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90.2(A) Scope. Covered.

New to the NEC Scope:

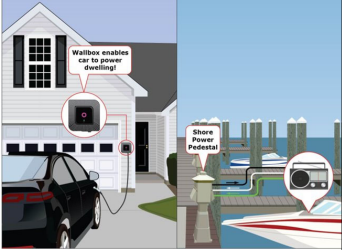
- Installations supplying shore power to ships and watercraft in marinas and boatyards, including monitoring of leakage current.
- Installations used to export electric power from vehicles to premises wiring or for bidirectional current flow.

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Wireless enables car to power dwelling!

Shore Power Pedestal



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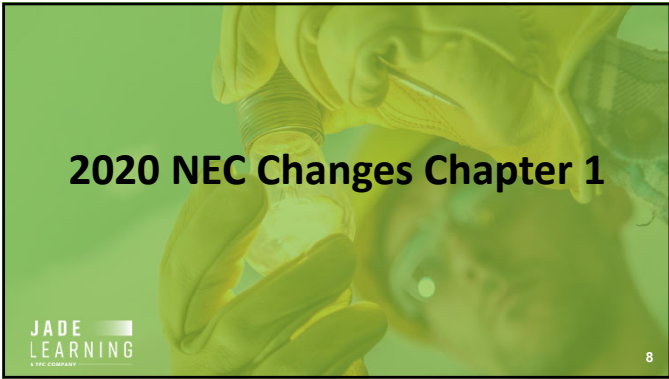
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2020 NEC Changes Chapter 1

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100 Definitions- Accessible.

Revised Definition for Accessible.

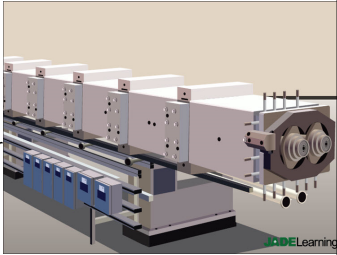
Accessible (Equipment):
Capable of being reached for operation, renewal, and inspection.

Not Equal To: Readily Accessible:
Capable of being reached quickly for operation, renewal, or inspection without employing extraordinary effort, tools, or navigation skills.

(A Condensed Definition)

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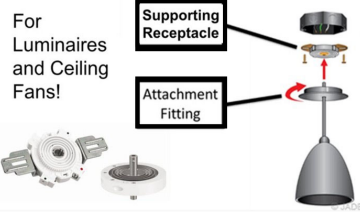
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100 Definitions- Attachment Fitting.

Brand-New Definition: *Attachment Fitting*

For Luminaires and Ceiling Fans!



Supporting Receptacle

Attachment Fitting

A device that, by insertion into a locking support and mounting receptacle, establishes a connection between conductors of the attached utilization equipment and the branch-circuit conductors connected to the locking support and mounting receptacle.

2020 NEC Changes


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100 Definitions- Dormitory Unit.

Brand-New Definition: *Dormitory Unit*



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- A building or space in a building where sleeping accommodations are provided for more than 16 people who are not related.
- May be one room or a series of closely associated rooms.
- Does not have individual cooking facilities.

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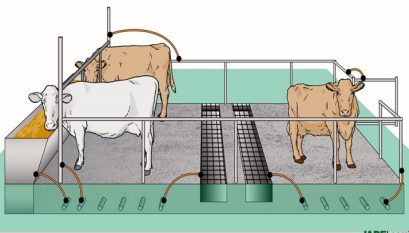
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100 Definitions- Equipotential Plane.

Brand-New Definition: *Equipotential Plane*



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Accessible conductive parts bonded together to reduce voltage gradients (differences) in a designated area.

Equipotential means equal voltage.

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100 Definitions- Fault Current, Fault Current Available.

TWO Brand-New Definitions:

Fault Current:
The current delivered at a point on the system during a short-circuit condition.

Available Fault Current:
The largest amount of current capable of being delivered at a point on the system during a short-circuit condition.

2020 NEC Changes

The diagram illustrates the path of fault current in a circuit. It starts at a 'Source' (yellow circle), goes through 'Equipment' (blue rectangle) which contains an 'OCPD' (Overcurrent Protective Device, shown in a dashed box), and finally reaches a 'Load' (green rectangle). Labels indicate 'Available fault current' at the source, before the equipment, and after the equipment. A note points to the equipment: 'Equipment with a short-circuit current rating' and 'Overcurrent protective device with an interrupting rating'.

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100 Definitions- Grounded Conductor. (1of2)

New Informational Note says:
Although an Equipment Grounding Conductor (EGC) is grounded, it is not considered a “grounded conductor” by the NEC. Note: An EGC is typically green or bare and only carries fault-current.

However, a “grounded” conductor is a white or gray conductor that IS A CURRENT-CARRYING CONDUCTOR.

2020 NEC Changes

The diagram shows a standard electrical receptacle. Labels identify the 'Grounded Conductor' (white wire), the 'Ungrounded Conductor' (black wire), and the 'Equipment Grounding Conductor' (green wire).

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100 Definitions- Grounded Conductor. (2of2)

Grounded Conductor:
The white or gray grounded conductor is a return path in a circuit for electrons reading zero-volts.

Grounding Conductor:
The green/bare EGC is the wire or metal-conduit used to carry fault-current, *should a short-to-ground occur*. This path enables the OCPD to trip.

2020 NEC Changes

The diagram shows a standard electrical receptacle. Labels identify the 'Grounded Conductor' (white wire), the 'Ungrounded Conductor' (black wire), and the 'Equipment Grounding Conductor' (green wire).

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100 Definitions- Habitable Room.


Brand-New Definition: *Habitable Room*
A room for living, sleeping, eating or cooking, but excluding bathrooms, closets, hallways, storage, and utility spaces.

Includes:

Bedrooms
Family Rooms
Kitchens
Dining Rooms

Does NOT Include:

Bathrooms
Closets
Hallways
Storage
Utility Spaces



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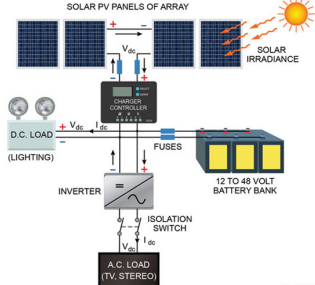
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100 Definitions- Island Mode.

Brand-New Definition:
Island Mode
The operational mode for stand-alone power production equipment or an isolated microgrid.

The 2017 NEC referred to this same system condition as *Stand-Alone Mode* or *Islanded Mode*.



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100 Definitions- Labeled.



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Equipment or material with a label, symbol, or identifying mark acceptable to the AHJ.
New Informational Note:
If a listed product is of such a size, shape, material, or surface texture that it is not possible to apply legibly the complete label to the product, the label may appear on the smallest unit container in which the product is packaged.

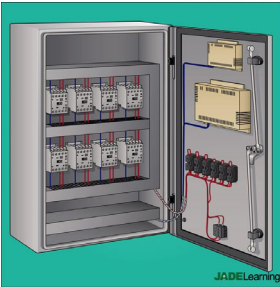
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100 Definitions- Reconditioned.

- Electromechanical systems, equipment, apparatus, and components that are restored to operating conditions.
- Also called rebuilt, refurbished, or remanufactured.
- Replacing a damaged circuit breaker with a new circuit breaker is NOT reconditioning the panel.

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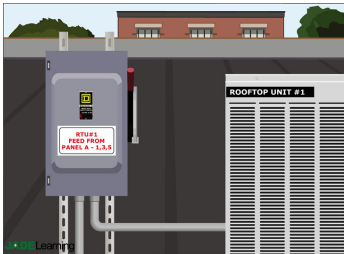
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110.22 Requirements for Electrical Installations. Identification of Disconnecting Means.



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In other than one- or two-family dwellings, the marking shall include the identification of the circuit source that supplies the disconnecting means.

- This directive aligns the marking requirements for disconnects with panels as specified in Section 408.4(B).

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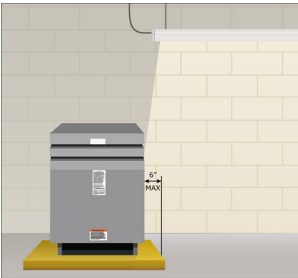
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110.26(A)(3) Height of Working Space.

- Support structures (concrete pads) under the electrical installation may not extend more than 6 inches beyond the front of the equipment.
- Strut channel may be above an electrical panel but may not extend more than 6 inches past the front of the equipment.

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110.26(C)(2) Large Equipment.

Equipment doors can't block entrance or egress – this is a violation!

Entrance and egress requirements change when the combined ampere rating of equipment is 1200 amperes or more.

- One entrance and one egress is required for disconnecting means with combined ratings of 1200 amps or more, over 6 feet wide, and installed according to Section 230.71
- Open equipment doors may not impede the entry or egress from the working space.

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2020 NEC Changes Chapter 2

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200.10(B) Identification of Terminals.

2017 NEC:
The neutral terminals must be a metal or coating that is substantially white or by the word "white" or the letter "W."

2020 NEC:
The neutral terminals must be a metal or coating that is white or silver in color or by the word "white" or the letter "W."

2020 NEC Changes

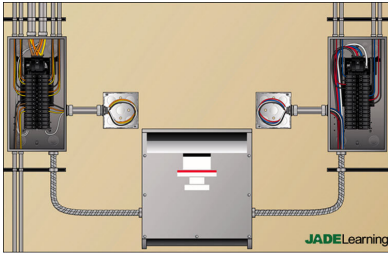
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210.5(C)(1) Branch Circuits Supplied From More Than One Nominal Voltage System.

Different systems within the same premises that have the same system voltage class shall be permitted to use the same identification.



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210.8(A) Branch Circuits. Ground Fault Circuit-Interrupter (GFCI) Protection. Dwelling Units.



In the 2020 NEC both of these circuits (120- and 240-volts) will require GFCI protection in an unfinished or finished basement.

- Receptacles in dwellings up to 250 volts need GFCI protection in 11 locations specified in Section 210.8. Including ALL areas of the dwelling basement!
- Indoor damp and wet locations in dwellings must now be GFCI protected in the 2020 NEC.

2020 NEC Changes

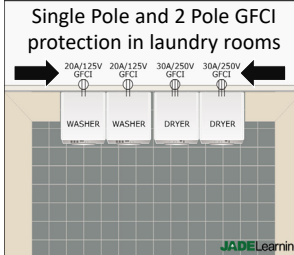
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210.8(B) GFCI Protection for Personnel. Other Than Dwelling Units.

- All 125-volt and 250-volt receptacles in laundry rooms need GFCI protection.
- GFCI protection is required in kitchens or areas with a sink and permanent provisions for either food preparation or cooking.
- Indoor damp locations (not just wet locations) need GFCI protection.



Single Pole and 2 Pole GFCI protection in laundry rooms

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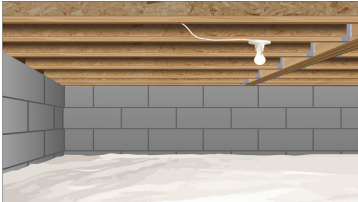
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210.8(C) Crawl Space Lighting Outlets.

GFCI protection shall be provided for lighting outlets not exceeding 120 Volts installed in crawl spaces.

Lights in all crawl spaces (not just dwelling units) must be GFCI protected.



These GFCI devices must be readily accessible.

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210.8(D) Specific Appliances.

Within 12 inches



- Dishwasher GFCI requirements were moved to Section 422 in the 2020 NEC.
- Vending machines must now have GFCI protection included in the attachment plug or not more than 12 inches from the attachment plug.

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210.8(E) Equipment Requiring Servicing.

GFCI protection is required for 125-volt, single phase receptacles installed in the following locations.

- Within 25 feet of all HVAC and refrigeration equipment addressed in 210.63 (including in attics!)

And in *Other* than Dwellings:

- In the same room or area as service equipment.
- In indoor dedicated spaces for other types of equipment.



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210.11(C)(3) Bathroom Branch Circuits.



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- The 20-amp branch circuit required for bathrooms is now limited to feeding only countertop receptacles in bathrooms.
- Floor receptacles must be fed from another circuit.

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210.11(C)(4) Garage Branch Circuits.



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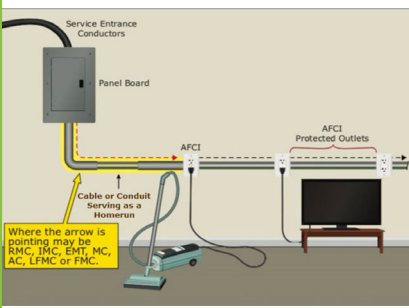
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- The required 20-amp garage branch circuit is permitted to supply only receptacles addressed in Section 210.52(G)(1), not all garage receptacles in this 2020 Code cycle.
- Section 210.52(G)(1) requires one receptacle in each vehicle bay no more than 5 ½ feet above the floor.

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210.12(A)(5) AFCI- Dwelling Units (C), (D).



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- When AFCI protection is provided at the first outlet of a branch circuit, a metal raceway is required between the panel and the first outlet.
- A metal raceway is not required if the AFCI protection device is a breaker in the panel.

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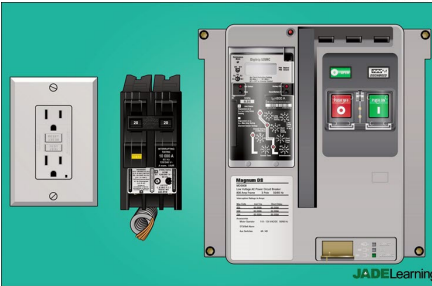
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210.15 Reconditioned Equipment.

The following equipment is expressly prohibited from being reconditioned in the 2020 NEC:

- GFCIs
- AFCIs
- Ground-Fault Protection for Equipment (GFPE)



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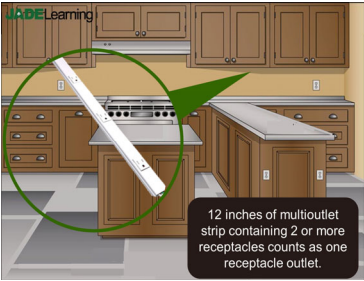
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210.52(C) Countertop and Work Surfaces.



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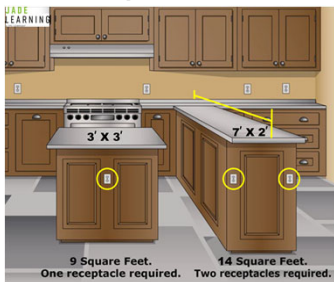
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210.52(C)(2) Island and Peninsular Countertops and Work Surfaces.



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

- In the 2020 NEC, any deck within 4 inches horizontally of a dwelling unit must have a receptacle outlet accessible from the deck.
- Previously, decks with even a ½" air gap were not technically attached to the dwelling and were exempt from the requirement.

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220.12 and Table 220.12- Lighting Load for Non-Dwelling Occupancies.

TYPE OF OCCUPANCY	UNIT LOAD	
	Volt-ampere (VA)	Watt (W)
Convention hall	100	100
Convention center	10	10
Daycare	10	10
Dormitory	10	10
Executive office	10	10
Fire station	10	10
Government	10	10
Health care clinic	10	10
Hotel	10	10
Industrial and storage, including apartment houses, without provision for working by teams	10	10
Library	10	10
Manufacturing facility	10	10
Medical office building	10	10
Museum	10	10
Office	10	10
Parking garage	10	10
Recreation	10	10
Performing arts theater	10	10
Police station	10	10
Post office	10	10
Restaurant	10	10
Retail	10	10
Self-storage	10	10
Service station	10	10
Store	10	10
Transportation	10	10
Warehouse	10	10
Workshop	10	10

- 2020 NEC moved all dwelling unit info from NEC 220.12 to NEC 220.14(J).
- 220.12 expanded to 29 occupancies.
- The 125% multiplier for continuous loads is now included in Table 220.12.
- Motors less than 1/8 hp and connected to lighting circuits are now part of the general lighting load of a service calculation.

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220.14(J) Unit Loads for Dwelling Units.

- In the 2020 NEC, 220.14(J) now contains all dwelling unit information for performing a service calculation.
- The general lighting load for a dwelling is still 3 VA for each square foot, excluding porches, garages, and unused or unfinished spaces not adaptable for future use.
- Motors less than 1/8 hp and powered by lighting circuits (such as bath fans) are now included in the general lighting load portion of the dwelling service calculation.

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220.53 Appliance Load- Dwelling Units.

- In 2020 NEC, a demand factor of 75% can only be applied to four or more appliances when they are rated ½ hp or greater, or 500 watts or greater.
- The permission to use a 75% demand factor during service calculations had no such restriction in 2017 NEC.



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220.53 Appliance Load- Dwelling Units.

- In the 2017 NEC it said “**kitchen ranges**” are exempt from the fastened in place portion of the service calculation.
- In the 2020 NEC kitchen ranges has been replaced with “**all household electric cooking equipment that is fastened in place.**” This ensures cooktops and similar equipment are included.



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225.10 Wiring on Buildings (or Other Structures).



- In the 2020 NEC the term “multiconductor cable” has been replaced with the specific cable Types: SE and TC-ER.
- Both SE (Service Entrance) and TC-ER (Tray-Cable with Crush-Proof Outer Jacket) are now approved as outdoor wiring methods.

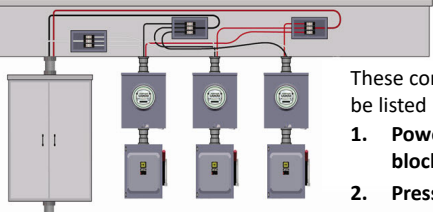
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230.46 Spliced and Tapped Conductors.



These components must now be listed in the 2020 NEC:

1. **Power distribution blocks**
2. **Pressure connectors**
3. **Devices for splices and taps**

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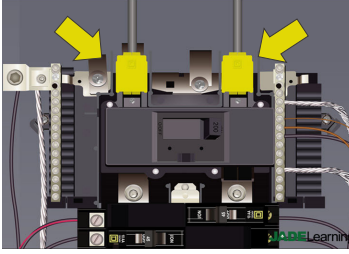
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230.62(C) Service Equipment- Enclosed or Guarded. Barriers.

- In 2020 NEC barrier requirements were moved from general requirements in Article 408 to Section 230.62(C) for service equipment only.
- Barriers are required for service equipment (panels that include the main cut-off) but not for sub-panels.




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230.71 Maximum Number of Disconnects.



- In 2020 NEC, six switches are no longer allowed inside one enclosure to function as a building's service disconnect.
- Up to six switches are permitted to serve as the one service disconnect, but they must now be in separate enclosures.

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230.85 Emergency Disconnects.

- Brand-new for 2020 NEC, 230.85 requires all one- and two-family homes to have an **exterior emergency disconnect**.
- The normal service equipment (if exterior mounted) can serve as the emergency disconnect if labeled correctly.
- **A meter base with built-in disconnect switch** can serve as this required emergency disconnect.



EMERGENCY DISCONNECT,
SERVICE DISCONNECT

2020 NEC Changes

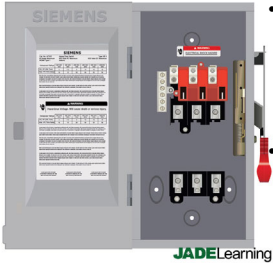
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240.62, 240.88, 240.102 Reconditioned Equipment.

- Low-voltage (1000 volts or less) and medium-voltage (over 1000 volts) fuseholders and nonrenewable fuses are not permitted to be reconditioned.
- Molded-case circuit breakers may not be reconditioned, but low- and medium- power circuit breakers, as well as high-voltage circuit breakers are permitted to be reconditioned.



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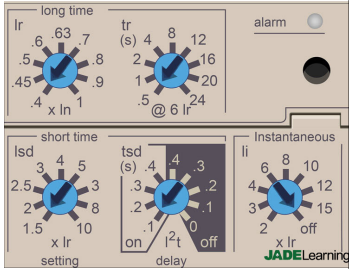
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240.87 Arc Energy Reduction.

- Arc energy reduction systems must be set to operate at less than the available arcing current of the circuit.
- Documentation of the system and performance testing must be made available to the AHJ.
- Temporary adjustment of the instantaneous trip setting is not permitted.



long time

Ir

short time

Isd

delay

tsd

instantaneous

Ii

alarm

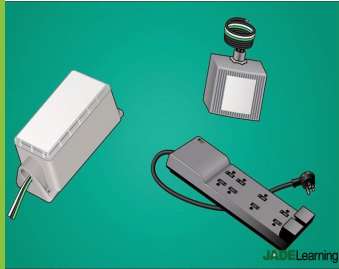
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242 Overvoltage Protection.



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- Brand new Article 242 combines and replaces Articles 280 and 285 in the 2017 NEC.
- Four types of Surge-Protective Devices (SPDs):
 1. Line side of service disconnect
 2. Load side of service disconnect
 3. Portable equipment (multi-outlet plug strip)
 4. Built into equipment

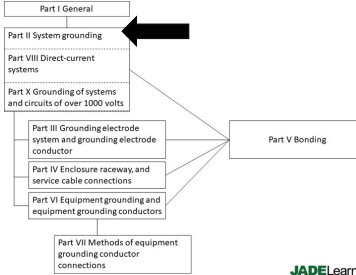
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250 Grounding and Bonding.

- Figure 250.1 was revised to more accurately reflect the Article.
- The term “Supply-Side Bonding Jumper” was moved from NEC 250.2, to Article 100.
- The words “and Bonding” were removed from Article 250, Part II.

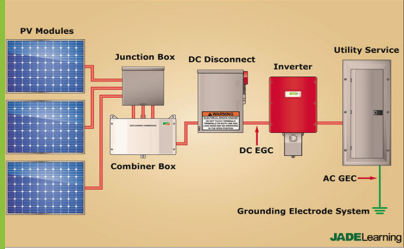
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250.25 Grounding Systems Permitted to be Connected on the Supply Side of the Disconnect.



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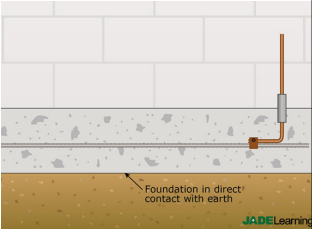
PV system disconnects and similar disconnects that act as service equipment for add-on electrical systems, when connected to the supply-side of utility-fed electrical systems, now require grounding and bonding according to the NEC.

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250.53(C) Grounding and Bonding.
Grounding Electrode System Installation.
Bonding Jumper.

- Rebar in a concrete foundation must be used as a grounding electrode but the rebar cannot be used as a bonding jumper to tie together other electrodes.
- A separate bonding jumper (not rebar) must be used to interconnect the electrodes of the grounding electrode system.



Foundation in direct contact with earth

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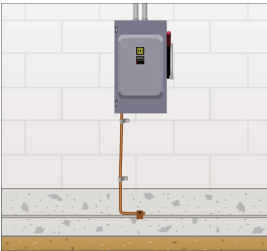
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250.64(A) Grounding Electrode Conductor.
Aluminum or Copper-Clad Aluminum Conductors.

- Outdoor aluminum or copper-clad aluminum conductors may not be terminated within 18 inches of the earth.
- New 2020 NEC makes it clear: Conductor terminations inside of outdoor enclosures listed for their environment **are** permitted within 18 inches of the bottom of the enclosure, even when installed on earth.



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2020 NEC Changes

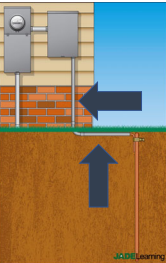
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250.64(B)(2) & (B)(3) Grounding Electrode Conductor Protection for Physical Damage.

- Size 6 AWG and larger grounding electrode conductors (GECs) exposed to physical damage must be protected by an approved raceway.
- GECs smaller than 6 AWG must be protected even if not exposed to physical damage.



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2020 NEC Changes

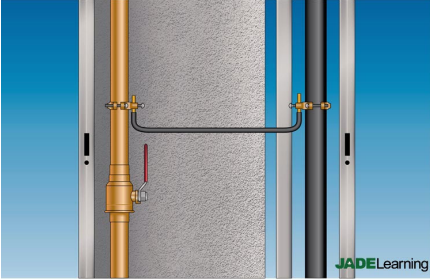
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New from the 2020 NEC: PVC is an approved raceway for protecting GECs.

54

250.104(A)(1) and (A)(3) Bonding Jumpers.



2020 NEC Changes

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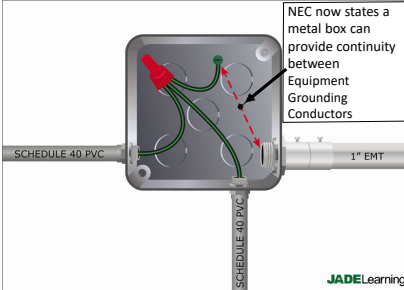
New 2020 NEC exception:
Bonding jumpers not required to be larger than 3/0 copper or 250 kcmil aluminum or copper-clad aluminum.

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250.109 Metal Enclosures.

2020 NEC now says equipment grounding & bonding conductors can use a metal box as an approved path for continuity. Notice in the image how the bonding jumper is connected to the EMT using the box.



2020 NEC Changes

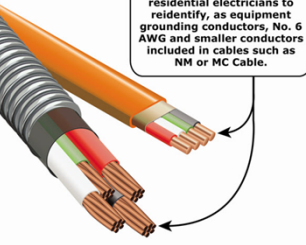
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NEC now states a metal box can provide continuity between Equipment Grounding Conductors

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250.119 Identification of Equipment Grounding Conductor.



2020 NEC Changes

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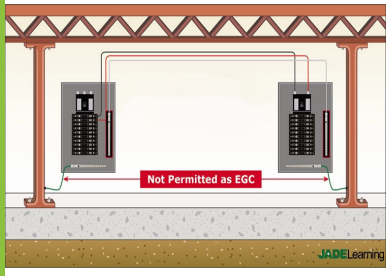
The 2020 NEC allows residential electricians to reidentify, as equipment grounding conductors, No. 6 AWG and smaller conductors included in cables such as NM or MC Cable.

- Electricians are no longer restricted from reidentifying 6 AWG and smaller conductors as equipment grounding conductors (EGCs).
- Previously, reidentifying EGCs was only permitted in supervised locations.
- Green AC conductors up to 60 volts can be used for purposes other than grounding.

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250.121(B) Restricted Use of Metal Frames.



2020 NEC Changes

New for 2020 NEC: 250.121(B) says the structural metal framing of a building or structure shall not be used as an equipment grounding conductor. However, a similar requirement existed in the 2017 NEC, in 250.136(A)

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250.122 Size of Equipment Grounding Conductors.

- EGCs no longer need to be increased in size due to ambient temperature or when bundling 4 or more conductors.
- EGCs may need to be increased for voltage drop and new for 2020 NEC, it can be increased by a qualified person (instead of the NEC).

RATING OR SETTING OF AUTOMATIC OVERCURRENT DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC., NOT EXCEEDING (AMPERES)	Size (AWG or kcmil)	
	COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM
15	14	12
20	12	10
30	10	8
60	8	6
100	6	4
200	4	2
300	3	1
400	2	1/2
500	1	3/5
600	1/2	3/5
700	3/5	4/5
800	3/5	4/5
1000	2/5	3/5
1200	2/5	3/5
1400	2/5	3/5
1600	2/5	3/5
2000	2/5	3/5
2500	2/5	3/5
3000	2/5	3/5
4000	2/5	3/5
5000	2/5	3/5
6000	2/5	3/5

2020 NEC Changes

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Table 250.122 Minimum Size Equipment Grounding Conductors for Grounding Raceway and Equipment.

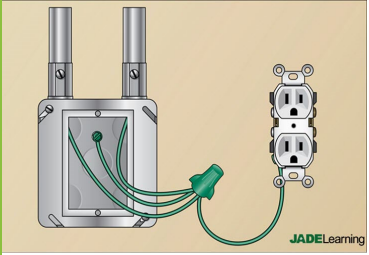
New for 2020 NEC: Table 250.122 has increased the size for Aluminum or Copper-Clad Aluminum EGCs for circuits protected by 5,000- and 6,000-amp overcurrent devices from 1200 kcmil to 1250 kcmil.

RATING OR SETTING OF AUTOMATIC OVERCURRENT DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC., NOT EXCEEDING (AMPERES)	Size (AWG or kcmil)	
	COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM
15	14	12
20	12	10
30	10	8
60	8	6
100	6	4
200	4	2
300	3	1
400	2	1/2
500	1	3/5
600	1/2	3/5
700	3/5	4/5
800	3/5	4/5
1000	2/5	3/5
1200	2/5	3/5
1400	2/5	3/5
1600	2/5	3/5
2000	2/5	3/5
2500	2/5	3/5
3000	2/5	3/5
4000	2/5	3/5
5000	2/5	3/5
6000	2/5	3/5

2020 NEC Changes

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250.148 Continuity of Equipment Grounding Conductors. Attachment in Boxes.



2020 NEC Changeswww.jadelearning.com61

- The 2020 NEC has removed the restriction that prohibits solder as the means for connecting EGCs.
- 2020 NEC also makes clear: Only wire-type EGCs are required to adhere to ALL bonding requirements in this section.

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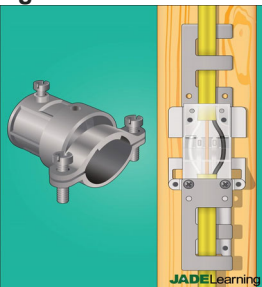
2020 NEC Changes Chapter 3

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300.15(F) Boxes, Conduit Bodies, or Fittings – Where Required. Fitting.



2020 NEC Changeswww.jadelearning.com63

- Transition fittings and interconnector devices are permitted to be installed in concealed locations if listed for concealed installations.
- In the 2017 NEC, these fittings were required to be accessible after installation.

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300.25 Exit Enclosures (Stair Towers).



2020 NEC Changes

A New Code Section for 2020 300.25: *Where an exit enclosure is required to be separated from the building, only electrical wiring methods serving equipment permitted by the authority having jurisdiction in the exit enclosure shall be installed in that exit enclosure.*

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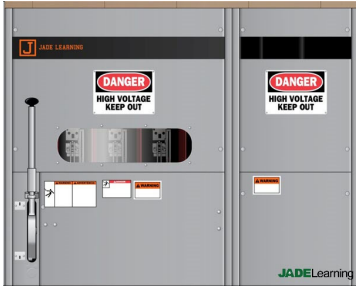
64

300.45 Danger Signs.

In the 2020 NEC: “Warning” signs are now called “Danger” signs.

OSHA Classifications:

- Warning:** If sign not heeded, it can cause death or serious injury.
- Danger:** If sign not heeded, it will cause death or serious injury.



2020 NEC Changes

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310.4 Conductor Constructions and Applications.

SECTION 310.104 DELETED

Table 310.104(A)
Table 310.104(B)
Table 310.104(C)
Table 310.104(D)
Table 310.104(E)

SECTION 310.4 NEW

Table 310.4(A)
Table 310.4(B)

Article 328 Medium Voltage Cable: Type MV DELETED

SECTION 311.10 NEW

Table 311.10(A)
Table 311.10(B)
Table 311.10(C)

New for 2020 NEC: 310.104 *Conductor Constructions & Applications* has been eliminated and its content divided between two brand-new Code sections: 310.4 & 311.10

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Table 310.12 Dwelling Unit Service and Main Power Feeder Conductors.

The 83% Table for sizing dwelling unit service conductors is back in 2020!

Previously 310.15(B)(7), it has returned as Table 310.12 in the new 2020 NEC!

2020 NEC Changes

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TABLE 310.12 SINGLE-PHASE DWELLING SERVICES AND FEEDERS		
SERVICE OR FEEDER RATING (AMPERES)	CONDUCTOR (AWG or kcmil)	
	COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM
100	4	2
110	3	1
125	2	1/0
150	1	2/0
175	1/0	3/0
200	2/0	4/0
225	3/0	250
250	4/0	300
300	250	350
350	350	500
400	400	500

Note: If no adjustment or correction factors are required, this table shall be permitted to be applied.

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310.15 Ampacity Tables.

TABLE 310.16 Ampacity of Insulated Conductors with Not More Than Three Current-Carrying Conductors in Raceways, Cable, or Earth (Ambient Temperature 30°C or 86°F)

2020 NEC Changes

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TEMPERATURE RATING OF CONDUCTOR (See Table 310.15)		COPPER		ALUMINUM OR COPPER-CLAD ALUMINUM	
60°C (140°F)	75°C (165°F)	60°C (140°F)	75°C (165°F)	60°C (140°F)	75°C (165°F)
15	20	25	35	20	25
20	25	35	50	25	35
25	35	50	70	35	50
30	45	60	90	45	60
35	55	70	110	55	70
40	65	80	130	65	80
45	75	90	150	75	90
50	85	100	175	85	100
55	95	110	200	95	110
60	105	120	225	105	120
65	115	130	250	115	130
70	125	140	275	125	140
75	135	150	300	135	150
80	145	160	325	145	160
85	155	170	350	155	170
90	165	180	375	165	180
95	175	190	400	175	190
100	185	200	425	185	200
105	195	210	450	195	210
110	205	220	475	205	220
115	215	230	500	215	230
120	225	240	525	225	240
125	235	250	550	235	250
130	245	260	575	245	260
135	255	270	600	255	270
140	265	280	625	265	280
145	275	290	650	275	290
150	285	300	675	285	300
155	295	310	700	295	310
160	305	320	725	305	320
165	315	330	750	315	330
170	325	340	775	325	340
175	335	350	800	335	350
180	345	360	825	345	360
185	355	370	850	355	370
190	365	380	875	365	380
195	375	390	900	375	390
200	385	400	925	385	400
205	395	410	950	395	410
210	405	420	975	405	420
215	415	430	1000	415	430
220	425	440	1025	425	440
225	435	450	1050	435	450
230	445	460	1075	445	460
235	455	470	1100	455	470
240	465	480	1125	465	480
245	475	490	1150	475	490
250	485	500	1175	485	500
255	495	510	1200	495	510
260	505	520	1225	505	520
265	515	530	1250	515	530
270	525	540	1275	525	540
275	535	550	1300	535	550
280	545	560	1325	545	560
285	555	570	1350	555	570
290	565	580	1375	565	580
295	575	590	1400	575	590
300	585	600	1425	585	600
305	595	610	1450	595	610
310	605	620	1475	605	620
315	615	630	1500	615	630
320	625	640	1525	625	640
325	635	650	1550	635	650
330	645	660	1575	645	660
335	655	670	1600	655	670
340	665	680	1625	665	680
345	675	690	1650	675	690
350	685	700	1675	685	700
355	695	710	1700	695	710
360	705	720	1725	705	720
365	715	730	1750	715	730
370	725	740	1775	725	740
375	735	750	1800	735	750
380	745	760	1825	745	760
385	755	770	1850	755	770
390	765	780	1875	765	780
395	775	790	1900	775	790
400	785	800	1925	785	800
405	795	810	1950	795	810
410	805	820	1975	805	820
415	815	830	2000	815	830
420	825	840	2025	825	840
425	835	850	2050	835	850
430	845	860	2075	845	860
435	855	870	2100	855	870
440	865	880	2125	865	880
445	875	890	2150	875	890
450	885	900	2175	885	900
455	895	910	2200	895	910
460	905	920	2225	905	920
465	915	930	2250	915	930
470	925	940	2275	925	940
475	935	950	2300	935	950
480	945	960	2325	945	960
485	955	970	2350	955	970
490	965	980	2375	965	980
495	975	990	2400	975	990
500	985	1000	2425	985	1000
505	995	1010	2450	995	1010
510	1005	1020	2475	1005	1020
515	1015	1030	2500	1015	1030
520	1025	1040	2525	1025	1040
525	1035	1050	2550	1035	1050
530	1045	1060	2575	1045	1060
535	1055	1070	2600	1055	1070
540	1065	1080	2625	1065	1080
545	1075	1090	2650	1075	1090
550	1085	1100	2675	1085	1100
555	1095	1110	2700	1095	1110
560	1105	1120	2725	1105	1120
565	1115	1130	2750	1115	1130
570	1125	1140	2775	1125	1140
575	1135	1150	2800	1135	1150
580	1145	1160	2825	1145	1160
585	1155	1170	2850	1155	1170
590	1165	1180	2875	1165	1180
595	1175	1190	2900	1175	1190
600	1185	1200	2925	1185	1200
605	1195	1210	2950	1195	1210
610	1205	1220	2975	1205	1220
615	1215	1230	3000	1215	1230
620	1225	1240	3025	1225	1240
625	1235	1250	3050	1235	1250
630	1245	1260	3075	1245	1260
635	1255	1270	3100	1255	1270
640	1265	1280	3125	1265	1280
645	1275	1290	3150	1275	1290
650	1285	1300	3175	1285	1300
655	1295	1310	3200	1295	1310
660	1305	1320	3225	1305	1320
665	1315	1330	3250	1315	1330
670	1325	1340	3275	1325	1340
675	1335	1350	3300	1335	1350
680	1345	1360	3325	1345	1360
685	1355	1370	3350	1355	1370
690	1365	1380	3375	1365	1380
695	1375	1390	3400	1375	1390
700	1385	1400	3425	1385	1400
705	1395	1410	3450	1395	1410
710	1405	1420	3475	1405	1420
715	1415	1430	3500	1415	1430
720	1425	1440	3525	1425	1440
725	1435	1450	3550	1435	1450
730	1445	1460	3575	1445	1460
735	1455	1470	3600	1455	1470
740	1465	1480	3625	1465	1480
745	1475	1490	3650	1475	1490
750	1485	1500	3675	1485	1500
755	1495	1510	3700	1495	1510
760	1505	1520	3725	1505	1520
765	1515	1530	3750	1515	1530
770	1525	1540	3775	1525	1540
775	1535	1550	3800	1535	1550
780	1545	1560	3825	1545	1560
785	1555	1570	3850	1555	1570
790	1565	1580	3875	1565	1580
795	1575	1590	3900	1575	1590
800	1585	1600	3925	1585	1600
805	1595	1610	3950	1595	1610
810	1605	1620	3975	1605	1620
815	1615	1630	4000	1615	1630
820	1625	1640	4025	1625	1640
825	1635	1650	4050	1635	1650
830	1645	1660	4075	1645	1660
835	1655	1670	4100	1655	1670
840	1665	1680	4125	1665	1680
845	1675	1690	4150	1675	1690
850	1685	1700	4175	1685	1700
855	1695	1710	4200	1695	1710
860	1705	1720	4225	1705	1720
865	1715	1730	4250	1715	1730
870	1725	1740	4275	1725	1740
875	1735	1750	4300	1735	1750
880	1745	1760	4325	1745	1760
885	1755	1770	4350	1755	1770
890	1765	1780	4375	1765	1780
895	1775	1790	4400	1775	1790
900	1785	1800	4425	1785	1800
905	1795	1810	4450	1795	1810
910	1805	1820	4475	1805	1820
915	1815	1830	4500	1815	1830
920	1825	1840	4525	1825	1840
925	1835	1850	4550	1835	1850
930	1845	1860	4575	1845	1860
935	1855	1870	4600	1855	1870
940	1865	1880	4625	1865	1880
945	1875	1890	4650	1875	1890
950	1885	1900	4675	1885	1900
955	1895	1910	4700	1895	1910
960	1905	1920	4725	1905	1920
965	1915	1930	4750	1915	1930
970	1925	1940	4775	1925	1940
975	1935	1950	4800	1935	1950
980	1945	1960	4825	1945	1960
985	1955	1970	4850	1955	1970
990	1965	1980	4875	1965	1980
995	1975	1990	4900	1975	1990

Note: 310.15(B)(16) shall be referenced for conductor ampacity derating as installed elsewhere in the Code.

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311 Medium Voltage Conductors and Cables.

- Article 311 is brand-new for the 2020 Code cycle.
- Medium voltage rules throughout the NEC moved to new Article 311.
- Medium voltage in this article is 2,001 volts to 35,000 volts.

2020 NEC Changes

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Diagram labels: PVC Jacket, Metallic Shield, Insulation Shield, Insulation, Strand Shield, Conductor.

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314.16(B)(5) Equipment Grounding Conductor Fill.

2020 NEC Changes

- There are new EGC fill-count instructions in the 2020 NEC.
- If more than 4 EGCs are in a box, a ¼ volume allowance is made for each additional EGC that enters a box based on the largest EGC.

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

2020 NEC Changes

- The 2020 NEC makes an allowance for installing a listed ceiling fan box, capable of carrying a fan's weight, at a later date, after the initial installation.
- Structural members to support a future box in habitable rooms must be present.

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314.29 Boxes, Conduit Bodies, Handhole Enclosures to be Accessible.

Inside Buildings:
Boxes and conduit bodies shall be installed so that the contained wiring can be accessed without removing any part of the building or structure.

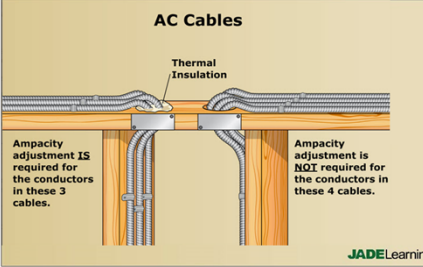
Underground:
Underground boxes and handhole enclosures shall be installed so that they are accessible without excavating sidewalks, paving, earth, or other substance that is to be used to establish the finished grade.

2020 NEC Changes

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320.80(A) Ampacity. Thermal Insulation.



In the 2020 NEC, AC Cables may need to be derated according to Table 310.15(C)(1) if more than 2 AC Cables containing 2 or more current-carrying conductors are bundled so they cannot displace their heat.

2020 NEC Changes

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330.104 Conductors.

- Section 330.104 has been revised to make a clear distinction between MC Cables used as control and signal conductors versus MC Cable used as normal branch circuit conductors for power and lighting.
- Minimum conductor sizes are different depending on the MC Cable use.



Copper, Nickel, or Nickel-Coated Copper	Aluminum	Copper-Clad Aluminum
No. 14 AWG	No. 12 AWG	No. 12 AWG

Copper, Nickel, or Nickel-Coated Copper	Aluminum	Copper-Clad Aluminum
No. 18 AWG	No. 12 AWG	No. 14 AWG

2020 NEC Changes

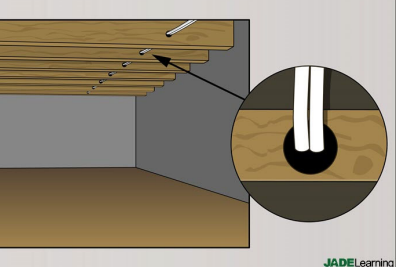
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334 Nonmetallic-Sheathed Cable: Types NM and NMC.



- References to Type NMS Cable was removed from Article 334 in the 2020 NEC.
- NMS cable consists of insulated power or control conductors but has not been available for years.

2020 NEC Changes

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337 Type P Cable.

- Type P Cable is a new addition to the 2020 NEC.
- Able to withstand various chemicals, abrasives, vibration and extreme temperatures.
- Has been used for decades on offshore drilling rigs.

Conductor
Soft annealed flexible stranded tinned copper per IEEE 1580

Insulation/Jacket
Flame retardant polyolefin, meeting the requirements for Type P of IEEE 1580 and Type X110 of UL 1309/CSA 245, 2000V/IEC 1000V.

A armor (Optional)
Basket weave wire armor per IEEE 1580 and UL 1309/CSA 245. Bronzed standard.

Sheath
Flame retardant, oil, abrasion, chemical and sunlight resistant thermosetting compound meeting UL 1309/CSA 245 and IEEE 1580.

2020 NEC Changes

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338.100 Construction.

- Bare copper conductors are no longer permitted to be cabled with USE when directly buried in a plexed cable.
- The twisting of single conductors together is called “plexed” cable.

2020 NEC Changes

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342.10(E) Severe Physical Damage.

- New for the 2020 NEC: Section 342.10(E) now permits Intermediate Metal Conduit (IMC) to be used in locations subject to severe physical damage.
- In the 2017 NEC, IMC was not expressly permitted for use where severe physical damage could occur.

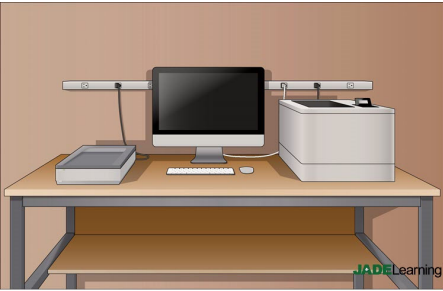
2020 NEC Changes

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380.12(7) Multioutlet Assembly. Uses Not Permitted.



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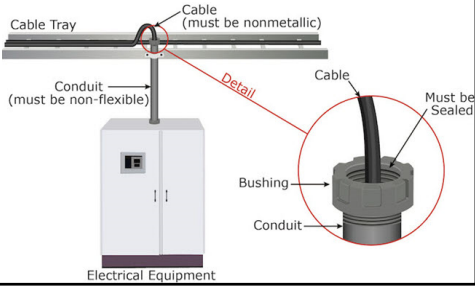
New to the 2020 Code cycle, multioutlet assemblies cannot be installed where cord and plug connected.

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392.46 Bushed Conduit or Tubing.

Section 392.46 has been expanded to clarify acceptable methods for transitioning from cable tray to conduit, and cable tray to equipment.



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2020 NEC Changes Chapter 4

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404.9 General Use Snap Switches, Dimmers, and Control Switches.



2020 NEC Changes

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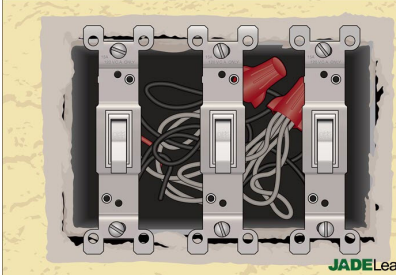
- In 2020 NEC, dimmers and control switches are specifically referenced in Section 404.9.
- The requirements for grounding these devices and their faceplates has been clarified in 2020.

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404.14(A), (B), (C), (D) Rating and Use of Switches.

Snap switches are now permitted to be used with new types of loads depending on the switch type (AC, AC/DC, CO/ALR or 347-volt switches) including LEDs and their associated drivers.



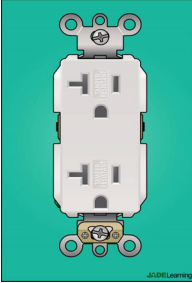
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406.3(A) Receptacle Rating and Type. Receptacles.



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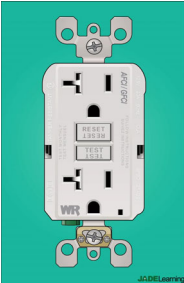
Section 406.3(A) has been revised in 2020 NEC to say:

- Receptacles shall be listed and marked with the manufacturer's name or identification and voltage and ampere ratings. Receptacles shall not be permitted to be reconditioned.

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406.4(D)(4) Replacements. AFCI Protection.



A white AFCI protected receptacle with a green ground screw at the top and a green ground screw at the bottom. It has two outlets and a switch.

When Replacing Receptacles:

- In the 2017 NEC, when no EGC was previously installed and no AFCI device was commercially available for a two-wire receptacle with no ground, an AFCI protected replacement receptacle was not required to be installed.
- Since AFCI protection is commercially available now, this exception was removed from the 2020 NEC.

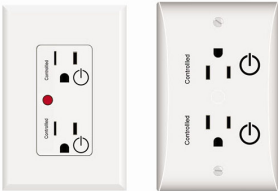
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406.4(D)(7) Replacements. Controlled Receptacles.



Two white controlled receptacles. Each has a switch and a red indicator light. The left one is labeled 'Controlled' and the right one is labeled 'Controlled'.

When replacing a controlled receptacle, an equivalent controlled receptacle must be installed.

• If automatic control is no longer required, the replacement receptacle may then not be identified as controlled.

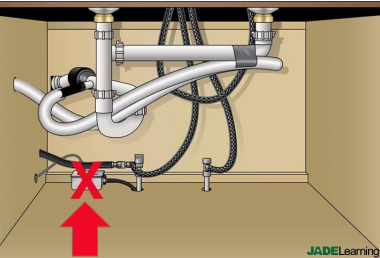
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406.5(G)(2) Receptacle Orientation. Under Sinks.



A diagram showing a kitchen sink with a receptacle installed underneath. A red 'X' is over the receptacle, and a red arrow points to it, indicating it is not to be installed face-up.

New for 2020 NEC:

- Receptacles shall not be installed in a face-up position in the area below a sink.
- This new directive has no exceptions and applies to all receptacles under all sinks.

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406.7 Attachment Plugs, Cord Connectors, and Flanged Surface Devices.

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New for 2020 NEC:

- Attachment plugs, cord connectors, and flanged surface devices shall not be permitted to be reconditioned.
- The term reconditioned is often referred to as rebuilt, refurbished, or remanufactured.



2020 NEC Changes

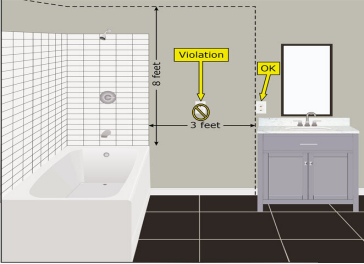
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406.9(C) Receptacles in Damp or Wet Locations. Bathtub and Shower Space. (1of2)

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Receptacle Locations in 2020

- Receptacles are not permitted within 8 feet vertically and 3 feet horizontally of the bathtub rim or shower stall threshold.
- Receptacles are still required within 3 feet of the sink.

2020 NEC Changes

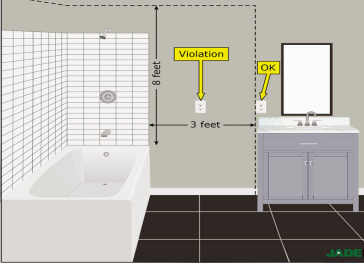
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406.9(C) Receptacles in Damp or Wet Locations. Bathtub and Shower Space. (2of2)

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If a bathroom is too small and conflict exists between the bathtub/shower space and receptacle(s) being installed, an exception allows the receptacle to be installed on the farthest wall in the bathroom.


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406.12 Tamper Resistant Receptacles.

The left image shows a modern hotel lobby with a long counter and a seating area. The right image shows a detached garage with a white door and a brown roof. Both images are watermarked with 'JADE Learning'.

In the 2020 NEC, tamper-resistant receptacles are now required in additional locations including common areas of hotels, assisted-living facilities, accessory buildings, and detached garages.

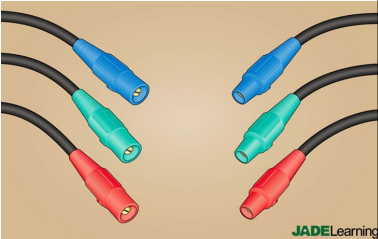
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406.13 Single Pole Separable Connector Type.

A diagram showing two sets of three-wire cables. Each set has a blue wire (ungrounded), a green wire (grounded), and a red wire (equipment ground). The wires are connected to a single-pole separable connector. The diagram is watermarked with 'JADE Learning'.

- Single-pole separable-connectors individually carry the ungrounded, grounded and equipment grounding conductors.
- Section 406.13(A) through (D) was added to 2020 NEC to provide new guidelines for these connectors.

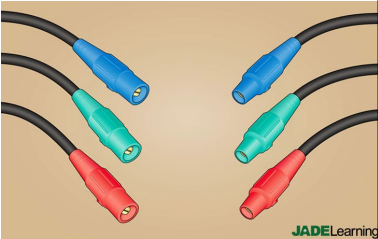
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406.13 Single Pole Separable Connector Type.

A diagram showing two sets of three-wire cables. Each set has a blue wire (ungrounded), a green wire (grounded), and a red wire (equipment ground). The wires are connected to a single-pole separable connector. The diagram is watermarked with 'JADE Learning'.

- Section 406.13(D) requires a specific order to attach these connectors:
 - Equipment Ground
 - Grounded Conductor
 - Ungrounded Conductor
- Disconnections must be done in the reverse order.

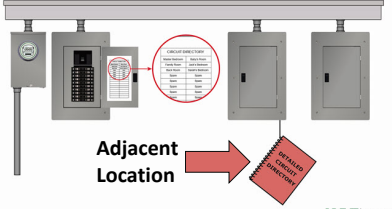
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408.4(A) Field Identification Required. Circuit Directory or Circuit Identification.



Adjacent Location

2020 NEC Changes



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Directories may be located on the face, inside of, or now in **an approved location adjacent to the panel door.**

The AHJ must approve any adjacent location(s).

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408.6 Switchboards/Panelboards. Short-Circuit Current Rating.



2020 NEC Changes

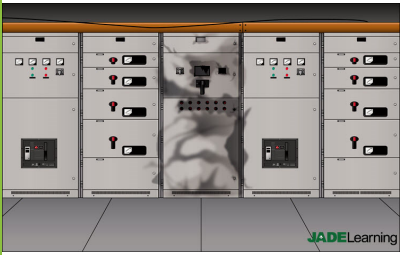
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Section 408.6 extends available fault current marking requirements to all switchboards, switchgear and panelboards in other than one- and two-family dwelling units.

The Short Circuit Current Rating (SCCR on Equipment) must be no less than the available fault current that may be able to pass through the equipment.

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408.8 Switchboards/Panelboards. Reconditioning of Equipment.



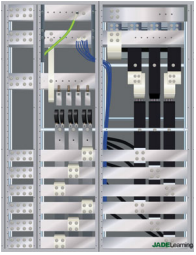
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If switchboards, switchgear or panelboards are damaged by fire, fire-related contaminants or water, the equipment must be evaluated by the original manufacturer or a qualified testing lab (UL) before returning to service.

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408.18(C)(2) Clearances. Connections. Grounded Circuit Conductors.



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- New rules for the placement of grounded (neutral) lugs.
- Applies to switchboards and switchgear, but not panelboards.
- Different requirements for when single or multiple grounded terminals are installed.

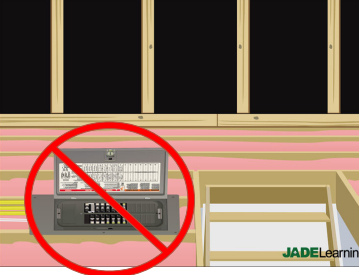
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408.43 Panelboard Orientation.



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- Panelboards are now prohibited from being installed on their backs, facing up.
- Panelboards may be placed horizontally, but all the breaker handles must be up when “on.”

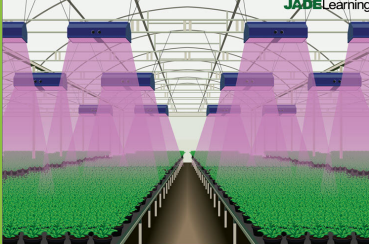
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410 Luminaires, Lampholders and Lamps. Part XVI. Special Provisions for Horticultural Lighting Equipment.



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- Horticulture lighting equipment is now regulated by the NEC.
- Locations include greenhouses & nurseries.
- Listing, installation, location, fittings, flexible cord, and GFCI requirements are provided.

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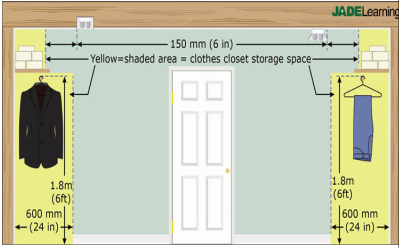
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410.2 and 410.16 Luminaires, Lampholders, and Lamps. Luminaires in Clothes Closets.

- The term “Closet Storage Space” has been updated to “Clothes Closet Storage Space.”
- Permitted locations of fixtures and dimensions of closet space is provided in Sections 410.16.



Yellow=shaded area = clothes closet storage space

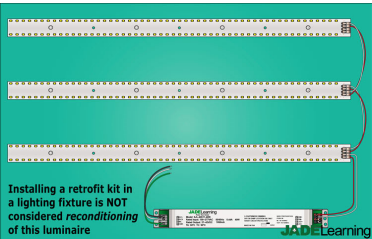
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410.7 Luminaires, Lampholders and Lamps. Reconditioned Equipment.



Installing a retrofit kit in a lighting fixture is NOT considered reconditioning of this luminaire

Luminaires, lampholders, and retrofit kits are **not** permitted to be reconditioned.

Installing a retrofit kit to a luminaire is **not** considered “reconditioning” when installed in accordance with instructions.

2020 NEC Changes

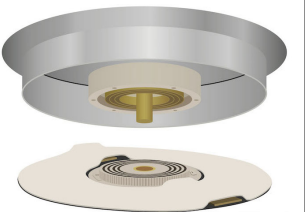
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410.36(A) Luminaires Supported by Outlet Boxes.

Section 410.36 in the 2020 NEC now clarifies that locking support & mounting receptacle outlets used to connect luminaires *are* considered lighting outlets and can be used to satisfy lighting outlet requirements found in Section 210.70(A), (B), and (C).



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410.42 Luminaire(s) with Exposed Conductive Parts. (1of2)



Revised for 2020 NEC, 410.42 states:
If accessible to unqualified persons, exposed conductive parts of any light fixture must either:

1. Be connected to an equipment grounding conductor.
2. Be separated from all live parts by a listed double insulation system.


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410.42 Luminaire(s) with Exposed Conductive Parts. (2of2)



Revised for 2020 NEC, 410.42 also states:
Portable luminaires with a polarized attachment plug shall not require connection to an equipment grounding conductor.

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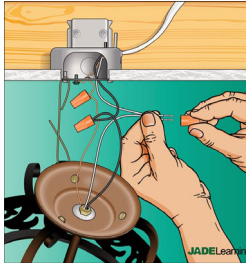
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410.44 Methods of Grounding.

Grounding of Luminaires & Equipment at Outlets:
There are two revised exceptions for this 2020 Code cycle.

- Replacement luminaires are permitted to connect to an EGC in the same manner as replacement receptacles.
- If no EGC exists, luminaire must be GFCI protected or replacement luminaire must not have conductive exposed parts.



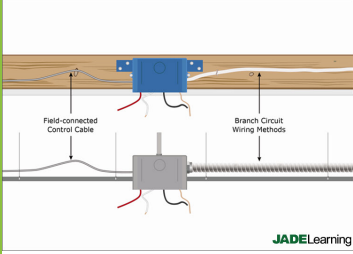
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410.69 Luminaires/Lamps. Identification of Control Conductor Insulation.



Field-connected Control Cable

Branch Circuit Wiring Methods

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Brand-New for 2020 NEC: Beginning January 1, 2022, field-installed control conductors in the same enclosure as branch-circuit conductors must have an insulation color other than colors reserved for neutral conductors or EGCs.

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410.116(C) Installation in Fire-Resistant Construction.

Brand-new for 2020:

- 410.116(C) prohibits installing recessed luminaires marked "FOR USE IN NON-FIRE-RATED INSTALLATIONS" in fire-rated installations.
- Section 410.116(C) provides three ways that recessed luminaires may be installed in locations with fire ratings.



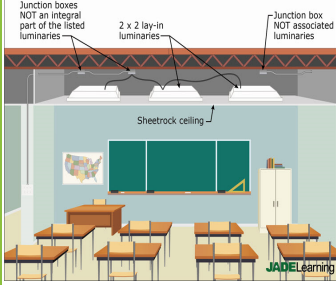
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410.118 Luminaire Access to Other Boxes.



Junction boxes NOT an integral part of the listed luminaires

2 x 2 lay-in luminaires

Junction box NOT associated luminaires

Sheetrock ceiling

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- Recessed luminaires are prohibited from being used as access points for outlet boxes, pull boxes, junction boxes or conduit bodies unless an integral part of the luminaire.
- Electricians may not modify recessed luminaires to make boxes an integral part of the luminaire.

108

422.5(A) GFCI Protection for Personnel.

- In the 2017 NEC, Section 422.5(A) required GFCI protection for personnel for equipment 250 volts or less.
- In the 2020 NEC, the voltage requirement is now 150 volts or less to ground.
- Dishwashers and sump pumps are now listed in this section- and will require GFCI protection if 150 volts or less to ground and 60 amps or less.



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422.16(A).(A)(1).(A)(2) Appliances. Flexible Cords.

Section 422.16(A) was reorganized for clarity.

2017 NEC Section 422.16(A)

Flexible cord shall be permitted (1) for the connection of appliances to facilitate their frequent interchange or to prevent the transmission of noise or vibration or (2) to facilitate the removal or disconnection of appliances that are fastened in place, where the fastening means and mechanical connections are specifically designed to permit ready removal for maintenance or repair and the appliance is intended or identified for flexible cord connection.

2020 NEC Section 422.16(A)

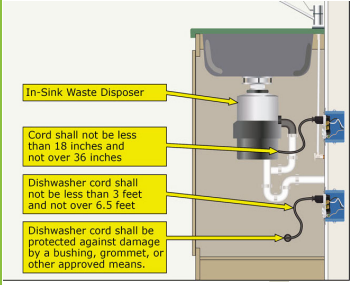
Flexible cord shall be permitted as follows:

- (1) To connect appliances to facilitate their frequent interchange or to prevent the transmission of noise or vibration or
- (2) To facilitate the removal or disconnection of appliances that are fastened in place, where the fastening means and mechanical connections are specifically designed to permit ready removal for maintenance or repair and the appliance is intended or identified for flexible cord connection.

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422.16(B) Specific Appliances.



- In-Sink Waste Disposer
- Cord shall not be less than 18 inches and not over 36 inches
- Dishwasher cord shall not be less than 3 feet and not over 6.5 feet
- Dishwasher cord shall be protected against damage by a bushing, grommet, or other approved means

2017 NEC said flexible cords shall terminate with a grounding type plug.

2020 NEC says flexible cords shall have an EGC **AND** be terminated with a grounding type plug.

For dishwashers and trash compactors, cords that pass through a hole must be protected by a bushing, grommet, or other approved means.

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425.28(B) Marking of Heating Equipment. Nameplate. Location.

- The nameplate must list the manufacturer (previously required the identifying name).
- The word “normal” was removed from normal rating in volts and watts.
- The 2020 NEC requires the label to be permanent.

1. The Manufacturer.
2. The rating in Volts.
3. The rating in Watts.
4. If it is AC or DC or both.
5. The Voltage of motors over 1/8 hp.
6. The Current of motors over 1/8 hp.
7. The Frequency of motors over 1/8 hp.
8. The heating load Voltage.
9. The heating load Current or Wattage.

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430.2 Definitions. Electronically Protected.

The 2020 NEC has a new definition for electronically protected when applied to motors:

A motor that is provided with electronic control that is an integral part of the motor and protects the motor against dangerous overheating due to failure of the electronic control.

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430.122(B) Conductors- Minimum Size and Ampacity. Output Conductors.

- The 2020 NEC now distinguishes between branch circuit/feeder and output conductors.
- Output conductors are now generally required to have an ampacity equal to or larger than 125% of the motor full-load current.

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