locations was added to the language as it brings correlation to wet locations as the potential shock hazards are present in both types of locations. Indoor damp locations could consist of areas such as mud rooms, pet wash area, etc.



Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Breakers



GFCI Breaker
CHFP120GF

GFCI Breaker
BRP120GF

GFCI Receptacles



GFCI
TRSGF15W

GFCI w/nightlight
TRSGFNL20LA

GFCI w/switch
TRSGFS15W

Audible Alarm GFCI
TRSGFA20LA

Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



For more information visit our website:
Circuit Protection: Eaton.com/residential

210.8(B)(8) GFCI Protection

Other Than Dwelling Units Garages, accessory buildings

2017 NEC Requirement:

Garages, service bays, and similar areas other than vehicle exhibition halls and showrooms

2020 NEC Change:

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

RATIONALE OF CHANGE:

It was identified that accessory buildings pose the same potential shock hazard as garages and hence require the same protection of receptacle outlets.



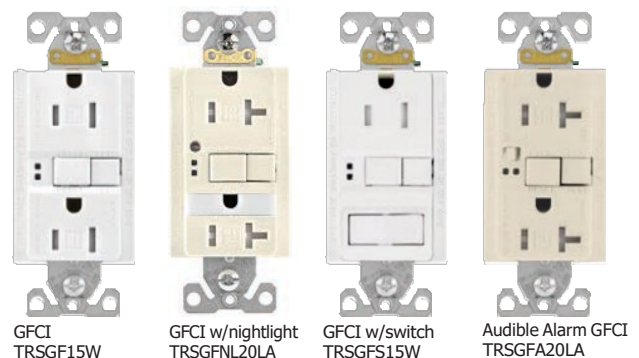
Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Breakers



GFCI Receptacles



Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring-devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



For more information visit our website:
Circuit Protection: Eaton.com/residential

210.8(B)(10) GFCI Protection

Other Than Dwelling Units Unfinished areas of basements

2017 NEC Requirement:

Unfinished portions or areas of the basement not intended as habitable rooms

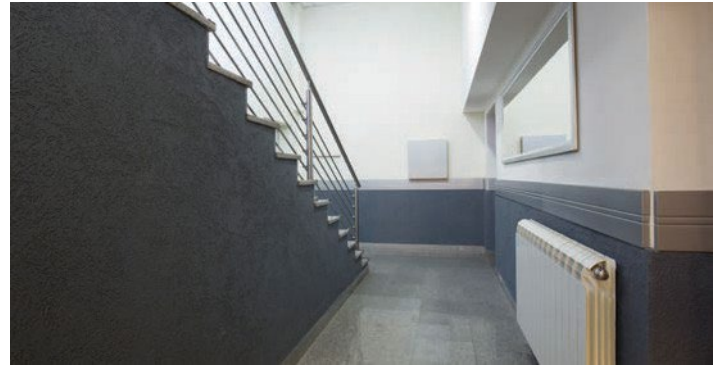
2020 NEC Change:

Unfinished areas of basements

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.

RATIONALE OF CHANGE:

Language was modified to provide clarity of the requirement. The potential for shock hazard exists whether the basement is located in a dwelling unit or other than dwelling unit such as a commercial establishment. It is imperative that GFCI protection be provided to protect personnel whether at home or at work.



Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Breakers



GFCI Breaker CHFP120GF GFCI Breaker BRP120GF

GFCI Receptacles



GFCI TRSGF15W GFCI w/nightlight TRSGFNL20LA GFCI w/switch TRSGFS15W Audible Alarm GFCI TRSGFA20LA

Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



For more information visit our website:
Circuit Protection: Eaton.com/residential

210.8(B)(11) GFCI Protection

NEW

Other Than Dwelling Units Laundry areas

2017 NEC Requirement:

No previous requirement

2020 NEC Change:

Laundry areas

RATIONALE OF CHANGE:

Laundry areas have been added to part B as correlation with part A since the potential hazards exist both in dwelling units as well as commercial facilities such as laundry mats. In multi-family establishments such as condos and apartments tend to have a common laundry area and these areas are required to have GFCI protection for the receptacles. This would include the 125-volt through 250-volt receptacle as required in the general language of 210.8(B).



Product solutions

Eaton's combined AFCI/GFCI technology provides fire and electrical safety in one device. Available in both receptacles and breakers. The fast-acting design shuts off power in the event of an arc-fault or ground-fault, potentially saving lives and protecting property. As the only manufacturer to offer this technology in a receptacle and a breaker, Eaton has a solution to get you code compliant no matter the project.

AF/GF Breakers



AF/GF Breaker
CHP115DF



AF/GF Breaker
BRP115DF

GFCI Breakers



Circuit Breaker
CHN250GF

AF/GF Receptacles



AF/GF
TRAFGF15W



AF/GF
TRAFGF20LA

Basic colors available for 15A & 20A AF/GF receptacles

(visit Eaton.com/wiring devices for other colors available):

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), V (Ivory), W (White)



For more information visit our website:

210.8(B)(12) GFCI Protection

NEW

Other Than Dwelling Units Bathtubs and shower stalls

2017 NEC Requirement:

No previous requirement

2020 NEC Change:

Bathtubs and shower stalls – where receptacles are installed with 1.8 m (6 ft) of the outside edge of the bathtub or shower stall.

RATIONALE OF CHANGE:

The potential hazards exist in commercial and industrial establishments that would require GFCI protection where bathtubs and shower stalls exist. The measurement requirements correlate with the language as required in part A as well. It was necessary to include this requirement since bathtubs and shower stalls may exist in an area that necessarily isn't a bathroom or a locker room.



Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Breakers



GFCI Breaker
CHFP120GF

GFCI Breaker
BRP120GF

GFCI Receptacles



GFCI
TRSGF15W

GFCI w/nightlight
TRSGFNL20LA

GFCI w/switch
TRSGFS15W

Audible Alarm GFCI
TRSGFA20LA

Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring-devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



For more information visit our website:
Circuit Protection: Eaton.com/residential

EATON NEC 2020 Code changes

Specific Appliances

2017 NEC Requirement:

Kitchen Dishwasher Branch Circuit. GFCI protection shall be provided for outlets that supply dishwashers installed in dwelling unit locations.

2020 NEC Change:

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).

RATIONALE OF CHANGE:

Specific Appliances was added in 210.8(D) to correlate with the changes in 422.5 for the General requirement, Type and Location of GFCI protection of Appliances. The GFCI protection of dishwashers is still required but has changed from just dwelling units to all dishwasher appliances now. Other specific appliances listed in 422.5(A) are Automotive vacuum machines, Drinking water coolers and bottle fill stations, Cord-and-plug-connected high-pressure spray washing machines, Tire inflation machines, Vending machines, Sump pumps and Dishwashers.



Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Breakers



GFCI Breaker
CHFP120GF

GFCI Breaker
BRP120GF

GFCI Receptacles



GFCI
TRSGF15W

GFCI w/nightlight
TRSGFNL20LA

GFCI w/switch
TRSGF515W

Audible Alarm GFCI
TRSGFA20LA

Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring-devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



• 422.5(B)(3) through (B)(5)

Related NEC Sections

- 422.5(A)

2017 NEC Requirement:

422.5(A) General.

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

- (1) Automotive vacuum machines provided for public use
- (2) Drinking water coolers
- (3) High-pressure spray washing machines – cord-and-plug-connected
- (4) Tire inflation machines provided for public use
- (5) Vending machines

(B) Type. The GFCI shall be readily accessible, listed, and located in one or more of the following locations:

- (1) Within the branch circuit overcurrent device
- (2) A device or outlet within the supply circuit
- (3) An integral part of the attachment plug
- (4) Within the supply cord not more than 300 mm (12 in.) from the attachment plug
- (5) Factory installed within the appliance

2020 NEC Change:

422.5(A) General.

Appliances identified in 422.5(A)(1) through (A)(7) rated 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
- (2) Drinking water coolers and bottle fill stations
- (3) Cord-and-plug-connected high pressure spray washing machines
- (4) Tire inflation machines
- (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.

422.5(B) Type and Location.

The GFCI shall be readily accessible, listed, and located in one or more of the following locations:

- (1) Within the branch-circuit overcurrent device
- (2) A device or outlet within the supply circuit
- (3) An integral part of the attachment plug
- (4) Within the supply cord not more than 300 mm (12 in.) from the attachment plug
- (5) Factory installed within the appliance.

RATIONALE OF CHANGE:

The requirements in 210.8(D) and 422.5(A) brings much needed correlation for GFCI protection while bringing consistency with future additions of the code as it relates to modifications of the list of specific appliances that require GFCI protection. It also provides the type and location of GFCI protection for appliances. The GFCI protection of dishwashers is still required but has changed from just dwelling units to all dishwasher appliances now. It is important to note that the requirements in 422.5(A) are for 60 amperes or less, single- or 3-phase and 150 volts or less to ground. Sump pumps were also added to the list as in the previous code, they may or may not have been required and was dependent upon the location of the sump pump. The requirement of "provided for public use" was removed for automotive vacuum machines and tire inflation machines so that now they are required to have GFCI regardless of their location.



For more information visit our website:
Circuit Protection: Eaton.com/residential
Receptacles: Eaton.com/wiringdevices

210.8(E) GFCI Protection Equipment Requiring Servicing

NEW

2017 NEC Requirement:

No previous requirement

2020 NEC Change:

GFCI protection shall be provided for the receptacles required by 210.63

RATIONALE OF CHANGE:

This change is an evolution from just having a receptacle for service of HVAC equipment to having a receptacle required by 210.63 for heating, air conditioning and refrigeration equipment and other electrical equipment such as indoor service equipment and indoor equipment requiring dedicated equipment spaces. This single, 125-volt, single-phase, 15- or 20-ampere receptacle shall be installed at an accessible location within 25 ft of the equipment and be GFCI protected.



Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Breakers



GFCI Breaker
CHP120GF

GFCI Breaker
BRP120GF

GFCI Receptacles



GFCI
TRSGF15W

GFCI w/nightlight
TRSGFNL20LA

GFCI w/switch
TRSGFS15W

While-in-use box w/GFCI
WIUXHTWRSGF15W

Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring-devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



Related NEC Sections

Outdoor Outlets

2017 NEC Requirement:

No previous requirement.

2020 NEC Change:

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).

RATIONALE OF CHANGE:

Outdoor receptacles are already required to be GFCI protected for 125-volt through 250-volt. Due to a reported tragic incident, this requirement for outdoor has evolved to outlets. This would include hard-wired or direct connected equipment applications such as the 240-volt air conditioner unit, heat pump, water well, septic systems, etc. This type of equipment at dwelling units do not receive much, if any maintenance after it is installed and typically just remains in place until it fails and repair or replacement is needed.



Product solutions

Eaton's ground fault current interrupters (GFCIs) provide superior safety over a standard electrical outlet in areas where electricity may come into contact with water. GFCIs are required in any application near water such as kitchen countertops, bathrooms, swimming pools, hot tubs, and outdoor receptacles. They immediately break the circuit when electrical current leakage is detected, reducing the risk of shock and electrocution.

GFCI Breakers



Circuit Breaker
CHN250GF

Outdoor GFCI Disconnect



Outdoor GFCI disconnect
CH60SPAST

Related NEC Sections

- 210.8(A)(3), Exception to (3)

For more information visit our website:
Circuit Protection: Eaton.com/residential
Receptacles: Eaton.com/wiringdevices

210.52(C)(2) Dwelling Unit Receptacle Outlets

REVISION

Island and Peninsular Countertops and Work Surfaces

2017 NEC Requirement:

Revision – various articles, refer to 2017 **NEC**, at least one (1) receptacle was required for 12 inch long or greater island and 1 receptacle required for 24 inch long or greater peninsula.

2020 NEC Change:

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.

(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.

RATIONALE OF CHANGE:

The evolution of significantly larger island and peninsular countertops has outgrown the previous requirement of at least 1 receptacle outlet. To provide for an adequate amount of receptacle outlets, the calculation has been changed to a square footage requirement. The placement of the additional receptacle outlet(s) has been left to the installer, designer or building owner. The intent of adequate number and placement of receptacles should help alleviate the use of extension cords or even cords hanging over the edge of the counter top for increased safety.



Product solutions

Combination USB Devices

Eaton's USB chargers offer fast, convenient and efficient charging of portable electronic devices directly from a standard outlet without bulky adapters or powered computers. This innovative line eliminates clutter in residential and commercial environments while enabling compatibility with USB Type-A, Type-C and Type-A/C electronics.

USB 5A Receptacles



USB 5A Device
TRUSB5A15W

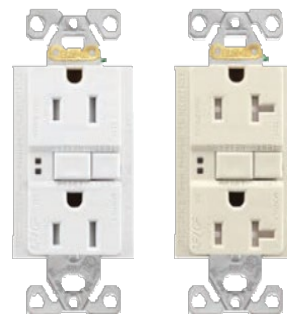
USB 5A Device
TRUSB5A15LA

USB 5A Device
TRUSBAC15LA

Wiring Devices

Eaton's straight blade receptacles cover the full range of residential, hospital, industrial, construction and commercial grades along with special solutions like tamper resistant, GFCI, AF/GF, corrosion resistant, severe duty insulated and watertight solutions.

AF/GF Receptacles



AF/GF
TRAFGF15W

AF/GF
TRAFGF20LA

TR Receptacles



Decorator
Receptacle
TR1107W

Standard
Receptacle
TR270LA

Basic colors for 15A & 20A AF/GF and standard TR receptacles (visit Eaton.com for more colors available):

| | | | | | | |
|---|---|----|----|----|---|---|
| A | B | BK | GY | LA | V | W |
|---|---|----|----|----|---|---|

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), V (Ivory), W (White)

• 210.52(C)(3)

2017 NEC Requirement:

(G) For one- and two-family dwellings, at least one receptacle outlet shall be installed in the areas specified in 210.52(G)(1) through (3). These receptacles shall be in addition to receptacles required for specific equipment.

(1) Garages. In each attached garage and in each detached garage with electric power, at least one receptacle outlet shall be installed in each vehicle bay and not more than 1.7 m (5½ ft) above the floor.

2020 NEC Change:

(G) For one- and two-family dwellings, and multifamily dwellings, at least one receptacle outlet shall be installed in the areas specified in 210.52(G)(1) through (G)(3). These receptacles shall be in addition to receptacles required for specific equipment.

(1) Garages. In each attached garage and in each detached garage with electric power, at least one receptacle outlet shall be installed in each vehicle bay and not more than 1.7 m (5½ ft) above the floor.

Exception: Garage spaces not attached to an individual dwelling unit of a multifamily dwelling shall not require a receptacle outlet in each vehicle bay.

RATIONALE OF CHANGE:

The addition of multifamily to the language brings clarity to the requirement as part of the garage branch circuit requirement in 210.11(C)(4) for at least one 120-volt, 20-ampere branch circuit to supply the receptacle outlets required by 210.52(G)(1). The location of these receptacle outlets are determined by number and location of the vehicle bay(s). Under 210.8(A)(2) requires that the garage receptacle outlets be GFCI protected.



Product solutions

Eaton's GFCI Breakers & GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI breakers immediately break the circuit when electrical current leakage is being detected, reducing the risk of shock and electrocution. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Breakers



GFCI Breaker
CHF120GF

GFCI Breaker
BRP120GF

GFCI Receptacles



GFCI
TRSGF15W

GFCI w/nightlight
TRSGFNL20LA

GFCI w/switch
TRSGFS15W

Audible Alarm GFCI
TRSGFA20LA

Basic colors available for 15A & 20A GFCI receptacles
(visit Eaton.com/wiring-devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



• 210.52(G)(1) through (G)(3)

Related NEC Sections

- 210.11(C)(4)

210.12(C) Arc-Fault Circuit-Interrupter Protection

Guest Rooms, Guest Suites, and Patient Sleeping Rooms in Nursing Homes and Limited-Care Facilities

2017 NEC Requirement:

Guest Rooms and Guest Suites. 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 shall be protected by any of the means described in 210.12(A)(1) through (6).

2020 NEC Change:

Guest Rooms, 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).

RATIONALE OF CHANGE:

The expansion of AFCI protection to Guest Rooms, Guest Suites, and Patient Sleeping Rooms in Nursing Homes and Limited-Care Facilities is one to areas that are similar to and used in a similar manner to areas already under the protection of AFCI in dwelling units. The construction and wiring techniques for these expanded areas are largely identical to these same dwelling unit areas as well. This reasoning shows that any and all potential arcing risks that come from these areas in a dwelling unit also exist for guest rooms, guest suites, and patient sleeping rooms in nursing homes and limited-care facilities and require the same AFCI protection.

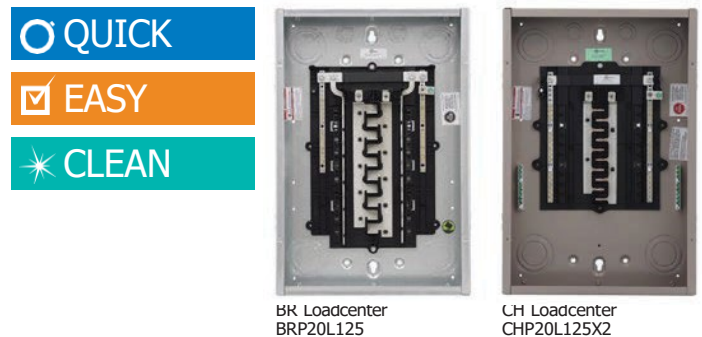
Guest Rooms and Guest Suites in a hotel or motel environment and Patient Sleeping Rooms in Nursing Homes and Limited-Care Facilities are naturally related to bedrooms of a dwelling unit. These Guest Rooms and Guest Suites and Patient Sleeping Rooms, like dwelling unit bedrooms, feature sleeping provisions where the public are particularly vulnerable if a fire were to occur. AFCI protection of branch circuits of these areas provide a level of safety to protect the public during an event where sleeping individuals would not be conscious to the normal signs of ignition. This same logic drove for AFCI protection was first introduced for dwelling unit Bedrooms in 1999. It is also pertinent that Guest Rooms, Guest Suites and Patient Sleeping Rooms are constructed and wired using similar techniques to Bedrooms of dwelling units. Any risk of arcing that could exist in Bedrooms would exist in these areas as well, so the **NEC** will protect them using AFCI technology in the same fashion.



Product solutions

BR and CH Plug-On Neutral Loadcenters

Eaton's BR and CH plug-on neutral portfolio offers advanced features designed to help you improve safety and ease of installation, and reduce your installation time while offering a more professional look and feel.

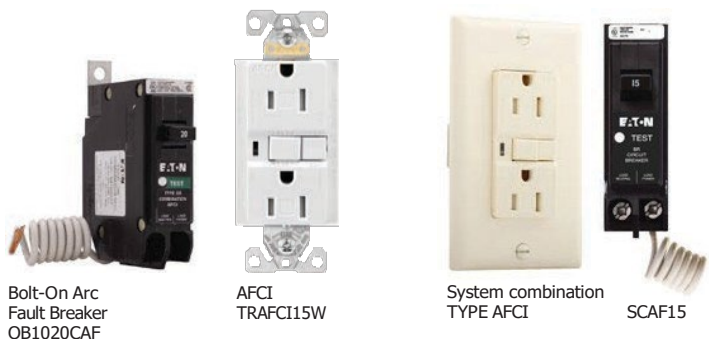


AFCI Breakers & Receptacles

Eaton now offers a system combination-type AFCI. This new solution consist of a (1) UL 489 circuit breaker and (1) AFCI or Dual Function (AF/GF) Outlet Branch-Circuit receptacle, which has been tested and listed as a system to provide complete AFCI protection within the home as required by 210.12(A)(4)(d).

UL Listed System Combination-Type AFCI

Eaton now offers a system combination-type AFCI. This new solution consist of a (1) UL 489 circuit breaker and (1) AFCI or Dual Function (AF/GF) Outlet Branch-Circuit receptacle, which has been tested and listed as a system to provide complete AFCI protection within the home as required by 210.12(A)(4)(d).



Basic colors available for 15A & 20A AFCI receptacles

(visit Eaton.com/wiring-devices for other colors available):

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), V (Ivory), W (White)



210.12(D) Arc-Fault Circuit-Interrupter Protection

Branch Circuit Extensions or Modifications – Dwelling Units, Dormitory Units, and Guest Rooms and Guest Suites

2017 NEC Requirement:

Branch Circuit Extensions or Modifications – Dwelling Units and Dormitory Units.

In any of the areas specified in 210.12(A) or (B), where branch-circuit wiring 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
- (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 conductors is not more than 1.8m (6ft) and does not include any additional outlets or devices.

2020 NEC Change:

Branch Circuit Extensions or Modifications – Dwelling Units, Dormitory Units, and Guest Rooms and Guest Suites.

Where branch circuit wiring for any of the areas specified in 210.12(A), (B), or (C) is modified, replaced, or extended, the branch circuit shall be protected by one of the following:

- (1) 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 1.8m (6ft) 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.

RATIONALE OF CHANGE:

This is part of the change that includes the 125-volt The expansion of AFCI protection for branch circuit extensions or modifications to Guest Rooms and Guest Suites is similar to the changes in 210.12(C) where the new areas are similar to and used in a similar manner to areas already under 210.12(D) in Dwelling and Dormitory Units. The construction and wiring techniques for these expanded areas are largely identical to these same dwelling unit areas as well, so it is logical for branch circuit extensions or modifications for Guest Rooms and Guest Suites to fall under the same requirements as the other areas covered in 210.12(D).

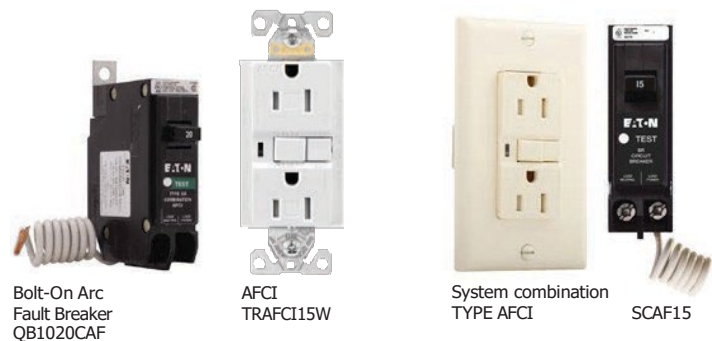
The 2020 change of 210.12(D) also includes a modification of the means of protection that is compliant with the code. The first option in the 2017 **NEC** only allowed a listed combination-type AFCI located at the origin of the branch circuit. In the 2020 **NEC**, the first option for means of protection includes the entirety of means 210.12(A)(1) through (A)(6). This modification serves to provide continuity between all sections in Article 212 as all six means of protection are accepted throughout the Article and should be uniform in 210.12(D).

The last modification to the 2020 code for 210.12(D) concerned the exception for conductor measurements. Splicing devices are not exempt from the consideration of “devices” in the extension of the existing branch circuit conductors. The measurement now also provides an exemption for conductors inside enclosures, cabinets, or junction boxes.

Product solutions

AFCI Breakers & Receptacles

Eaton now offers a system combination-type AFCI. This new solution consist of a (1) UL 489 circuit breaker and (1) AFCI or Dual Function (AF/GF) Outlet Branch-Circuit receptacle, which has been tested and listed as a system to provide complete AFCI protection within the home as required by 210.12(A)(4)(d).



Basic colors available for 15A & 20A AFCI receptacles

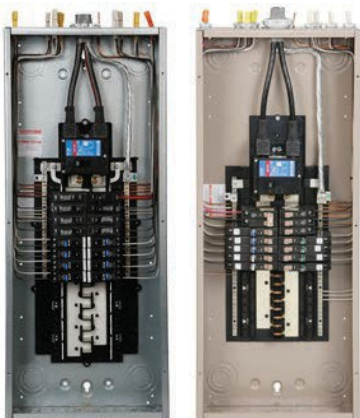
(visit Eaton.com/wiring devices for other colors available):
A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), V (Ivory), W (White)



Product solutions

BR and CH Plug-On Neutral Loadcenters

Eaton’s BR and CH plug-on neutral portfolio offers advanced features designed to help you improve safety and ease of installation, and reduce your installation time while offering a more professional look and feel.



Related NEC Sections

- 210.12(A), (B), or

- (C)
- 210.12(A)(1) through (A)(6)

230.62(C) Service Equipment

Enclosed or Guarded Barriers

2017 NEC Requirement:

Previous requirements located in article 408.3(A)(2) – Service Panelboards, Switchboards, and Switchgear – Barriers shall be placed in all service panelboards, switchboards, and switchgear such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations.

Exception: This requirement shall not apply to service panelboards with provisions for more than one service disconnect within a single enclosure as permitted in 408.36, Exceptions 1, 2, and 3.

2020 NEC Change:

Barriers shall be placed in service equipment such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations.

RATIONALE OF CHANGE:

Article 230.62(C) pertaining to barriers was original language from Article 408.3(A)(2) for barriers on service panelboards, switchboards, and switchgear installations now moved to article 230 for Services. This requirement for prohibiting possible inadvertent contact of service busbars and service terminals while conducting maintenance load terminations is now under Article 230 in order to umbrella across all service equipment.



Product solutions

Beginning January 1, 2017, UL requires the addition of a feature to help ensure that the user does not come into contact with live parts once the main disconnect inside the loadcenter has been switched off. To comply, Eaton has developed a terminal insulator that covers the stripped service entry cable and line side lugs of the main breaker device. Each main breaker loadcenter will ship with a terminal insulator kit (contains 2 terminal insulators). The terminal insulator kits are also available for purchase in minimum quantities of 10 kits i.e. for convertible loadcenter applications.



CSR,BW,BWH Rubber Boot Kit
TICSR300



CSR,BW,BWH Rubber Boot
CSR2200N

Related NEC Sections

- 408.3(A)(2)
- 408.36, Exceptions 1, 2, and 3

For more information visit our website:
Circuit Protection: Eaton.com/residential
Receptacles: Eaton.com/wiringdevices

2017 NEC Requirement:

No previous requirement.

2020 NEC Change:

(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.

RATIONALE OF CHANGE:

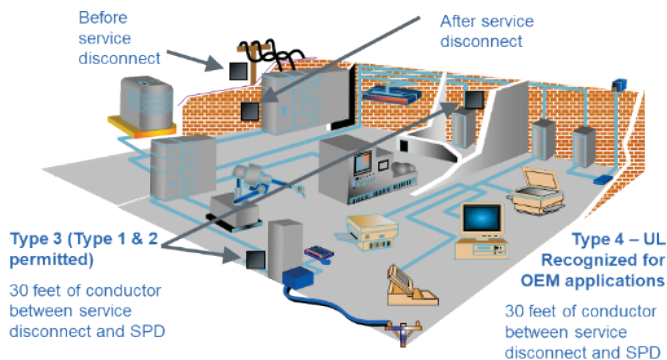
Article 230.67 is a new requirement for the 2020 **NEC** that mandates the use of a surge-protective device (SPD) to provide overvoltage protection for all dwelling unit services. Most electrical equipment installed in a dwelling unit is for overcurrent protection, but there is a lack of overvoltage protection for this type of installation. Overvoltage protection such as an SPD is capable of mitigating the damage to a dwelling from transient surge events inside the system or external events like a utility power grid switching. The need for surge protection has become necessary to ensure that life safety devices when called upon to perform their function, will do so. Many life safety devices such as fire alarms, smoke alarms, GFCIs, AFCIs, etc. have electronics that will benefit from surge protection.

230.67(B) refers to the required location of the SPD to be either 1) an integral part of the service equipment or 2) located immediately adjacent thereto. 230.67(C) mandates that this installation must be a Type 1 or Type 2 SPD which also refers to the location of the device. Type 1 SPDs are installed between the service and the main distribution panel whereas Type 2 SPDs are installed between the main distribution panel and the subsequent branch circuits. The recommended solution is a Type 2 SPD that is either factory-installed or field-installed at the main panel of the dwelling unit.

Language was also provided in part (D) for when service equipment is replaced, then surge protection is to be provided.

Product solutions

Complete home surge protection. Eaton offers a complete line of UL1449 3rd Edition Listed surge protection products providing protection for all of your sensitive electronics and appliances in residential and light commercial applications.



Surge Brick
CHSPT2ULTRA



Surge breaker
CH230SUR



Surge Breaker
BR230SUR



Plug-in module
BRSURGE



Plug-in module
CHSA

For more information visit our website:
Circuit Protection: Eaton.com/residential
Receptacles: Eaton.com/wiringdevices

230.67 Services

Eaton surge protective devices Complete home surge protection

What is a surge? Why do you need protection?











A surge is an electrical disturbance that travels through your AC power, telephone and cable lines, potentially damaging home electronics and appliances.

Where do surges typical come from?

Lightning, utility disturbances and home appliances turning on/off.

Surge application per 2020 NEC 230.67:

- A surge protective device (SPD) shall be installed in all new and replacement services supplying dwelling units
- Shall be a Type 1 or Type 2 SPD
- Shall be attached to the service equipment or immediately adjacent (refer to **NEC 230.67** for exceptions)

| Description | Basic | Better | Best | Multi-family |
|----------------------------------|---|---|--|--|
| Suggested product | Surge modules  | Surge breakers   | Surge bricks    | Surge metering     |
| Catalog numbers | BRPSURGE, BRNSURGE, CHPSURGE, CHNSURGE, CLSURGE | BR230SUR, BR250SUR, CH230SUR, CH250SUR, CL230SUR | CHSPT2ULTRA, CHSPT2SURGE | 3MMSURGE, 3MMSURGEH |
| Nominal discharge current | 3 kA | 10 kA | 20 kA | 20 kA |
| Surge current capacity per phase | 18 kA | 38 kA | 108 kA | 100 kA |
| Circuit breaker required | No | No | 2-pole 50 | N/A |
| Branch spaces used | 2 | 2 | 2 | N/A |
| Warranty | 1 year manufacturers | 1 year manufacturers | Lifetime/equipment up to \$75,000 ^① | 1 year manufacturers |
| BR PON / BR legacy | Yes | Yes | Either | N/A |
| CH PON / CH legacy | Yes | Yes | Either | N/A |
| Classified listing | Yes | Yes | N/A | N/A |

^① Lifetime warranty applies only to CHSPT2ULTRA



Plug-In Module
BRSURGE



Surge Breaker
CH230SUR



Surge Breaker
BR230SUR



Surge Brick
CHSPT2ULTRA



Surge Meter
3MMSURGE

230.71 Service Equipment

Disconnecting Means Maximum Number of Disconnects

2017 NEC Requirement:

(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.

2020 NEC Change:

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

(B) Two to Six Service Disconnecting Means. 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: Metering centers are addressed in UL 67, Standard for Panelboards

Information 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.

RATIONALE OF CHANGE:

The safety and challenges of having more than one disconnect has been recognized and with these changes, the intent is to provide a safer installation by requiring installations in separate enclosures. By having a single disconnect to de-energize conductors and circuit parts in the enclosure except on the line side therefore reducing the possibility of inadvertent contact with energized parts. The terms used in part (B)(4), "metering centers" and "compartments" are not defined in the **NEC** or UL 67. This has created confusion from a design, installation and inspection perspective.

The "six-disconnect rule" has been altered to no longer allow a single enclosure to house the grouped disconnects. The 2020 **NEC** requires separation as to supply each respective disconnect with its own individual "enclosure", "vertical section", "compartment" depending on the application. The intention of this modification is to decrease the likelihood where personnel or tool could come in contact, inadvertent or otherwise, with an energized entity of the system while performing maintenance on a single disconnect. This reasoning is similar to the logic involved with the alteration of 230.62(C) where barriers are now mandated for all service equipment that falls under the purview of Article 230. This kind of contact with energized conductors by personnel or their tool could cause an arc-flash event. With the magnitude of energy that could be at these groups of disconnects it is a precaution toward safety to mandate each disconnect to be provided with its own enclosure, vertical section, or compartment.

To design a system that has a service disconnect such as a fusible safety switch or enclosed breaker upstream of such "metering center" would provide a safer installation for the electrical worker to de-energize the equipment prior to working on the equipment.

Product solutions

Eaton group metering and meter breaker product lines offer residential group meter sockets and meter mains for single-family homes, multi-tenant apartments or condominiums, and office complexes. Customers can install a multi-tenant metering device in one location to have a space-saving, cost-effective energy tabulation system.



Meter stack
1MM312R

Main circuit breaker
1MP2122R

Related NEC Sections

2017 NEC Requirement:

No previous requirement.

2020 NEC Change:

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)

RATIONALE OF CHANGE:

Article 230.85 is a new requirement for the 2020 edition of the **NEC**. This new language is primarily to aid first responders by providing a disconnecting means to a dwelling that is readily accessible, outside of the structure, and easily functional without extensive electrical training. This emergency disconnect for dwellings will offer a rapid means for first responders to de-energize the site without entry or prior knowledge of the structure's main breaker location.

In the past, removing the meter to the service has often been considered a de-energizing solution for first responders. Neither meter sockets nor electrical meters are proper service disconnecting means and this removal action could create an environment causing shock for the first responder. Article 230.85 now requires an emergency disconnect in a readily available outdoor location to provide a safe method of power interruption to the dwelling.



Product solutions

Eaton's Residential Meter Breakers save time and cost by providing contractors with all-in-one service entrance equipment. They allow for quick, flexible, simple installation, and can be used with BR- or CH-type branch circuit breaker styles. Constructed to be a self-contained durable enclosure and meet the latest NEC wire bending space requirements, they are particularly useful for residential metering in areas where utilities are deregulated, and the electrical contractor has to supply watt-hour meter sockets.

Single Meter Socket w/ Integral Main Breaker + Main lug panel



Single meter socket + Enclosed main breaker or switch + Main lug panel



Meterbreaker or Combo panel meets by default



Emergency Disconnect
MBE1224B100BTS

Related NEC Sections

- 110.21(B)
- 230.82(3)

For more information visit our website:
Circuit Protection: Eaton.com/residential
Receptacles: Eaton.com/wiringdevices

2017 NEC Requirement:

240.67 Arc Energy Reduction. Where fuses rated 1200 A or higher are installed, 240.67(A) and (B) shall apply. This requirement shall become effective January 1, 2020.

(A) Documentation. Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the fuses.

(B) Method to Reduce Clearing Time. A fuse shall have a clearing time of 0.07 seconds or less at the available arcing current, or one of the following shall be provided:

- (1) Differential relaying
- (2) Energy-reducing maintenance switching with local status indicator
- (3) Energy-reducing active arc flash mitigation system
- (4) An approved equivalent means

Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a disconnect switch to reduce the clearing time while the worker is working within an arc-flash boundary as defined in **NFPA 70E-2015**, Standard for Electrical Safety in the Workplace, and then to set the disconnect switch back to a normal setting after the potentially hazardous work is complete.

Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the disconnect switch or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in **NFPA 70E-2015**, Standard for Electrical Safety in the Workplace.

Informational Note No. 3: IEEE 1584, IEEE Guide for Performing Arc Flash Hazard Calculations, is one of the available methods that provides guidance in determining arcing current.

2020 NEC Change:**240.67 Arc Energy Reduction.**

Where fuses rated 1200 A or higher are installed, 240.67(A) and (B) shall apply. This requirement shall become effective January 1, 2020.

240.67(A) Documentation.

Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the fuses.

Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.

240.67(B) Method to Reduce Clearing Time.

A fuse shall have a clearing time of 0.07 seconds or less at the available arcing current, or one of the following means shall be provided and shall be set to operate at less than the available arcing current:

- (1) Differential relaying
- (2) Energy-reducing maintenance switching with local status indicator
- (3) Energy-reducing active arc-flash mitigation system
- (4) Current-limiting, electronically actuated fuses
- (5) An approved equivalent means

Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a disconnect switch to reduce the clearing time while the worker is working within an arc-flash boundary as defined in **NFPA 70E-2018**, Standard for Electrical Safety in the Workplace, and then to set the disconnect switch back to a normal setting after the potentially hazardous work is complete.

2020 NEC Change:

Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the disconnect switch or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in **NFPA 70E-2018**, Standard for Electrical Safety in the Workplace.

Informational Note No. 3: IEEE 1584-2002, IEEE Guide for Performing Arc Flash Hazard Calculations, is one of the available methods that provides guidance in determining arcing current.

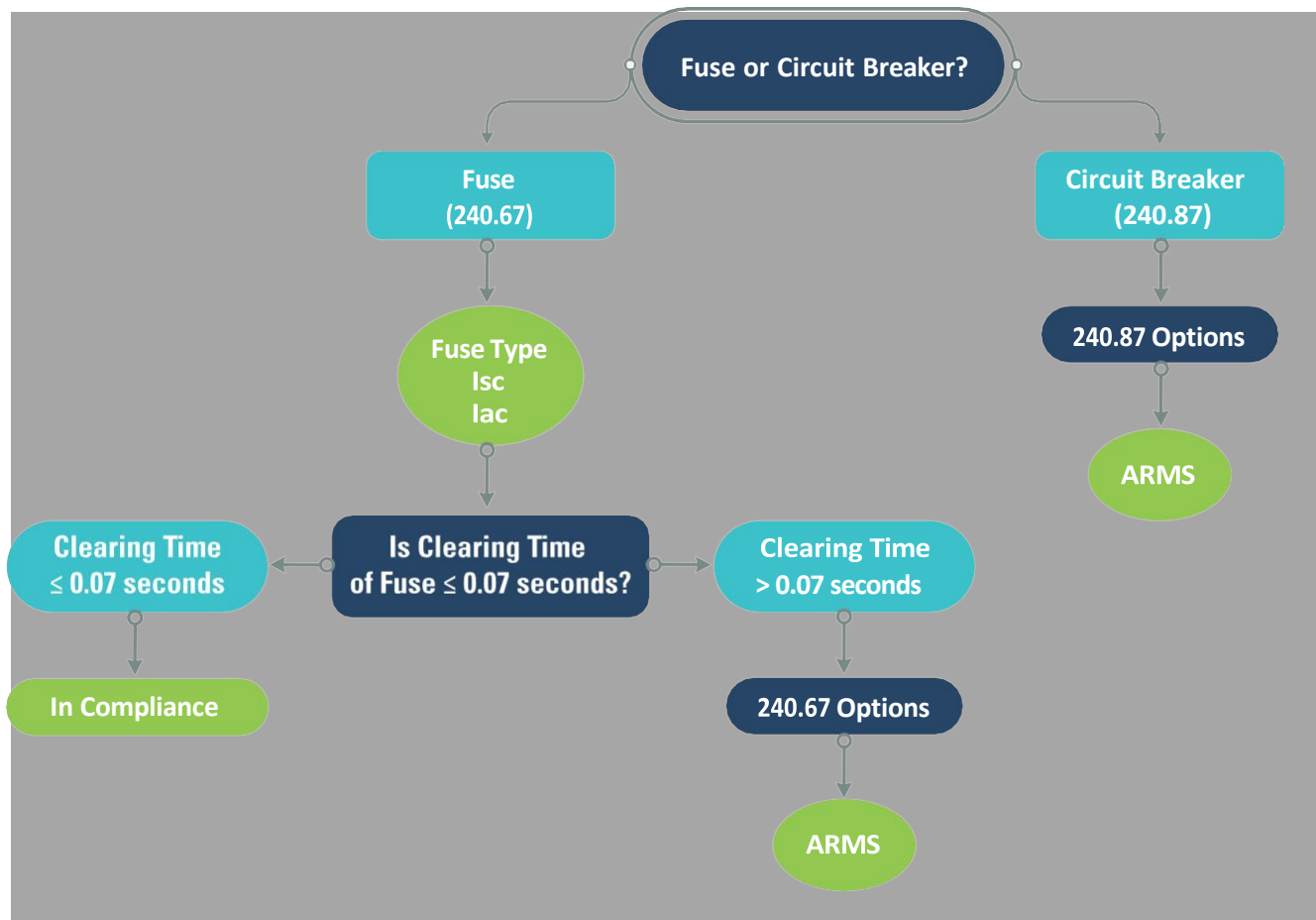
240.67(C) Performance Testing.

The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer’s instructions.

A written record of this testing shall be made and shall be available to the authority having jurisdiction.

Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.

Arc Energy Reduction Compliance Flowchart



For more information visit our website:
 Circuit Protection: Eaton.com/residential
 Receptacles: Eaton.com/wiringdevices

RATIONALE OF CHANGE:

Article 240.67 has now become effective for the 2017 and 2020 editions of the **NEC** as of January 1, 2020. The major modification to this article from the 2017 edition is the requirement of Performance Testing and means of Documentation to pertinent parties involved with the installation as to the location of the fuses and the chosen method of reducing clearing time. The code specifically calls out Primary Current Injection as a compliant method of Performance Testing, but also leaves leeway for "another approved method when first installed on the site." The informational note also provides clarity on the nature of fuses and the risks of conducting performance tests on fuses via Primary Current Injection.

Secondary Current Injection is an alternate method to Primary Current Injection that Eaton recommends to conduct proper performance tests on fuses. Primary Current Injection requires either: 1) the equipment (fuse) to be shipped to an Eaton facility where the test can be conducted or 2) delivery of the sizeable testing equipment that requires a significant amount of source power that may not be on site. Secondary Current Injection is a much less invasive procedure that can be performed on site with more manageable equipment that requires only a 120V receptacle.

After performing the required Performance Testing, documentation via a written record is to be made available to the AHJ. Documentation of the location of the fuses, the chosen method of reducing clearing time, and their performance testing results can be done by using the Eaton Arc Energy Reduction Inspection Form attached to this document and available for download on the Eaton 2020 Code Changes website.

Article 240.67 now also accept means of current-limiting, electronically actuated fuses to reduce the level of arc energy in the system.

Product solutions

Eaton's Main Service Modules are part of Gangable Metering, which consists of a Main Service Module used in conjunction with a Meter Stack to make a custom metering lineup. Gangable Metering is used in large condominiums, strip malls or other applications where more than six units are metered.



Main circuit breaker
3MFS1200RUG



Bussmann Class L
KRP-C Fuses



Bussmann Class T
JJN Fuses



Arc Energy Reduction Relay



Primary Injection Testing



Secondary Injection Testing

Arc Energy Reduction Verification

This completed form is required to ensure compliance with the requirements for Arc Energy Reduction per the 2020 **NFPA 70, National Electrical Code**.

PERMIT # _____ DATE _____

PROJECT NAME: _____

PROJECT LOCATION: _____

ELECTRICAL CONTRACTOR: _____

DESIGN ENGINEER: _____

COMPLIANCE CHECKLIST

1. Where a fuse rated 1200A or larger, does the project contain a fuse that has a clearing time of 0.07 seconds or less at the available arcing current? If yes is selected, then compliance with 240.67(B) has been achieved. Proceed to question 3 and 4.

YES NO

2. If not, does the project contain any of the means of Arc Energy Reduction? NEC 240.67(B)(1-5)

- Differential Relaying YES NO
- Energy-reducing maintenance switching with local status indicator YES NO
- Energy-reducing active arc-flash mitigation system YES NO
- Current-limiting, electronically actuated fuses YES NO
- An approved equivalent means YES NO

3. Has the project tested the performance of the Arc Energy Reduction protection system via primary current injection testing or another approved method via the manufacturer's instructions?

YES NO

4. Required documentation for the Arc Energy Reduction protection system shall include:

- A written record of the Arc Energy Reduction performance testing made available to the Authority Having Jurisdiction.
- Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the fuses.
- Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.
- Signature by professional engineer or other qualified person. Qualifications of person other than professional engineer must be submitted with documentation.

Note: If **NO** has been selected for questions #1-3 and/or no documentation has been provided for #4, then compliance with 240.67 has not been achieved.

2017 NEC Requirement:

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

(A) Documentation. Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the circuit breaker(s).

(B) Method to Reduce Clearing Time. One of the following means shall be provided:

- (1) Zone-selective interlocking
- (2) Differential relaying
- (3) Energy-reducing maintenance switching with local status indicator
- (4) Energy-reducing active arc flash mitigation system
- (5) An instantaneous trip setting that is less than the available arcing current
- (6) An instantaneous override that is less than the available arcing current
- (7) An approved equivalent means

Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a circuit breaker trip unit to "no intentional delay" to reduce the clearing time while the worker is working within an arc-flash boundary as defined in **NFPA 70E-2015**, Standard for Electrical Safety in the Workplace, and then to set the trip unit back to a normal setting after the potentially hazardous work is complete.

Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the circuit breaker or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in **NFPA 70E-2015**, Standard for Electrical Safety in the Workplace.

Informational Note No. 3: An instantaneous trip is a function that causes a circuit breaker to trip with no intentional delay when currents exceed the instantaneous trip setting or current level. If arcing currents are above the instantaneous trip level, the circuit breaker will trip in the minimum possible time.

Informational Note No. 4: IEEE 1584-2002, IEEE Guide for Performing Arc Flash Hazard Calculations, is one of the available methods that provide guidance in determining arcing current.

2020 NEC Change:**240.87 Arc Energy Reduction.**

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

240.87(A) Documentation.

Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the circuit breaker(s). Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.

240.87(B) Method to Reduce Clearing Time.

One of the following means shall be provided and shall be set to operate at less than the available arcing current:

- (1) Zone-selective interlocking
- (2) Differential relaying
- (3) Energy-reducing maintenance switching with local status indicator
- (4) Energy-reducing active arc flash mitigation system
- (5) An instantaneous trip setting. Temporary adjustment of the instantaneous trip setting to achieve arc energy reduction shall not be permitted.
- (6) An instantaneous override
- (7) An approved equivalent means

2020 NEC Change:

Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a circuit breaker trip unit to “no intentional delay” to reduce the clearing time while the worker is working within an arc-flash boundary as defined in **NFPA 70E-2018**, Standard for Electrical Safety in the Workplace, and then to set the trip unit back to a normal setting after the potentially hazardous work is complete.

Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the circuit breaker or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in **NFPA 70E-2018**, Standard for Electrical Safety in the Workplace.

Informational Note No. 3: An instantaneous trip is a function that causes a circuit breaker to trip with no intentional delay when currents exceed the instantaneous trip setting or current level. If arcing currents are above the instantaneous trip level, the circuit breaker will trip in the minimum possible time.

Informational Note No. 4: IEEE 1584-2002, IEEE Guide for Performing Arc Flash Hazard Calculations, is one of the available methods that provide guidance in determining arcing current.

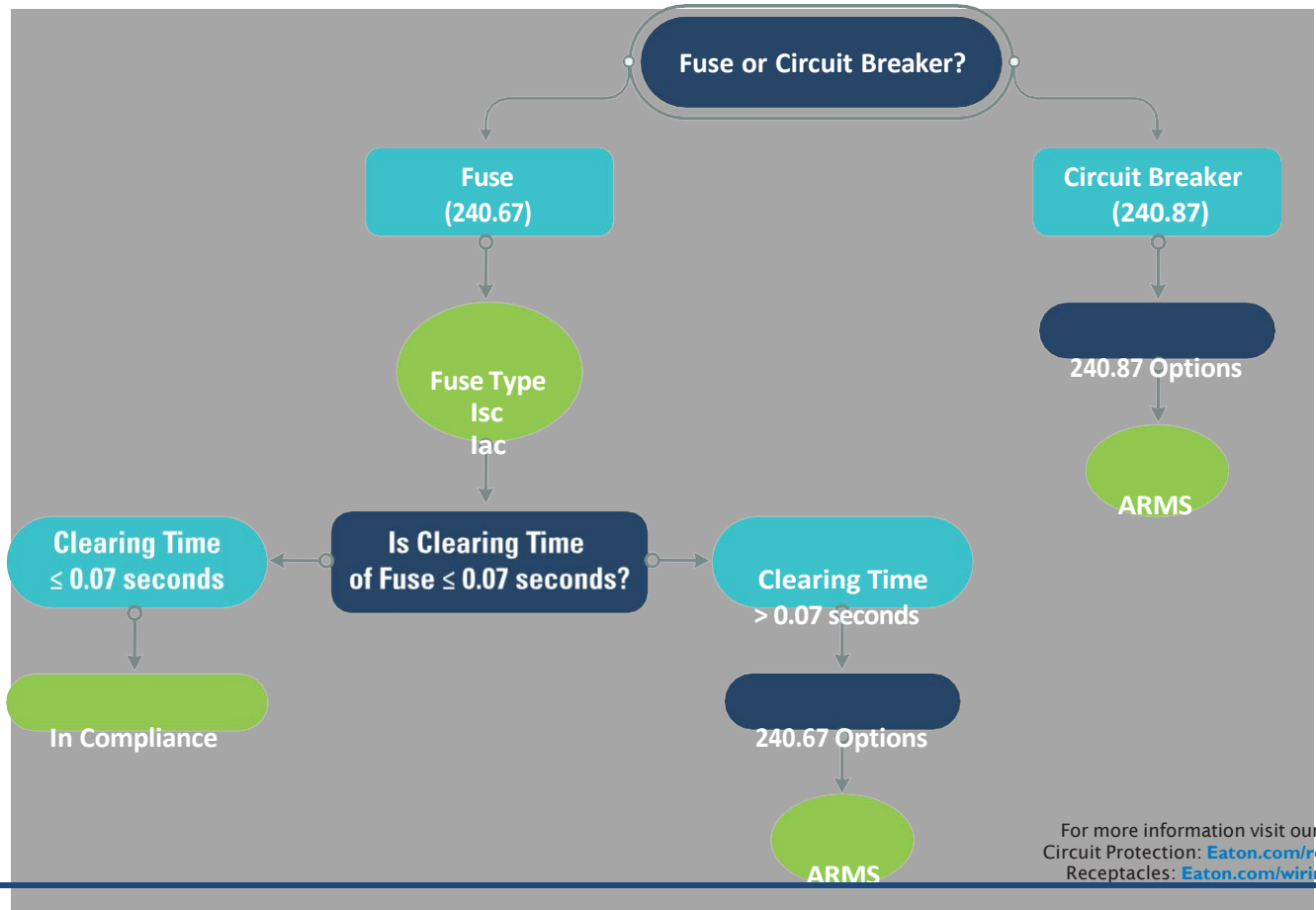
240.87(C) Performance Testing.

The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer’s instructions.

A written record of this testing shall be made and shall be available to the authority having jurisdiction.

Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.

Arc Energy Reduction Compliance Flowchart



RATIONALE OF CHANGE:

Article 240.87 has several significant changes for the 2020 edition of the **NEC** from the 2017 edition. The first concerns the required documentation indicating the chosen method of reducing clearing time of the system. All pertinent parties must be provided with documentation that the circuit breaker is set to operate at a value below the available arcing current.

A second major modification to 240.87 is that the method of clearing time reduction must be set to operate at less than the available arcing current. This available arcing current calculation is also a new requirement to the 2020 **NEC**. This method and value now must be included in the documentation of the arc energy reduction system.

Method #5 was modified to now no longer permit temporary dial adjustment of the instantaneous trip setting to achieve arc energy reduction for an instantaneous trip setting. This new language addresses the issue that the risk of arc energy reduction is not mitigated by this temporary dial change. It is the intention of the code to have the electrical system calculations determine the final instantaneous trip setting and for that value to be permanent unless the electrical system calculations are altered.

Lastly, 240.87(C) addresses the new requirement for Performance Testing of the arc energy reduction protection system. As with 240.67(C), the code specifically calls out Primary Current Injection as a compliant method of Performance Testing, but also leaves leeway for "another approved method when first installed on the site."

Secondary Current Injection is an alternate method to Primary Current Injection that Eaton recommends to conduct proper performance tests on circuit breakers. Primary Current Injection requires either: 1) the equipment (circuit breaker) to be shipped to an Eaton facility where the test can be conducted or 2) delivery of the sizeable testing equipment that requires a significant amount of source power that may not be on site. Secondary Current Injection is a much less invasive procedure that can be performed on site with more manageable equipment that requires only a 120V receptacle.

After performing the required Performance Testing, documentation via a written record is to be made available to the AHJ. Documentation of the location of the circuit breakers, the chosen method of reducing clearing time, and their performance testing results can be done by using the Eaton Arc Energy Reduction Inspection Form.

Product solutions

Eaton's Main Service Modules are part of Gangable Metering, which consists of a Main Service Module used in conjunction with a Meter Stack to make a custom metering lineup. Gangable Metering is used in large condominiums, strip malls or other applications where more than six units are metered.



Main circuit breaker
3MCB1600RBC



Power defense breaker
PDG32G0600FNNN



Power defense breaker
PDG63M1600E4RN



Emergency Disconnect
MBE1224B100BTS



Primary Injection Testing



Secondary Injection Testing

For more information visit our website:
Circuit Protection: Eaton.com/residential
Receptacles: Eaton.com/wiringdevices

Arc Energy Reduction Verification

This completed form is required to ensure compliance with the requirements for Arc Energy Reduction per the 2020 **NFPA 70, National Electrical Code**.

PERMIT # _____ DATE _____

PROJECT NAME: _____

PROJECT LOCATION: _____

ELECTRICAL CONTRACTOR: _____

DESIGN ENGINEER: _____

COMPLIANCE CHECKLIST

1. **Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted is 1200A or higher, does the project contain any of the means of Arc Energy Reduction? NEC 240.87(B)(1-7)**
 - Zone-selective Interlocking YES NO
 - Differential Relaying YES NO
 - Energy-reducing maintenance switching with local status indicator YES NO
 - An instantaneous trip setting. (Temporary adjustment of the instantaneous trip setting to achieve arc energy reduction shall not be permitted.) YES NO
 - An instantaneous override YES NO
 - An approved equivalent means YES NO
2. **Has the project tested the performance of the Arc Energy Reduction protection system via primary current injection testing or another approved method via the manufacturer's instructions?**

YES NO
3. **Required documentation for the Arc Energy Reduction protection system shall include:**
 - A written record of the Arc Energy Reduction performance testing made available to the Authority Having Jurisdiction.
 - Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the fuses.
 - Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.
 - Signature by professional engineer or other qualified person. Qualifications of person other than professional engineer must be submitted with documentation.

Note: If **NO** has been selected for questions #1-2 and/or no documentation has been provided for #3, then compliance with 240.87 has not been achieved.

406.4(D)(4)

Receptacle General Installation Requirements Replacements

2017 NEC Requirement:

(D). Replacements. Replacement of receptacles shall comply with 406.4(D)(1) through (D)(6), 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 a receptacle outlet is located in any areas specified in 210.12(A) or (B), 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.

2020 NEC Change:

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

(4) If a receptacle outlet located in any areas specified in 210.12(A), (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: Section 210.12(D), Exception, shall not apply to replacement of receptacles

RATIONALE OF CHANGE:

If a receptacle is replaced in a area that is specified in 210.12(A), (B) or (C), then it is required to have AFCI protection by the means specified in part (4) of this requirement. The Exception No. 1 was removed as it is no longer relevant since products are commercially available to comply with this requirement. It is important to provide the installer flexibility when adding or changing receptacles to meet this requirement with the use of Outlet Branch Circuit AFCI receptacle or AFCI circuit breaker. There are also products such as the AF/GF receptacle or AF/GF circuit breaker to help with compliance when both levels of protection are required.

Product solutions

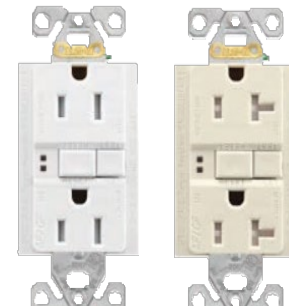
Eaton's combined AFCI/GFCI technology provides fire and electrical safety in one device. Available in both receptacles and breakers. The fast-acting design shuts off power in the event of an arc-fault or ground-fault, potentially saving lives and protecting property. As the only manufacturer to offer this technology in a receptacle and a breaker, Eaton has a solution to get you code compliant no matter the project.

AF/GF Breakers



AF/GF Breaker CHP115DF AF/GF Breaker BRP115DF

AF/GF Receptacles



AF/GF TRAFGF15W AF/GF TRAFGF20LA

GFCI Breakers



Circuit Breaker CHN250GF

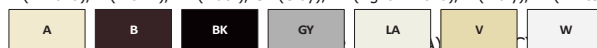
Plug-on Neutral Loadcenters



CH Loadcenter CHP32B200X6 BR Loadcenter BRP30B200

Basic colors available for 15A & 20A AF/GF receptacles

(visit Eaton.com/wiring devices for other colors available):
A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), V (Ivory), W (White)



Bathtub and Shower Space

2017 NEC Requirement:

(C) Bathtub and Shower Space. Receptacles shall not be installed within or directly over a bathtub or shower stall.

2020 NEC Change:

(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 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.

RATIONALE OF CHANGE:

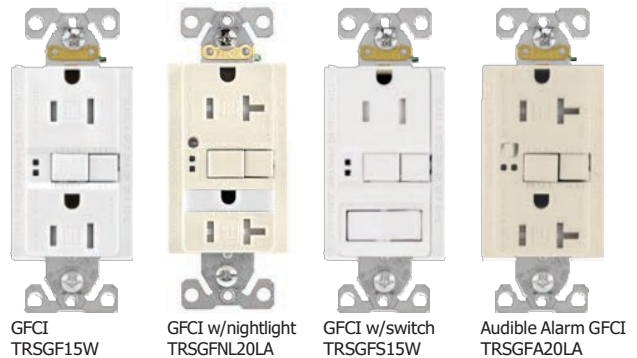
The requirement of not allowing receptacle outlets within or directly over a bathtub or shower stall has expanded the measurement into a zone approach. The zone will now extend to 3 ft horizontally and 8 ft vertically. The measurement will be taken outer edge of the stall or rim. This is an installation that will need to pay close attention to at the rough-in stage as some bathrooms may not have the necessary room to comply therefore resulting in an exception that allows for the receptacle outlet to be installed on the farthest wall opposite of the bathtub rim or shower stall threshold.



Product solutions

Eaton's GFCI receptacles provide superior safety and ensure electric shock protection in areas where electricity may come into contact with water such as kitchen countertops, bathrooms, swimming pools, hot tubs and outdoor receptacles. GFCI receptacles will render itself inoperable if no GFCI protection is present and a red indicator light will blink notifying the user there is no power and the device must be replaced.

GFCI Receptacles



Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring-devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



2017 NEC Requirement:

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

- (1) Dwelling units in all areas specified in 210.52 and 550.13
- (2) Guest rooms and guest suites of hotels and motels
- (3) 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 waiting transportation, gymnasiums, skating rinks, and auditoriums
- (7) Dormitories

2020 NEC Change:

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

- (1) Dwelling units, 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, motels and their common areas
- (3) Child care 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) Dormitory units
- (8) Assisted living facilities

RATIONALE OF CHANGE:

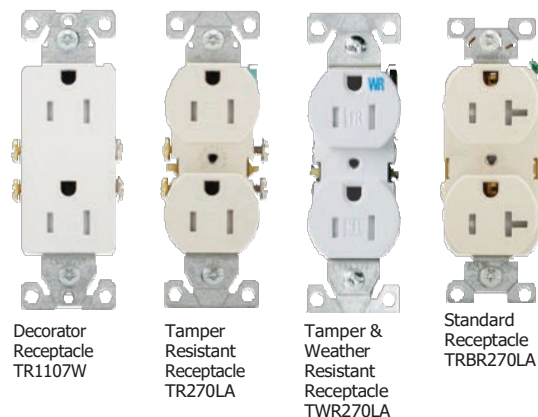
All 15- and 20-ampere, 125- and 250-volt non-locking-type receptacles in the areas specified in 406.12(1) through (8) shall be listed tamper-resistant receptacles.

- (1) Dwelling units, 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, motels and their common areas
- (3) Child care 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) Dormitory units
- (8) Assisted living facilities

Product solutions

Eaton's tamper-resistant straight blade receptacles cover the full range of residential, hospital, industrial, construction, and commercial grades to meet any application. Choose from decorator or traditional styles, multiple colors, tamper resistant solutions and weather resistant products for exterior installations.

TR Receptacles



Basic colors available for 15A & 20A TR duplex receptacles

(visit Eaton.com/wiring-devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



Related NEC Sections

- 210.12 (A), (B), or (C)
- 210.52
- 518.2

• 550.13

For more
information
visit our
website:
Circuit
Protection:
Eaton.com/residential
Receptacles:
Eaton.com/wiringdevices

Motors – GFCI Protection and Pool Pump Motor Replacement

2017 NEC Requirement:

(C) GFCI Protection. Outlets supplying pool pump motors connected to single-phase, 120-volt through 240-volt branch circuits, whether by receptacle or by direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel.

(D) No previous requirement

2020 NEC Change:

(C) GFCI Protection. 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 ground-fault circuit-interrupter protection.

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

RATIONALE OF CHANGE:

The requirement has been modified to outlets supplying all pool motors and not just pool pump motors with wording that correlates to other GFCI requirements. It specifies pool motors rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase, shall be provided with Class A GFCI protection. This change will expand the GFCI protection requirements to other voltage systems than previously required. The requirement has been modified to use the term outlet and removed the phrase “whether by receptacle or by direct connection”. A part (D) was added as a new requirement for pool pump motor replacement in accordance with part (C) to require GFCI protection. Unfortunate circumstances have driven this much needed change to help protect from electrocution associated with pool motors.



Product solutions

Eaton’s CH Spa Panels are premium factory-assembled “combination” units that provide ground fault protection, as well as a convenient way to turn spa pumps on and off. The NEC requires that all pool and spa pumps be protected by a ground fault interrupter and a disconnect switch mounted within 10 feet of the tub or the spa.

Spa Panels



Spa Panel
CH60SPAST

GFCI Breakers



Circuit Breaker
CHN250GF

GFCI Receptacles



GFCI
TRSGF15W

Basic colors available for 15A & 20A GFCI receptacles

(visit Eaton.com/wiring-devices for other available colors)

A (Almond), B (Brown), BK (Black), GY (Gray), LA (Light Almond), RD (Red), V (Ivory), W (White)



