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Welcome NC Electricians!

What Does North Carolina Require?

4 to 8 Hours of Continuing Education is Required

- NC licenses [I, L, U, SP SFD] must complete 8 hours of continuing education every year. Half of those hours must come from an in-person or VILT classroom session.
- NC licensees [SP-FA/LV, SP-EL, SP-PH, SP-WP, SP-ES, SP-SP] must complete 4 hours of continuing education every year. Half of those hours must come from an in-person or VILT classroom session.

Today's class is worth 4 hours of classroom/VILT continuing education.

2023 NEC Changes

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2023 NEC Changes Part 2

12:35 PM – 12:45 PM Eastern	Registration / Check In / Intro
12:45 PM – 2:15 PM Eastern	NEC Chapter 5 <i>with poll questions</i>
2:15 PM – 2:25 PM Eastern	Break
2:25 PM – 3:05 PM Eastern	NEC Chapter 6 <i>with poll questions</i>
3:05 PM – 3:15 PM Eastern	Break
3:15 PM – 3:55 PM Eastern	NEC Chapter 7 <i>with poll questions</i>
3:55 PM – 4:30 PM Eastern	NEC Chapter 8 and NEC Chapter 9 <i>with poll questions</i>
4:30 PM EST	End of Class

2023 NEC Changes

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Important Reminders

- If you have trouble hearing or need assistance, let us know.
- Poll question responses are mandatory; you are NOT graded on your answers.
- Make sure you have paid and provided JADE Learning your electrical license number.
- Be sure to sign-in/check-in and confirm your registration information is correct. Make sure your name is showing correctly.
- You will be emailed a copy of your certificate within 2 business days.
- You must complete a short evaluation at the end of class to receive credit from the state.
- **Questions? Concerns? Call the JADE Learning office at 1-800-443-5233**

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2023 NEC Changes

Article 500

Hazardous (Classified) Locations, Classes I, II, and III, Divisions

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500.1 Scope

In **2023 NEC**, the *Scope* of Article 500 *Hazardous Locations*, is now broken down into two sections:

- **(A) Covered**
- **(B) Not Covered**

The revised *Scope* now provides a general overview of all things covered as well as not covered in *Article 500 Hazardous Locations*.

This includes covering electrical installations inside of Class I through Class III, Division 1 and 2 hazardous material locations.

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An Overview of Classes and Divisions [& Zones]

HAZARDOUS MATERIALS	NEC STANDARDS	IEC EURONORM STANDARDS
Gas or Vapor	Class I, Div. 1 Class I, Div. 2	Zone 0 and 1 Zone 2
Dust	Class I, Div. 1 Class I, Div. 2	Zone 10 Zone 11
Fibers and Flyings	Class I, Div. 1 Class I, Div. 2	Zone 10 Zone 11

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500.5(D) Class III Locations

In **2023 NEC**, 500.5(D) has been expanded in order to provide more clarity.

(D)(1) Class III, Division 1 is now split into 2 subsections to dive deeper into topics:

- **(D)(1)(a) Combustible Fibers/Flyings**
- **(D)(1)(b) Ignitable Fibers/Flyings**

(D)(2) Class III, Division 2 was also split into the same 2 subsections:

- **(D)(2)(a) Combustible Fibers/Flyings**
- **(D)(2)(b) Ignitable Fibers/Flyings**

These subsections also include the same informational notes found in the 2020 NEC

2023 NEC Changes

Class III Locations contain nonmetal combustible fibers and flyings
Class III locations can be divided into two divisions: Division 1 and 2

Some Examples:

- Some areas of rayon, cotton, and other textile mills
- Associated manufacturing and processing plants
- Cotton gins and cotton-seed mills
- Flax-processed plants
- Clothing manufacturing plants
- Some areas of woodworking plants

Division 1

Explosible mixtures of nonmetal combustible fibers/flyings in the air under normal operating conditions or where mechanical failure or abnormal operation of machinery or electrical equipment could cause such a mixture and possible ignition

Division 2

Nonmetal combustible fibers/flyings not normally present in the air in explosible quantities, but infrequent malfunction or abnormal operations could cause accumulated fibers/flyings to become suspended in the air

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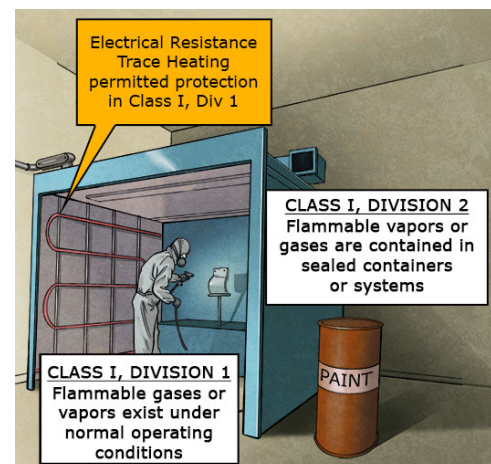
500.7 Protection Techniques

In the **2023 NEC**, 500.7 now references Chapter 9, Table 13 for important information on the suitability of protection techniques for specific hazardous locations.

In the **2023 NEC**, 500.7(P)-(T) lists 5 *new* protection techniques for electrical equipment & installations inside of hazardous locations:

- **(P) Protection by Electrical Resistance Trace Heating "60079-30-1"**
- **(Q) Protection by Impedance Heating "IEEE 844.3"**
- **(R) Enclosed-Break**
- **(S) Non-sparking**
- **(T) Sealed**

2023 NEC Changes



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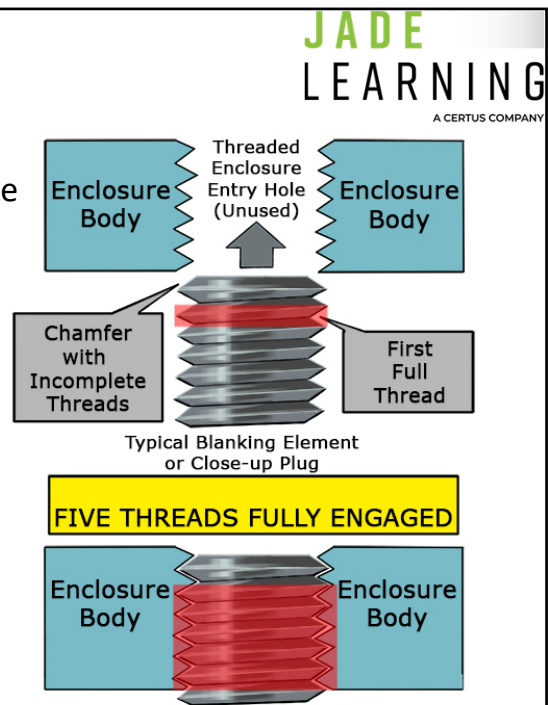
500.8(E)(3) Unused Openings

In **2020 NEC**, 500.8(E)(3) required unused openings in hazardous location enclosures to be closed using listed metal close-up plugs. The plug engagement had to comply with 500.8(E)(1) or (E)(2).

In **2023 NEC**, 500.8(E)(3) says to close these same unused openings using either listed **blanking elements** or close-up plugs. The revised code goes on to say that the **thread engagement** must comply with 500.8(E)(1) or (E)(2).

- 500.8(E)(1) and (E)(2) require 5 threads fully engaged!

2023 NEC Changes



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Article 501 Class I Locations

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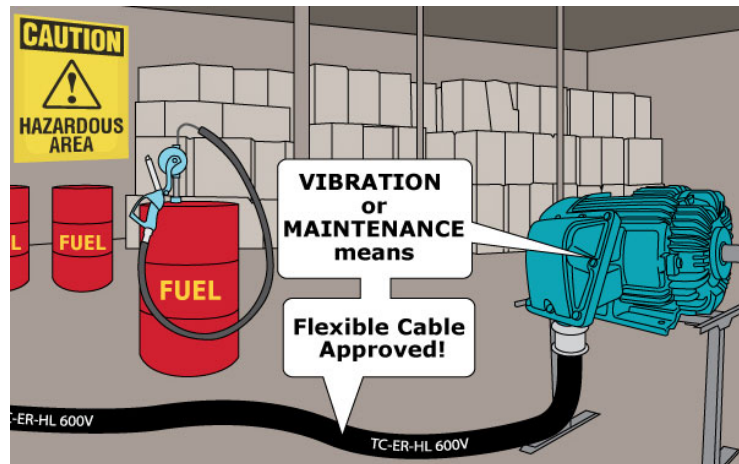
10

501.10(A)(2) Flexible Connections

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501.10(A)(2) has been revised in 2023 NEC to specify that **vibration of equipment during operation** and **allowing for movement after installation during maintenance** are the only two reasons why flexible connections can be used in a Class I, Div. 1 location.

501.10(A)(2)(3) has been revised to use the newly defined term— **Restricted Industrial Establishment**.



2023 NEC Changes

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Question 0

Participation is a must.

Getting the correct answer is NOT required!

In 2023 NEC, when is it permitted to use flexible connections in a Class I, Division 1 location?

- A. When a motor operates at full load current and when rubber dampeners are not available.
- B. When equipment is rated 500 watts or greater, and the equipment is installed directly on the floor.
- C. Vibration of equipment during operation and to allow for movement after installation [during maintenance].



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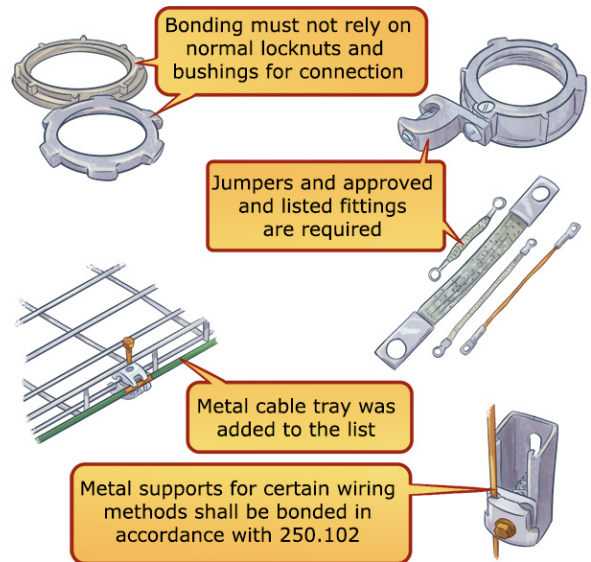
501.30(B) Bonding

In the **2023 NEC**, information on bonding was moved from 501.30(A) to **501.30(B)**

It was also expanded to include:

(1) Specific Bonding Means which includes two requirements for bonding.

(2) Flexible Metal Conduit and Liquidtight Flexible Metal Conduit which includes two requirements for flexible metal conduit and liquidtight flexible metal conduit.



Applies between Class I Locations and the system grounding point

2023 NEC Changes

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Article 502
Class II Locations
Article 503
Class III Locations

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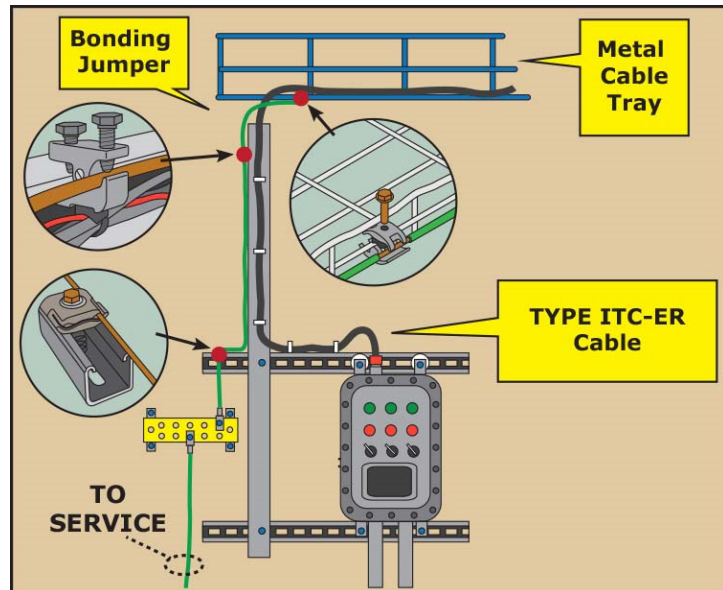
502.30(B), 503.30(B) Bonding

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New in 2023 NEC, metal struts, angles, or channels providing any support or offering mechanical or physical protection to cables or conductors as permitted in 335.4(5), 336.10(7)(c), or 722.135(C) shall be bonded in accordance with 250.102!

SUMMARY: Now, metal parts such as Unistrut® require bonding to be applied when the strut supports or protects the wiring.

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Article 505 Zone

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505.8 Protection Techniques

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In **2023 NEC**, there are a few changes to Section 505.8, including wording revisions that include the new term: ***Restricted Industrial Establishments***.

505.8(I) is retitled as ***Detection systems for flammable gases***.

505.8(O)-(Q) are added as acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations:

- **(O) Protection by Impedance Heating "IEEE 844.3"**
- **(P) Pressurized Room "p"**
- **(Q) Special Protection "s"**

Protection from Impedance Heating, Pressurized Room and Special Protection are now approved protection techniques for flammable environments.



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505.15(C) Zone 2

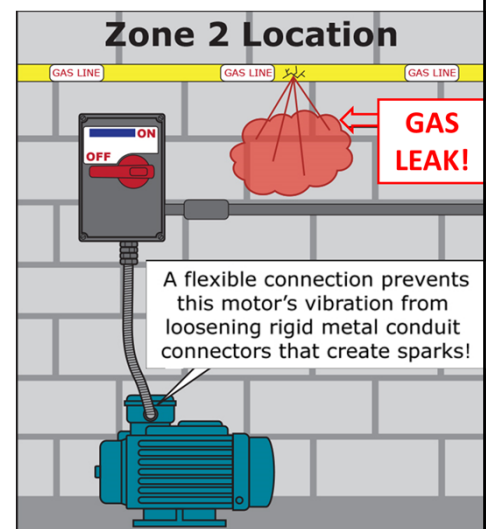
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In **2020 NEC**, 505.15(C) told us:
Where provision must be made for flexibility, one or more of [11 wiring methods] shall be permitted.

In **2023 NEC**, that code section gets more specific as to when a flexible wiring methods can be used; it states:

Where flexibility is necessary to minimize the transmission of vibration from equipment during operation or to allow for movement after installation during maintenance, one or more of [11 wiring methods] shall be permitted.

2023 NEC Changes

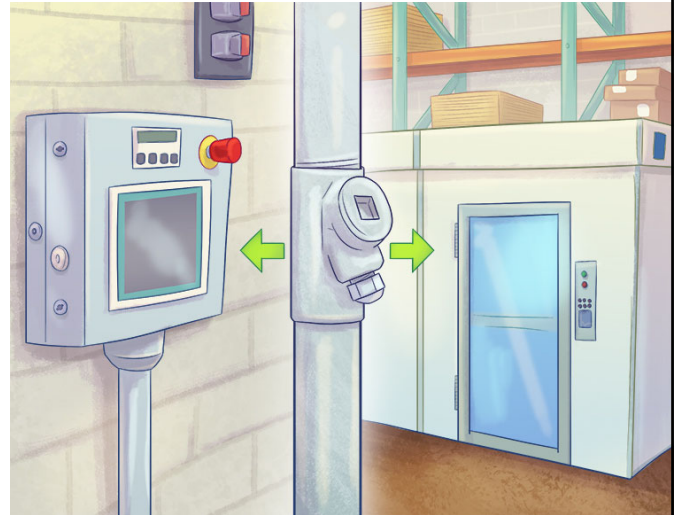


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505.16(B) Zone 1

In **2023 NEC**, 505.16(B)(3) now applies to **Pressurized Rooms**

- In accordance, the wording is changed to include not only pressurized enclosures as it was in the 2020 NEC, but also **pressurized rooms**.
- Informational Note No. 3 is added and sends Code users to UL 60079-13 for information on explosive atmospheres



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Article 512

Cannabis Oil Equipment and Cannabis Oil Systems Using Flammable Materials

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512 Cannabis Oil Equipment and Cannabis Oil Systems Using Flammable Materials.

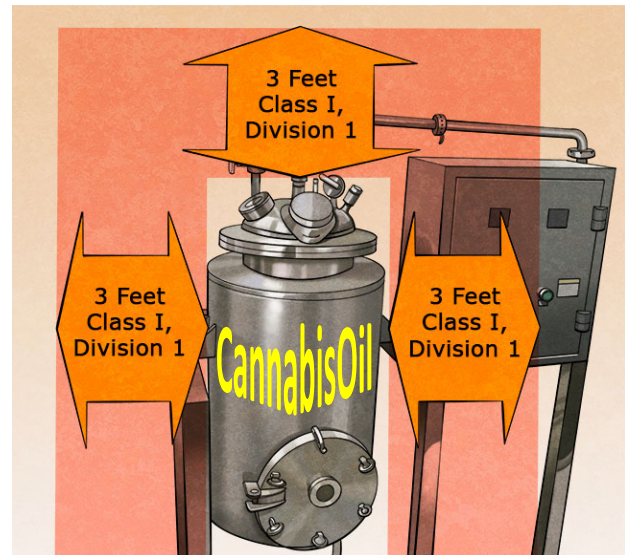
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NEW in 2023 NEC, Article 512 addressing *Cannabis Oil Equipment & Systems*, covers the following:

512.1 Scope.

This article covers cannabis oil preparatory equipment, extraction equipment, booths, post-processing equipment, and systems using flammable materials (flammable gas, flammable liquid-produced vapor, combustible liquid-produced vapor) in commercial and industrial facilities.

2023 NEC Changes



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Article 517 Health Care Facilities

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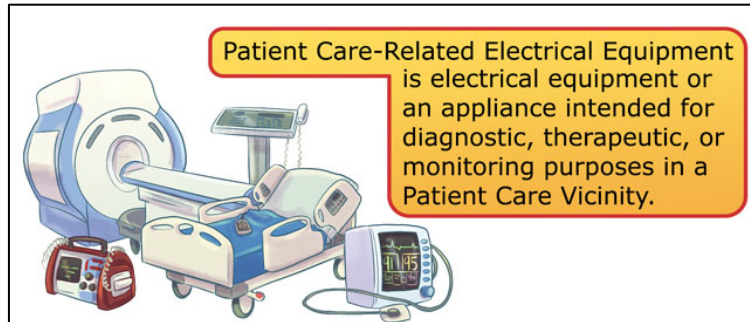
22

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517.6 Patient Care-Related. Electrical Equipment

Section 517.6 is brand-new **in 2023 NEC**.

- It clarifies that the marking, labeling, or other restrictions described in 110.21(A)(2) and imposed on the use of electrical equipment do not apply to patient care-related electrical equipment.
- Provides information on requirements for reconditioning or re-certification in compliance with FDCA when patient care-related electrical equipment is relocated.



2023 NEC Changes

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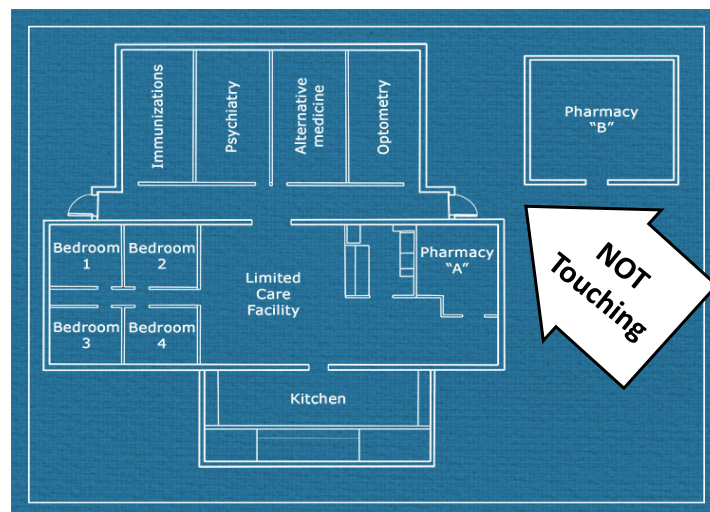
23

517.10(B) Not Covered

In **2020 NEC**, Section 517.10(B) declares healthcare locations, such as medical offices and waiting rooms, as being exempt from the strict wiring methods of Article 517.

In **2023 NEC**, a new location within a healthcare facility has been added to that list of exempt areas, as follows:

- *Pharmacy services not contiguous* (meaning not touching or sharing a common border) *to health care facilities.*



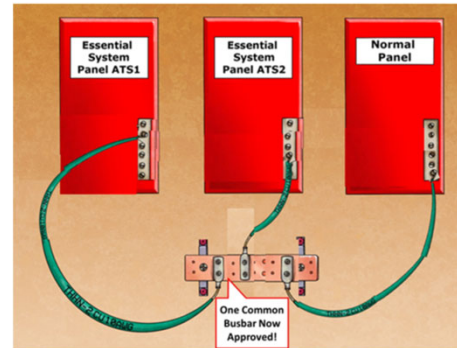
2023 NEC Changes

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517.14 Panelboard Bonding

In the **2023 NEC**, there is a new exception to the requirement to bond healthcare facility panelboards using a continuous conductor between equipment grounding terminal buses inside each panel.

- The new exception *allows for panelboards that are serving the same patient care facility to be bonded together using an accessible busbar installed outside of the panels.*



2023 NEC Changes

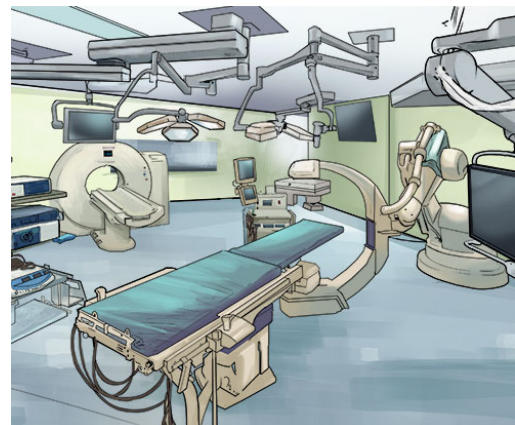
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517.20(A) Receptacles and Fixed Equipment

In **2023 NEC**, Section 517.20(A) went from requiring BOTH methods of shock protection in wet locations to requiring **one of the two** methods.

- It also adds two new informational notes:
 - Informational Note 1 included in (A)(1) states: *isolated power systems can eliminate the danger of electric shock to patients who might be more susceptible to leakage current and unable to move in their beds*
 - Informational Note 2 included in (A)(2) states: *See Annex E of ANSI/UL 943-2018 and 110.3(B) for more information*



2023 NEC Changes

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517.22 Demand Factors

Section 517.22 is all new **in the 2023 NEC** and states:

Demand factors for receptacle loads supplied by branch circuits not exceeding 150 volts to ground and installed in Category 1, Category 2, Category 3, and Category 4 patient care spaces shall be in accordance with 220.110.

517.22 gives the electrician permission to use demand factors from **Table 220.110** when calculating healthcare facility receptacles.

Table 220.110(1)&(2)

Demand Factors for Patient Care Spaces

Category 1	Category 2	Category 3	Category 4
100% of first 5000 Volt-Amperes	100% of first 5000 Volt-Amperes	100% of first 10,000 Volt-Amperes	100% of first 10,000 Volt-Amperes
50% from 5001-10,000 Volt-Amperes	50% from 5001-10,000 Volt-Amperes	50% for over 10,000 Volt-Amperes	50% for over 10,000 Volt-Amperes
25% for over 10,000 Volt-Amperes	25% for over 10,000 Volt-Amperes	—	—

2023 NEC Changes

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517.30 Healthcare. Sources of Power

In 2020 NEC, 517.30(A) said essential electrical systems (EES) must have a minimum of two independent sources of power: One normal that supplies the entire electrical system, and one alternate for when the normal power source is interrupted.

In 2023 NEC, 517.30(A) says essential electrical systems (EES) shall have two or more independent sources. One on-site source shall be sized to supply the entire EES. The other independent source shall be sized to supply the entire EES and shall be permitted to be located on-site or off-site. Additional sources other than the first two independent sources shall be permitted to be sized to supply the intended load.

In 2020 NEC, 517.30(B) approved of these 3 power sources for EES:

- Generator units
- Fuel cell systems
- Battery systems

In 2023 NEC, 517.30(B) adds 2 more!

- Utility Supply Power **[NEW!]**
- Healthcare Microgrid **[NEW!]**

2023 NEC Changes

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517.70 Applicability

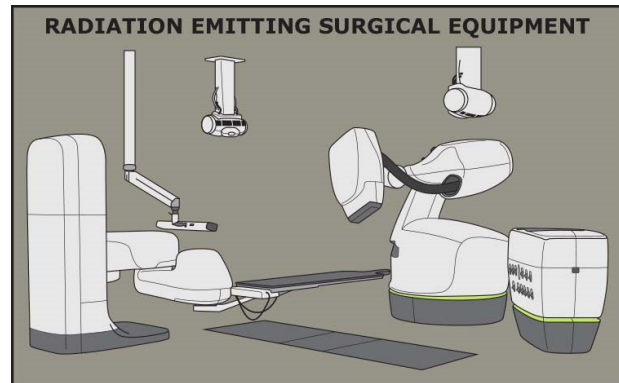
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In 2020 NEC: Part V of Article 517 is titled, 517, *X-ray Installations*.

In 2023 NEC: Part V has been retitled to say, 517, *Diagnostic Imaging and Treatment Equipment*.

Part V was retitled to make clear that Article 517 Part V installation requirements apply to much more than just X-ray machine installations.

In the 2023 NEC, Article 517 Part V rules apply to all types of imaging and treatment equipment that have the potential to produce harmful radiation.



2023 NEC Changes

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Article 518 Assembly Occupancies

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518.5 Supply

In the **2020 NEC**, Section 518.5 said little regarding power supplies inside *Assembly Occupancies*.

In **2023 NEC**, the section expands to 3 new subsections of varying topics.

In **2020 NEC**: Section 518.5 covered various power outlet and power supply rules for equipment inside assembly occupancies.

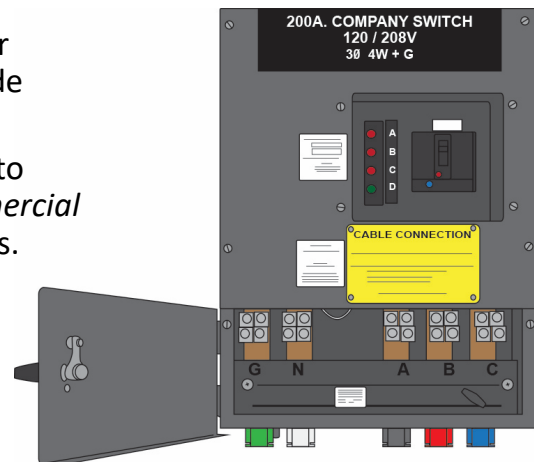
In **2023 NEC**: Section 518.5 has been repurposed to cover rules for installing *Power Outlets and Commercial Appliance Outlet Centers*, in assembly occupancies.

EXAMPLE: A commercial appliance outlet center may contain the power outlets in a building for supplying event-lighting, signs, sound equipment, or the like.

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Assembly Occupancies include places and businesses where public crowds can gather.



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Article 547 Agricultural Buildings

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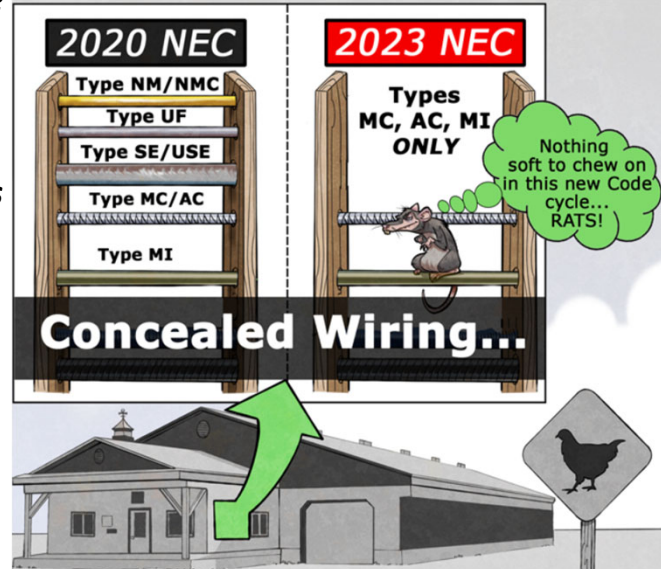
547.26 Physical Protection

Section 547.26 is new **in 2023 NEC**; it states: **All electrical wiring and equipment subject to physical damage shall be protected.**

AND...

- **Nonmetallic cables shall not be permitted to be concealed within walls and above ceilings of buildings (i.e., offices, lunchrooms, ancillary areas, etc.) or portions thereof, which are contiguous with or physically adjoined to livestock confinement areas.**
- There is also an informational note that addresses **rodents and other pests**

2023 NEC Changes



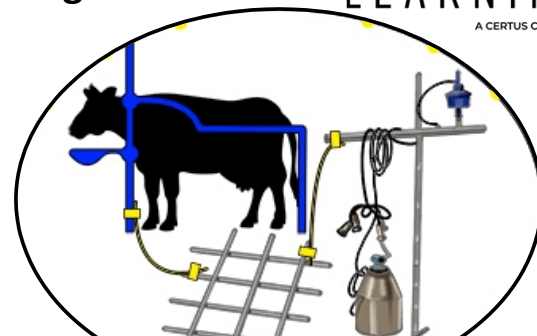
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547.44 Equipotential Planes and Bonding of Equipotential Planes

547.44 is NEW **in 2023 NEC**. It addresses:

The installation and bonding of equipotential planes, as follows:
(A) Where Required

- (1) Indoors
- (2) Outdoors
- (B) Bonding



Equipotential Bonding

Equipotential bonding ties together all exposed metal surfaces in an area so if one metal surface is accidentally energized, they ALL become energized. This prevents a voltage gradient (difference) between surfaces and reduces the chance for electric shock!

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550.16(C)(1) Exposed Non-Current-Carrying Metal Parts

New for 2023 NEC, Section 550.16(C)(1) now includes the following requirement:

Chassis of multiple mobile home sections shall be bonded together with a solid copper, 8 AWG minimum, insulated or bare, bonding conductor with terminations in accordance with 250.8 and 250.12.

The diagram illustrates the bonding of metal parts in a mobile home chassis. A green bonding conductor, labeled '8 AWG', is shown connecting two metal components. A circular inset provides a close-up view of the conductor's termination, showing it is secured with a bolt and nut to a metal surface.

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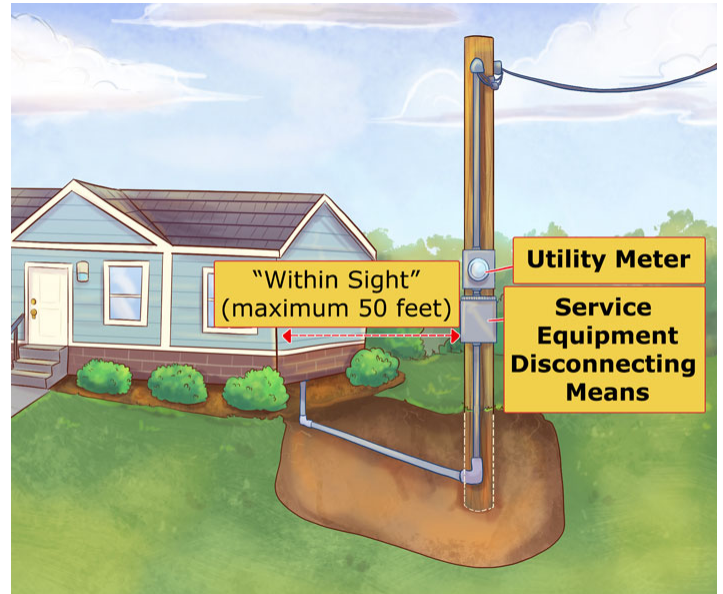
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550.32 Service Equipment

In 2023 NEC, Section 550.32 has removed the 30-foot rule, but **now requires service equipment to be "within sight" of the mobile home it serves.**

The service disconnect is now permitted to be used as the emergency disconnect required for all one- and two-family dwellings, per 230.85.

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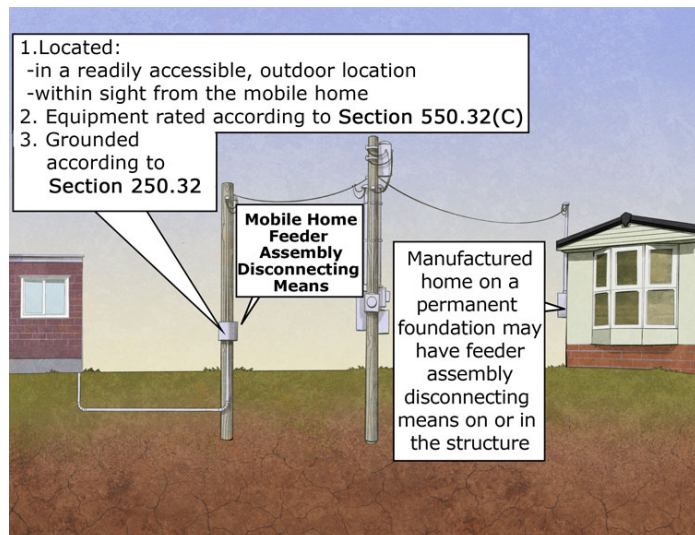
550.33(A) Feeder Equipment

In 2023 NEC: Section 550.33(A) now fills in some of the previously missing information about the placement of mobile home service equipment when it is fed by feeder conductors.

The text now points code users to specific parts of the NEC that should be applied to this installation.

There are also new rules specific to installing a feeder assembly, including its means of disconnect!

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Article 551

Recreational Vehicles and Recreational Vehicle Parks

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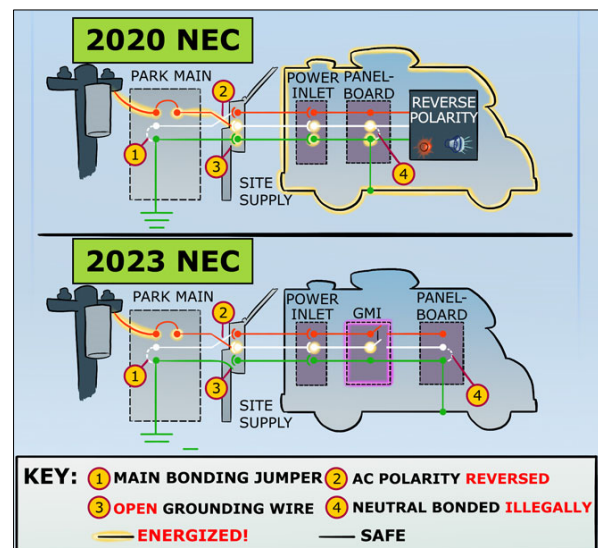
551.40(D) Loss of Ground Device

In **2023 NEC**, 551.40(D) is revised so that the **reverse polarity indicating device** [required in 2020 NEC] is **replaced with a requirement for a grounding monitor interrupter (GMI)**

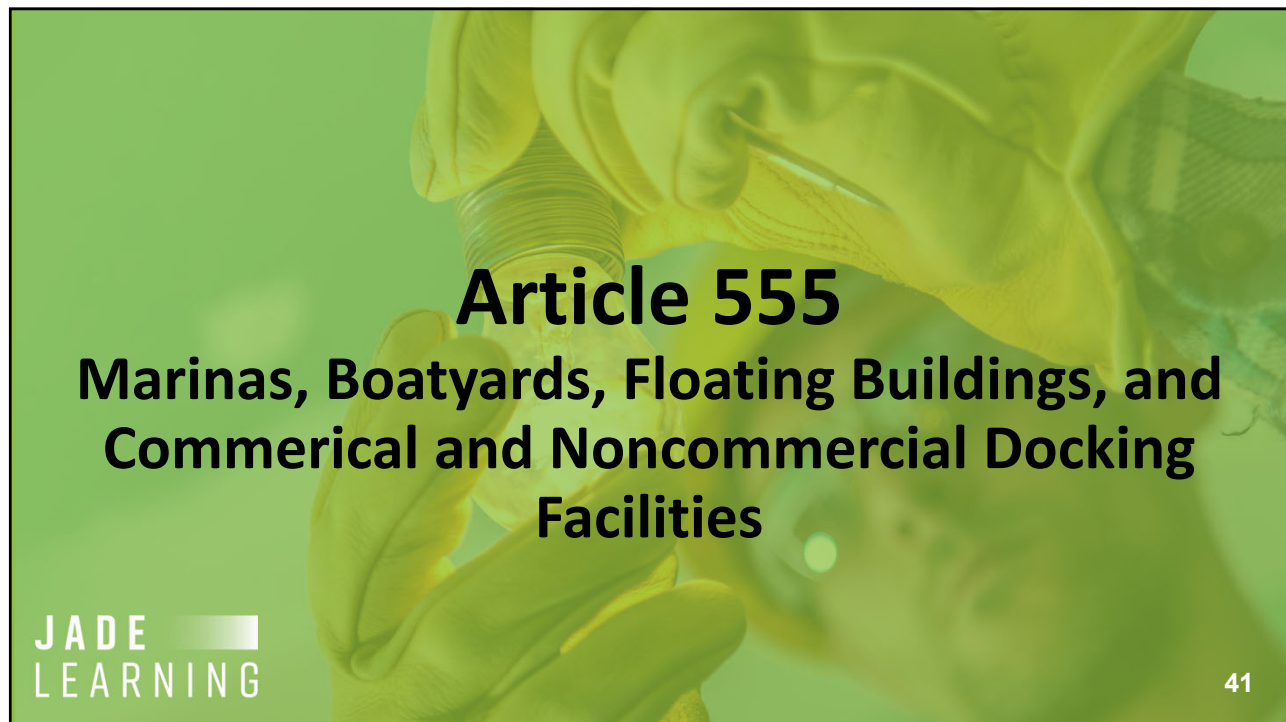
- The GMI will:
- **Check for the presence and integrity of an EGC and a ground-fault current path.**
- **Keep the circuit open when a fault condition is detected.**
- **Potentially, but not always, report a reverse polarity condition.**

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555.14 Equipotential Planes and Bonding of Equipotential Planes

555.14 is new **in 2023 NEC** and states the following:

- An equipotential plane shall be installed where required in this Section to mitigate step and touch voltages at electrical equipment. The parts specified in this Section shall be bonded together and to the electrical grounding system. The bonded conductor shall be solid copper conductors; insulated, covered, or bare; not smaller than 8 AWG.***

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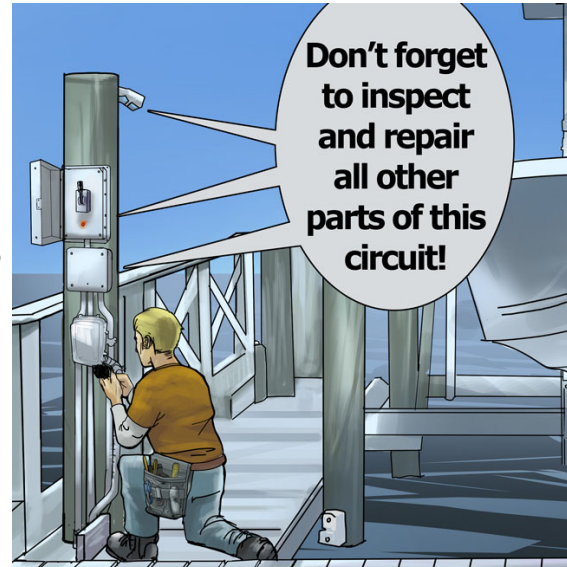
555.15 Replacement of Equipment

555.15 is new **in 2023 NEC**, it requires the following for all **docking facilities**:

- *When modifications or replacements of electrical enclosures, devices, or wiring methods are necessary on a docking facility, they shall be required to comply with the requirements of this Code, and the installation shall require an inspection of the circuit. Existing equipment that has been damaged shall be identified, documented, and repaired by a qualified person to the minimum requirements of the edition of the Code to which it was originally installed.*

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555.36(C) Emergency Electrical Disconnect

555.36(C) is new **in 2023 NEC**.

It states: *Each marina power outlet or enclosure that provides shore power to boats shall be provided with a listed emergency shutoff device or electrical disconnect that is clearly marked "Emergency Shutoff" in accordance with 110.22(A).*

- *Emergency shutoff must be within sight of the marina power outlet or other enclosure that provides shore power to boats, readily accessible, externally operable, manually resettable, and listed for use in wet locations.*
- *The emergency shutoff device or electrical disconnect shall de-energize the power supply to all circuits supplied by the marina power outlets or enclosure(s) that provide shore power to boats. A circuit breaker handle shall not be used for this purpose.*

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2023 NEC Changes Article 620

Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts, and Stairway Chairlifts

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620.22 Branch Circuits for Car Lighting, Receptacles, Ventilation, Heating, and Air Conditioning

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In 2020 NEC: The one required lighting branch circuit for elevator cars could power:

- Receptacles
- Generic accessories (alarms and monitors)
- Auxiliary lighting
- Ventilation for the car

In 2023 NEC: That circuit can power all of the above, *plus*:

- Car emergency signaling
- Communications devices (including their charging circuits)

For the elevator car's heat and air conditioning branch circuit(s), 620.22(B) now states: If no machine room exists for the elevator, the overcurrent device can be installed outside the hoistway if accessible only to qualified persons



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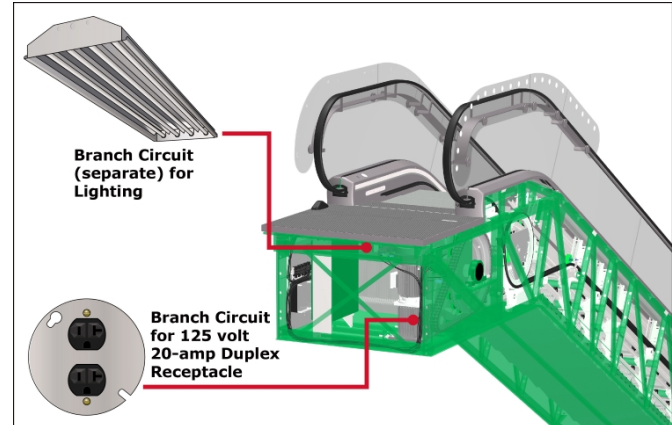
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620.23 Branch Circuits for Machine Room, Control Room/Machinery Space, Control Space, or Truss Interior Lighting and Receptacle(s)

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In **2023 NEC**, the truss interior (structural support areas) of escalators, dumbwaiters and similar equipment must now be served by the required lighting circuit for that equipment. The NEC has determined that illumination inside the truss structural area is as important as illuminating control rooms and similar areas.

2023 NEC Changes



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Article 625 Electric Vehicle Power Transfer System

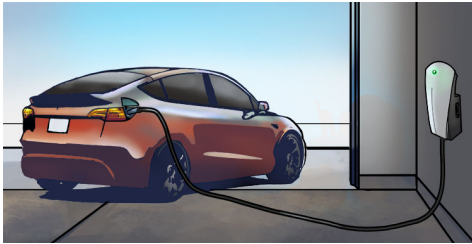
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625.40 Electric Vehicle Branch Circuit

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- The **2023 NEC** updates the requirements for 625.40, now calling the equipment **Electric Vehicle Supply Equipment (EVSE)**.
- In the **2020 NEC**, only one outlet for charging electric vehicles was permitted on a single branch circuit.
 - The **2023 NEC** allows more than one EV charging outlet to be on a single branch circuit as long as the equipment is rated 120-volts or less and 16-amperes or less.
- Additionally, there is a new exception that sends installers to 625.42(A) or (B) when attempting to install more than one charging outlet on a single branch circuit

2023 NEC Changes

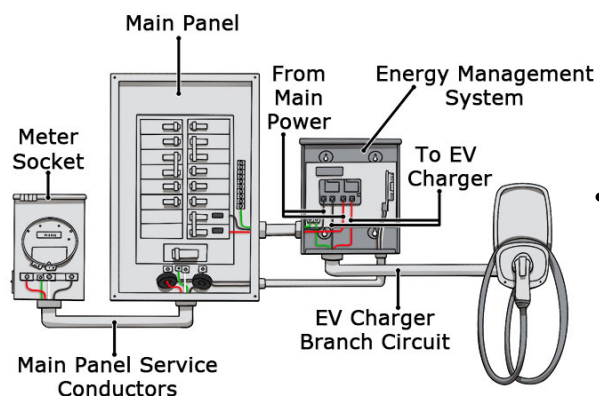
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Article 625.42 Rating

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Electric Vehicle Supply Equipment (EVSE) controlled by Emergency Management System (EMS)



- The **2023 NEC** revises Section 625.42 to correspond with similar terminology changes. What was previously referred to as power transfer equipment is now called **electric vehicle supply equipment (EVSE)**
- 625.42(A) and (B) are both new sections.
 - (A) **Energy Management System (EMS)**
 - (B) **EVSE with Adjustable Settings**

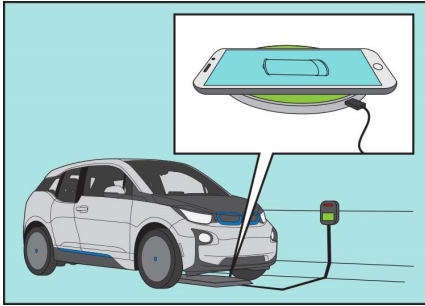
2023 NEC Changes

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625.43 Disconnecting Means

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- **In the 2023 NEC**, 625.43 is revised for clarity and to discuss remote disconnecting means for the charging equipment.
- Now, the section specifically states:
 - ***For Electric Vehicle Supply Equipment (EVSE)***
 - ***and Wireless Power Transfer Equipment***
- The following sentence is also added:
 - ***If the disconnecting means is installed remote from the equipment, a plaque shall be installed on the equipment denoting the location of the disconnecting means.***

2023 NEC Changes

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625.49 Island Mode

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- 625.49 is an entirely new section **in the 2023 NEC**.
- It is titled Island Mode, and reads as follows:
 - ***EVPE and bidirectional EVSE that incorporate a power export function shall be permitted to be part of an interconnected power system operating in island mode.***

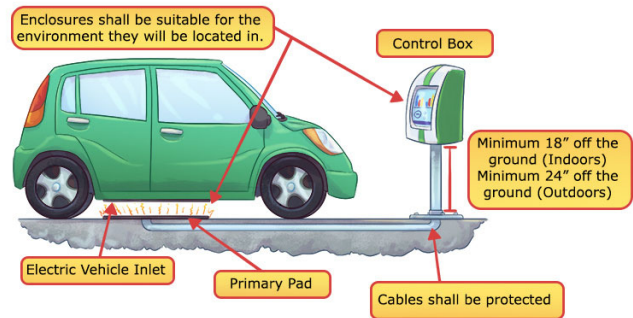
2023 NEC Changes

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625.102 Installation

- Section 625.102 has several relatively large revisions **for the 2023 NEC.**
- The following sections were renamed, and content was revised accordingly:
 - (A) was retitled from Type to **General**
 - (B) was retitled from General to **Control Box**
 - (D) was retitled from Protection of Output Cable to **Protection of Cords and Cables to the Primary Pad**



2023 NEC Changes

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Article 626 Electrified Truck Parking Spaces

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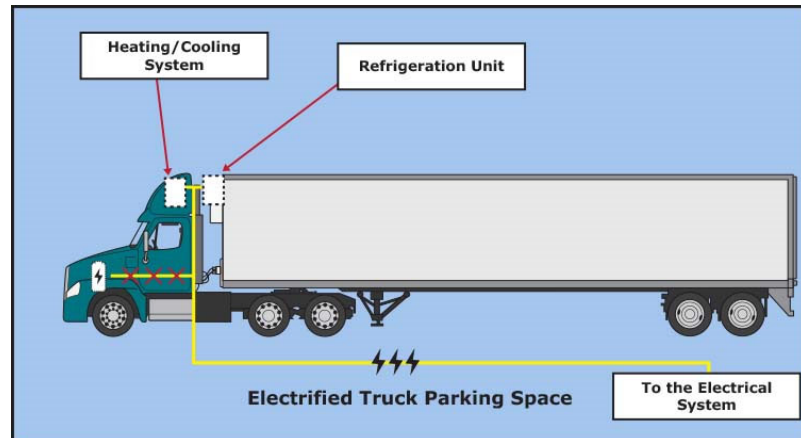
54

54

626.1 Electrified Truck Parking Spaces. Scope

Section 626.1 has some minor revisions **in the 2023 NEC.**

- It now states: Non-propulsion electrical elements of trucks are what will be connected to a supply of electricity at an electrified truck parking space.



2023 NEC Changes

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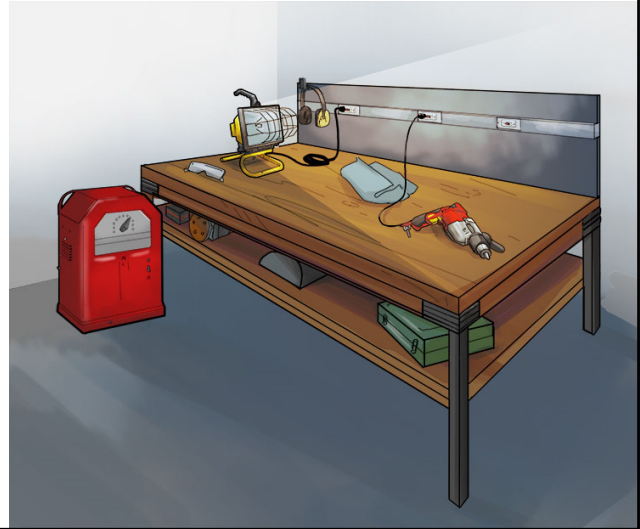
Article 630 Electric Welders

56

630.8 Ground-Fault Circuit-Interrupter Protection for Personnel

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- Section 630.8 is all new **for the 2023 NEC.**
- It now requires ***Class A type GFCI protection for all single-phase, 125-volt 15- and 20-amp receptacles installed in work areas where it is determined that an electric welders are operated.***



2023 NEC Changes

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Article 646 Modular Data Centers

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646.19 Entrance to and Egress from Working Space

- Section 646.19 is another all-new section **for 2023 NEC.**
- It has two sections addressing entrance to and egress from modular data centers.
- 646.19 states that: *Doors shall open to the full extent of their designed egress opening and be equipped with listed panic hardware or listed fire exit hardware.*



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Article 680 Swimming Pools, Fountains, and Similar Installations

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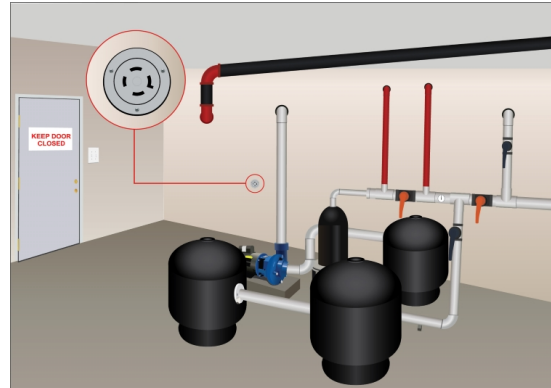
60

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680.5 GFCI and Special Purpose GFCI (SPGFCI) Protection

Section 680.5 previously only provided minimal information in the 2020 NEC.

The **2023 NEC** expands it to cover more information on GFCI protection and adds Special Purpose Ground-Fault Circuit Interrupter (SPGFCI) devices for protecting pool motors that operate at above 150 volts measured to ground.



2023 NEC Changes

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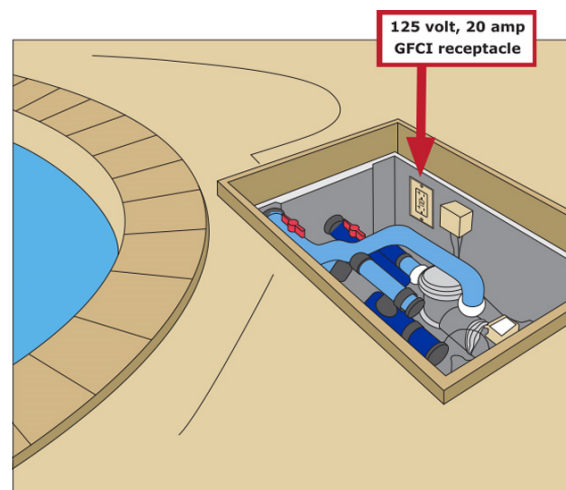
61

680.12 Equipment Rooms, Vaults, and Pits

Section 680.12 is expanded in the **2023 NEC** to include information on Receptacles.

There are now two sections:

- **(A) Drainage**
 - This section contains the same information as the 2020 NEC, with some small verbiage changes to include vaults
- **(B) Receptacles**
 - This is a new section that addresses GFCI receptacle(s) within an equipment room.



2023 NEC Changes

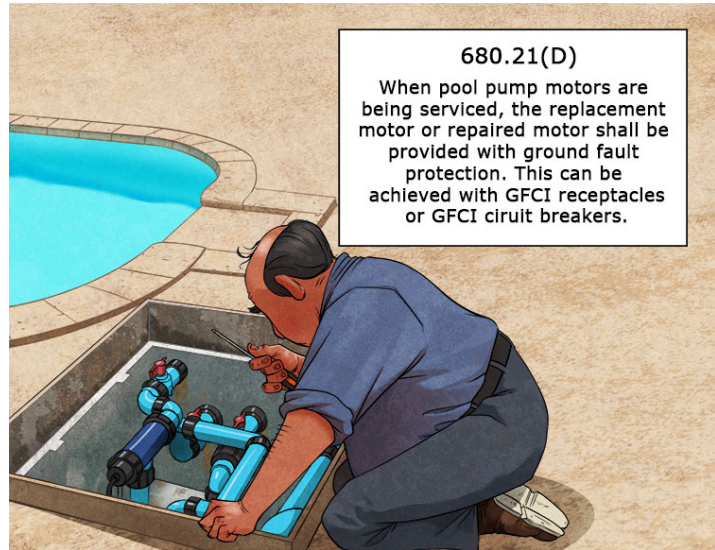
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680.21(D) Pool Pump Motor Replacement

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In **2023 NEC**, Section 680.21(D) has been revised so that anytime a pool pump motor is replaced or repaired, either the replacement or repaired pump motor shall be provided with GFCI protection. This can be achieved with GFCI receptacles or GFCI circuit breakers.



2023 NEC Changes

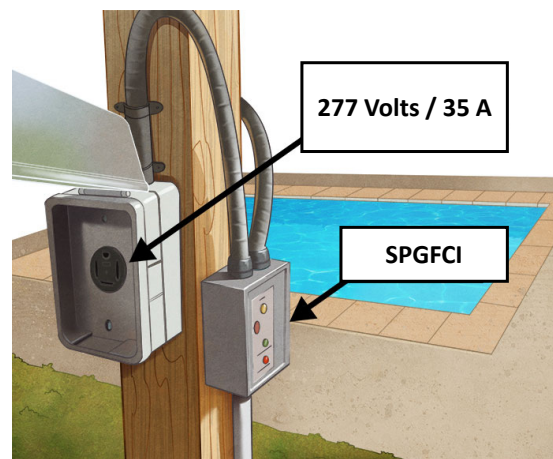
63

680.22(A)(4) Receptacles

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Section 680.22(A)(4) has been retitled to include special purpose ground fault circuit interrupters (SPGFCI) in addition to the GFCIs previously covered in the 2020 NEC.

- In the **2020 NEC**: All 15- and 20-amp, single-phase 125-volt receptacles within 6 feet of the inside wall of a pool required Class A GFCI protection.
- In the **2023 NEC**: All receptacles rated 125 volts through 250 volts, 60 amps or less, within 6 feet of the inside wall of a pool require either GFCI or SPGFCI protection [See 680.5(B) and 680.5(C), GFCI and SPGFCI for applicable protection rules].



2023 NEC Changes

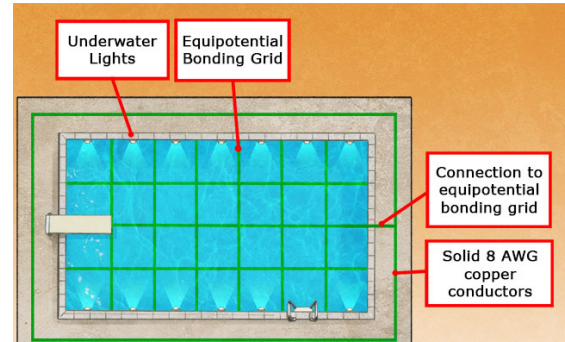
64

680.26 Equipotential Bonding

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All changes in 680.26 were verbiage or structure revisions to make the 2020 NEC material clearer for the new 2023 NEC.

- (A) now specifies **required by (B) and (C)**, instead of the whole section
- (B) adds a statement on **vinyl liners and fiberglass composite shells**
- (5) was revised for clarity and not required items are now listed in an exception
- (6) was revised for clarity to now list out the 3 metal parts. The Exception remains the same.
- (7) was revised for clarity. 2 exceptions were moved into the exception itself. 1 exception remains unchanged
- (C) Verbiage revision to mention (B)(1)-(7)



2023 NEC Changes

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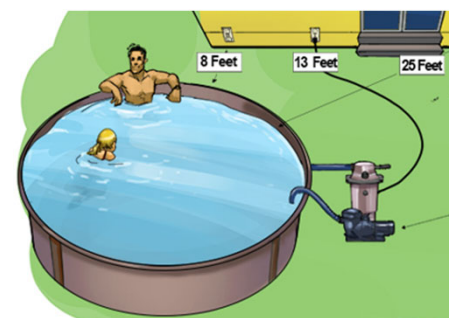
680.32 Ground-Fault Circuit-Interrupter (GFCI) and Special Purpose Ground-Fault Circuit-Interrupter (SPGFCI) Protection

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Similar to other changes in 2023 NEC, Section 680.32 follows suit by including **Special Purpose Ground-Fault Circuit-Interrupters (SPGFCI)**

New in 2023 NEC: 680.32 now states that electrical equipment used with storable pools must comply with GFCI protection rules of 680.5(B) or SPGFCI protection rules of 680.5(C)

New in 2023 NEC: Ground Fault protection was required for just **125-Volt, 15- and 20-ampere receptacles...but is now required for receptacles rated 125-250 volts, up to 60 amps** within 20 ft of the inside walls of the storable pools, spas, or hot tubs.



2023 NEC Changes

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Per 680.43(A)(3), receptacles used for power to an outdoor spa/hot tub limit to 150 volts to ground.

The diagram shows a brown hot tub with a yellow interior. A white GFCI outlet is mounted on the wall, with a power cord plugged into it. A speech bubble points to the outlet with the text: "Per 680.43(A)(3), receptacles used for power to an outdoor spa/hot tub limit to 150 volts to ground." The hot tub is located in a room with grey walls and a large window showing green trees outside.

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Perimeter Surface(s) area boundary

Determined by:

- A. Extent of Footing
- B. Rising to its exposed surface(s)
- C. 1m (3 ft) measured horizontally

1.5m (5 ft) from inside wall

3 ft

Inside Wall

Area of shell

8 AWG solid copper grid

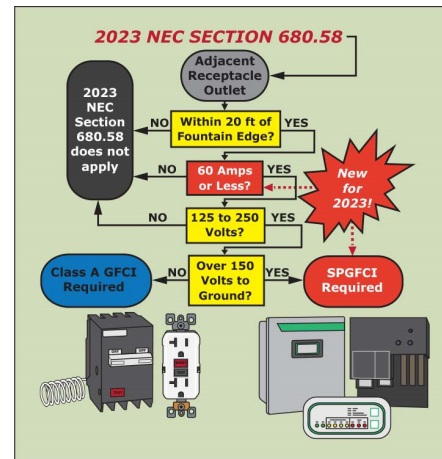
A, B, C

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680.58 GFCI, SPGFCI Protection for Adjacent Receptacle Outlets

- Section 680.58, similar to many other sections in Article 600, adds SPGFCI Protection to its requirements.
- It also adds the requirement of 60amps or less for GFCI or SPGFCI protection to be required.

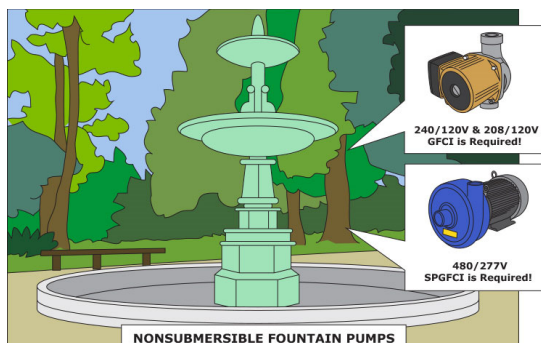


2023 NEC Changes

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680.59 GFCI and SPGFCI Protection for Permanently Installed Nonsubmersible Pumps



- There are several changes to the Section 680.59 in the 2023 NEC:
 - SPGFCIs are now included, adding the statement that they must comply with 680.5(C)
 - GFCI protection must comply with 680.5(B)
 - This section no longer applies to nonsubmersible pump motors rated 250 volts or less and 60 amperes or less.
 - An exception is added to allow certain low-voltage motors to forego GFCI and SPGFCI protection entirely.

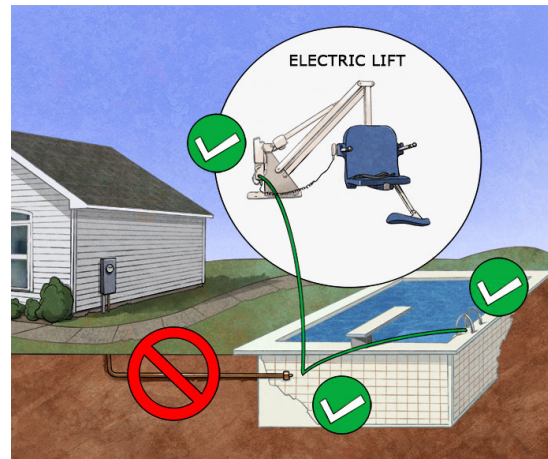
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680.83 Equipotential Bonding

- Section 680.83 in the 2020 NEC points installers to 680.26(B)(5) and 680.26(B)(7) for bonding requirements
- In the 2023 NEC, these are kept, but additional information on the bonding conductors were added:
 - 8 AWG
 - Solid copper
 - Insulated, covered, or bare
 - Bonding connections must be made with one of the 8 different approved connection types outlined in 250.8 of the 2023 NEC
 - Bonding conductor to reduce gradients in the pool lift area is not required to extend to attach to remote panelboards, service equipment, or electrodes.



2023 NEC Changes

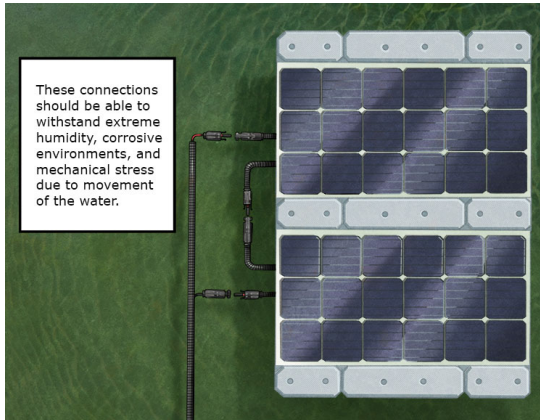
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Article 690 Solar Photovoltaic (PV) Systems

72

690.4(G) PV Equipment Floating on Bodies of Water



- Section 690.4(G) is an all-new section to address PV Equipment floating on or attached to structures floating on bodies of water.

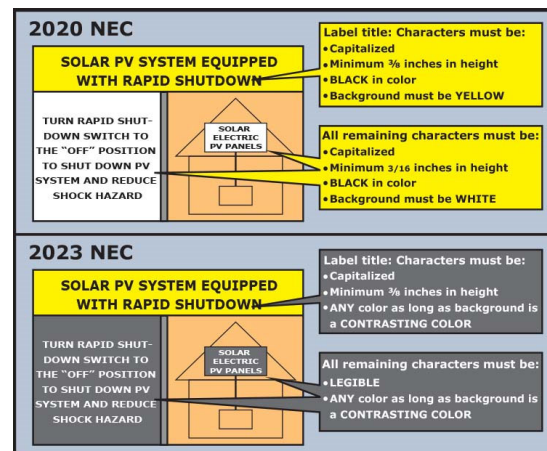
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690.12(D) Buildings with Rapid Shutdown

- In the 2023 NEC, Section 690.12(D) is retitled Buildings with Rapid Shutdown from equipment.
- In addition, there is now more clarity provided with the requirements for Solar PV Systems with Rapid Shutdown and 2 subsections:
 - **(1) Buildings with More than One Rapid Shutdown Type**
 - **(2) Rapid Shutdown Switch**



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Article 694 Wind Electric Systems

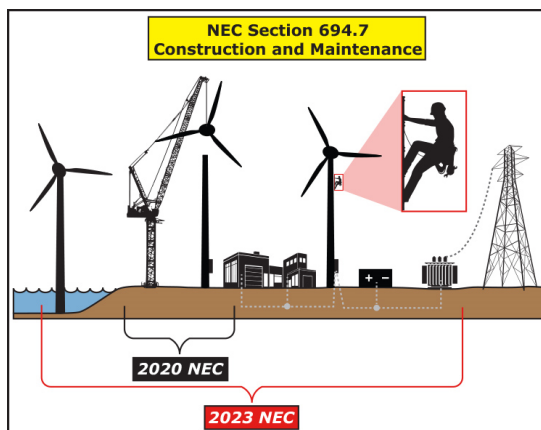
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694.7 Construction and Maintenance

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- Section 694.7 was renamed in the 2023 NEC. It is now Construction and Maintenance and it was previously called Installation.
 - Subsection (D) was also renamed **Overvoltage Protection** from Surge Protection Devices.
- **Subsection (A) adds a reference to offshore devices**
- **Subsection (B) added to the informational note to see UL 6141 and UL 6142**

2023 NEC Changes

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695.1 Fire Pumps. Scope.

- Section 695.1 in the 2023 NEC covers the same material as it did in the 2020 NEC.
- The changes in this section are to what is not covered:
 - ***Water Pumps installed in One- and Two-Family Dwellings and Used for Fire Suppression***
 - This includes an informational note to see NFPA 13D-2019

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2023 NEC Changes Article 700

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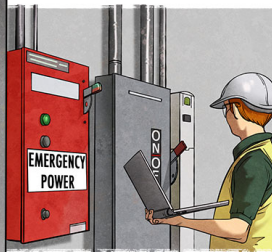
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700.3 Tests and Maintenance

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Conducting or Witnessing
Commissioning of the
Emergency Power System
at Startup



Later, Periodic
Commissioning of the
Emergency System

- Section 700.3 in the 2023 NEC updated sections (A) and (F):
 - (A) was renamed **Commissioning Witness Test** from Conduct or Witness Test
 - In the language below, “the test” was reworded to “**the commissioning**”
 - Added informational note to see NECA 90
- (F)(6) & (7) were added
 - (6) addresses the **permanent connection point for the temporary generator**
 - (7) addresses a **permanent label fixed in the field**.

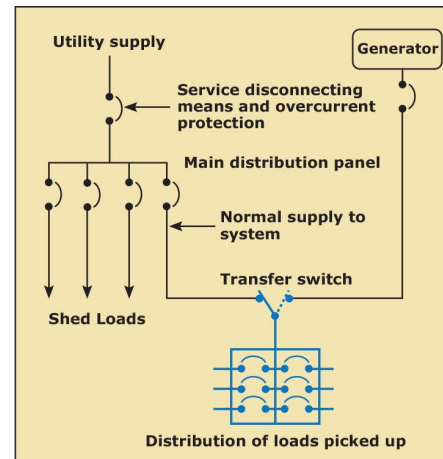
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700.4(B) Selective Load Management

- The 2020 NEC's section 700.4(B) has been moved to 700.4(A) in the 2023 NEC.
- For the 2023 NEC, section 700.4(B) has been titled **Selective Load Management** and addresses the following:
 - The order in which the alternate power source is permitted to provide energy to system loads:
 - Emergency Circuits
 - Legally Required Standby Circuits
 - Optional Standby Circuits



2023 NEC Changes

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700.11 Wiring, Class-2 Powered Emergency Lighting Systems

- Section 700.11 is an all-new section for the 2023 NEC.
- This section contains 4 subsections that address different aspects of class-2 emergency lighting control device installations:
 - (A) General
 - (B) Identification
 - (C) Separation of Circuits
 - (D) Protection
- The most important things to remember about this section are: **Identify, Separate, Protect**



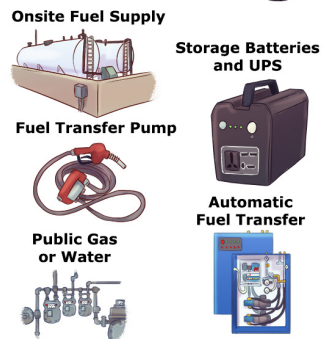
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700.12(C) Supply Duration

Emergency Power Supply Duration



- Section 700.12(C) was renamed to **Supply Duration** from Storage Battery.
- This section has been expanded to include information on the following:
 - **(1) On-Site Fuel Supply**
 - **(2) Fuel Transfer Pumps**
 - **(3) Public Gas System, Municipal Water System**
 - **(4) Storage Batteries and UPS**
 - **(5) Automatic Fuel Transfer**

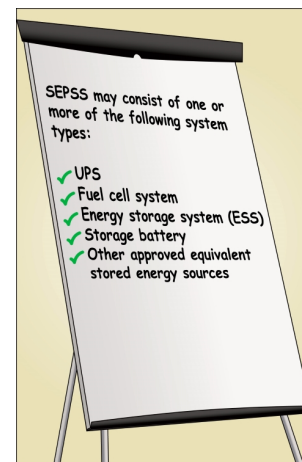
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700.12(E) Stored-Energy Power Supply Systems (SEPSS)

- Section 700.12(E) was renamed in the 2023 NEC to **Stored-Energy Power Supply Systems (SEPSS)**. In the 2020 NEC it was previously named Uninterruptable Power Supplies
- This section also expanded to include more information. The titles of the subsections are:
 - Types
 - Fire Protection, Suppression, Ventilation, and Separation



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Article 701

Legally Required Standby Systems

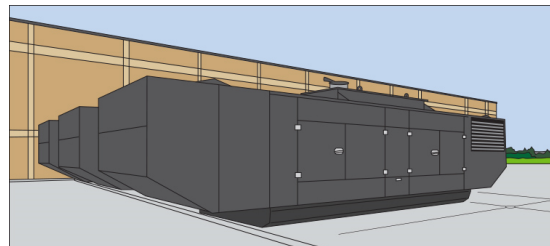
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701.1 Scope

- Section 701.1 Scope contains the same information as in the 2020 NEC, however, the 2023 NEC **expands to add 2 additional informational notes.**
 - Informational Note 4 addresses what types of systems legally required standby systems are typically installed to serve
 - Informational Note 5 addresses when legally required standby systems are considered level one or level two systems when applying NFPA 110-2019 for more information



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701.12(C)(3) Public Gas System, Municipal Water Supply

Legally Required Standby Systems

Where a public gas system is approved as the only fuel source, 2 hours of fuel stored on-site is no longer required!



- Section 701.12(C)(3) has been revised in the 2023 NEC.

- First, notice the words “Prime movers” in the 2020 NEC have been replaced with “**sources**” in the 2023 NEC for clarity.

- Additionally, the following requirement from the 2020 NEC has been removed:

- Means shall be provided for automatically transferring one fuel supply to another where dual fuel supplies are used.

- Lastly, the following sentence was added to the Exception:

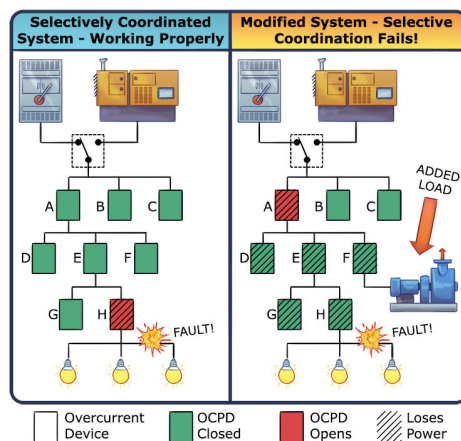
- Where a public gas system is approved, the requirements of 701.12(C)(1) shall not apply**

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701.32 Selective Coordination



- Section 701.32 was split up into the following three subsections in the 2023 NEC:

- **(A) General**
- **(B) Replacements**
- **(C) Modifications**

- Subsection (A) contains the same information as the 2020 NEC.
- Subsections (B) and (C) are new
- Subsection (C) contains the same exception and informational note as included in the 2020 NEC.

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Article 702

Optional Standby Systems

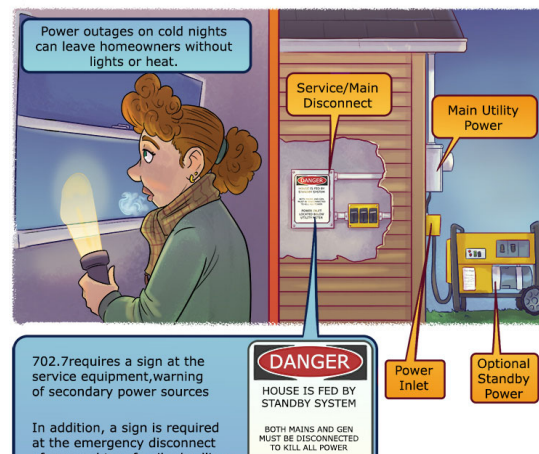
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702.7(A) Standby

- In the 2023 NEC, section 702.7(A) was updated to provide more specific requirements for standby equipment signage
 - First, the requirement was updated that the sign shall be **placed at equipment**, instead of at service-entrance equipment as in the 2020 NEC.
 - Previously in the 2020 NEC, the requirements were separated into one- and two- family dwellings and commercial and industrial installations.
 - The 2023 NEC updates commercial and industrial installations to installations **other than one- and two- family dwellings** to be more inclusive.
 - Lastly, the requirements for one- and two-family dwellings remain the same, but the section referenced has been updated to 445.19(C)



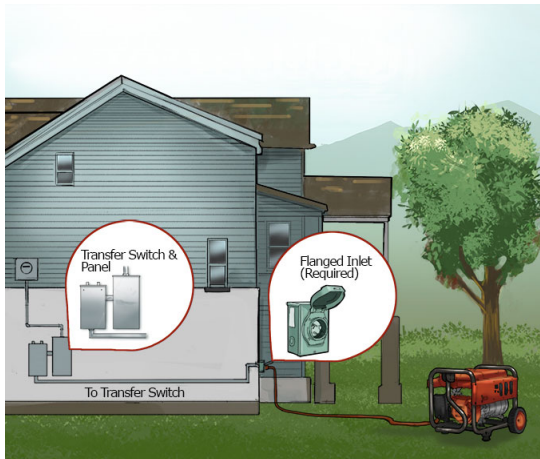
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702.12(B) Portable Generators 15kw or Less

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- Section 702.12(B) in the 2023 NEC adds to the requirement that was previously in the 2020 NEC.
- Now, it specifies that ***the flanged inlet or other cord-and-plug-type connection shall be located outside the building or structure.***

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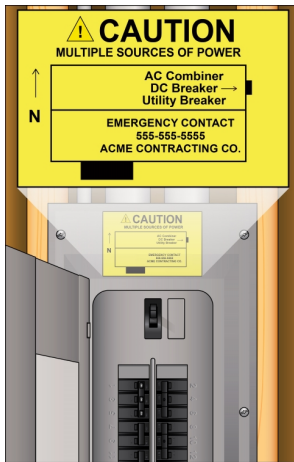
Article 705 Interconnected Electric Power Production Sources

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705.10 Identification of Power Sources



- The primary change in the 2023 NEC for section 705.10 is that it now includes **labels**, instead of just permanent plaques and directories
- The information in the 2023 NEC remains primarily the same as the 2020 NEC, but is reorganized into requirements (1), (2), and (3).
- Requirement (2) is new to add the **requirement to include emergency phone numbers for off-site emergency telephone numbers**

2023 NEC Changes

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Article 706 Energy Storage Systems

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706.7 Commissioning and Maintenance

- Section 706.7 in the 2023 NEC has been renamed ***Commissioning and Maintenance***, rather than just Maintenance in the 2020 NEC.
- To follow suit with the title change, this section also expands to include information on commissioning.
- Additionally, while the primary information on maintenance remains the same, there is an additional sentence in the 2023 NEC that states ***this shall not apply in one- and two-family dwellings***



2023 NEC Changes

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Article 724

Class 1 Power-Limited Circuits and Class 1 Power-Limited Remote Control and Signaling Circuits

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Article 724 Class 1 Power-Limited Circuits and Class 1 Power-Limited Remote Control and Signaling Circuits

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- Article 724 is an all-new article for the 2023 NEC.
- Previously, in the 2020 NEC, Article 725 covered all Class 1, Class 2, and Class 3 Remote Control, Signaling, and Power Limited Circuits
- Now, in the 2023 NEC, **Class 1 is split into a separate article from Class 2 and 3, Article 724.**

Class 1 non-power limited circuits	Class 1 power limited circuits, RC, and Signaling	Classes 2 & 3 power limited circuits
Chaps 1-4 300.2-300.25	Article 724	Article 725

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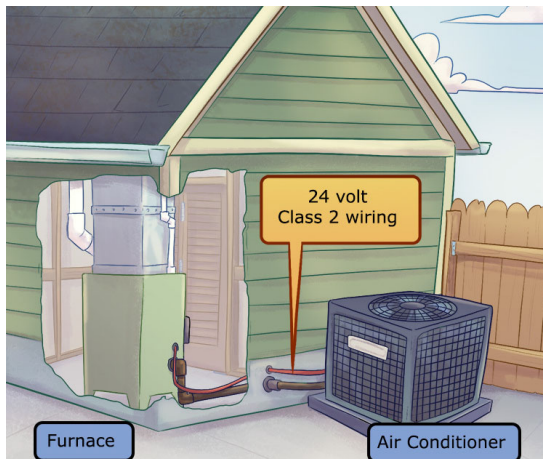
Article 725 Class 2 and Class 3 Power-Limited Circuits

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Article 725 Class 2 and Class 3 Power-Limited Circuits



- Article 725 in the 2020 NEC included Class 1 Power Limited, Remote Control, and Signaling Circuits.
- In the 2023 NEC, Class 1 Power Limited, Remote Control, and Signaling Circuit requirements have been moved to Article 724.
- Coincidentally, **Article 725 now only addresses Class 2 and Class 3 Power-Limited Circuits**

2023 NEC Changes

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725.3(A) Spread of Fire or Products of Combustion

- In Article 725.3(A) in the 2020 NEC, included information on the Number and Size of Conductors in the raceway. This has been moved to Article 724 in the 2023 NEC.
- In the 2023 NEC, 725.3(A) has been changed to ***Spread of Fire or Products of Combustion***
- The information in this section remains the same for the Class 2 and Class 3 Circuits.



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Article 726

Class 4 Fault-Managed Power Systems

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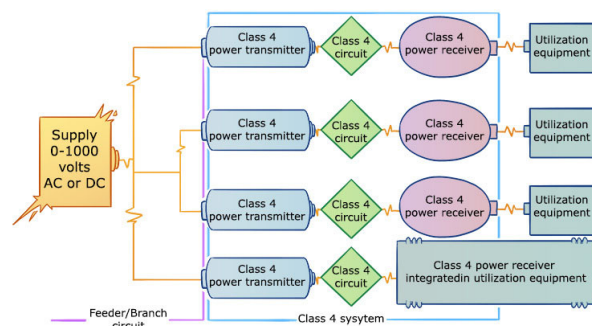
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Article 726 Class 4 Fault-Managed Power Systems

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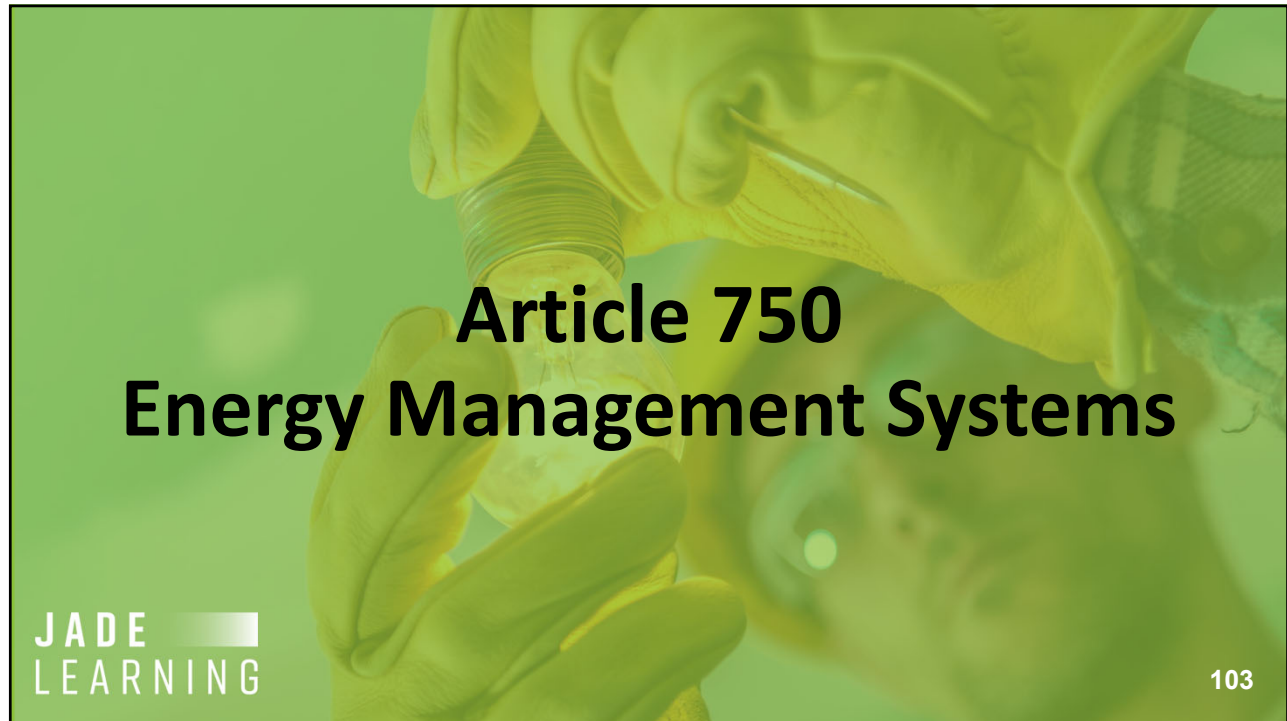
- Article 726 is an all-new article in the 2023 NEC.
- It contains 3 parts:
 - **Part I General**
 - **Part II Class 4 Circuits**
 - **Part III Listing Requirements**
- This new Article covers class 4 systems capable of reducing or eliminating energy on the circuit conductors whenever a fault is detected.



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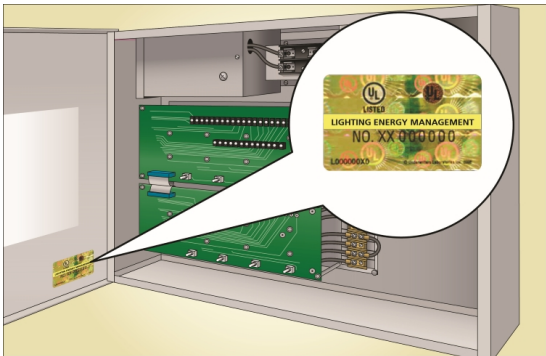


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750.6 Listing

- In the 2023 NEC, section 750.6 is an all-new section.
- This section gives the ***manufacturer and installers options as to how to comply with new listing requirements*** for energy management systems.





2023 NEC Changes
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Article 760 Fire Alarm Systems

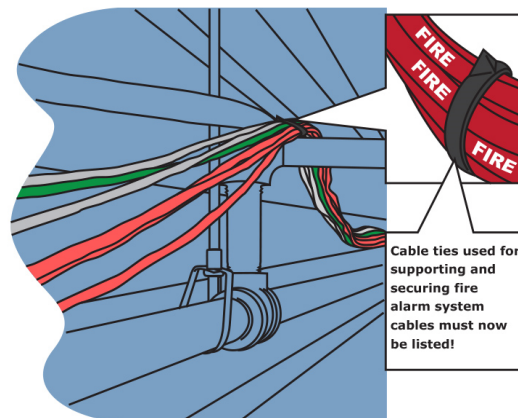
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760.24 Mechanical Execution of Work

- In the 2023 NEC, section 760.24 remains unchanged except for two related items. These items are:
 - ***Cable ties must now be listed.***
 - The installation must ***comply with section 300.11***, which contains securing and supporting requirements.



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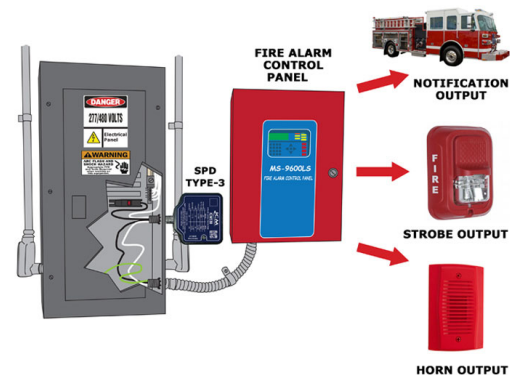
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760.33 Supply-Side Overvoltage Protection

- Section 760.33 is an all-new section in the 2023 NEC.
- It now requires a ***listed surge protective-device (SPD)*** installed on the supply side of a fire alarm control panel, in accordance with Part II of Article 242.



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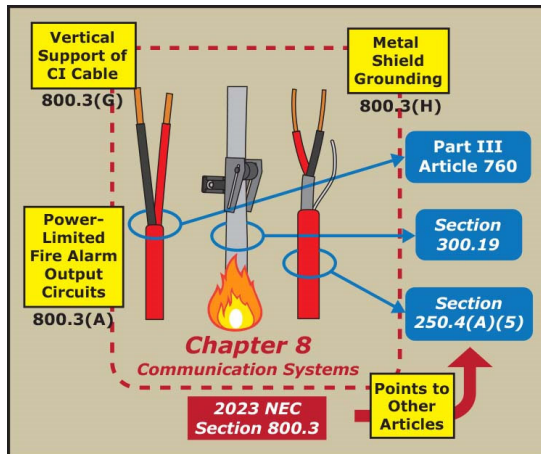
2023 NEC Changes Article 800 Communications Systems

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800.3 Other Articles



- In the 2023 NEC, Section 800.3 was expanded and revised for clarity and accuracy.
 - First, the entire section now specifies that the definitions in **Article 100** apply
 - (A) was revised to be titled **Output Circuits** is a new section that now specifically states five additional Parts of Articles that apply
 - (F) was revised to be titled **Optical Fiber Systems** states that **Article 770** applies
 - (G) was revised to be titled **Vertical Support for Fire-Resistive Cables and Conductors** and mentioned where **Section 300.19** applies
 - (H) is also a new section titled **Bonding and Grounding of Cable Shields** that specifies where **Section 250.4(A)(5)** applies.

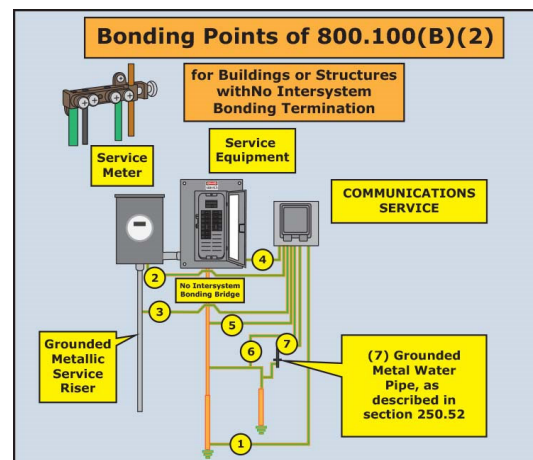
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800.100(B)(2) Electrode. In Buildings or Structures with Grounding Means

- Section 800.100(B)(2) underwent some structural changes in the 2023 NEC.
- In general, the information included in this section remains the same.
 - The Informational note including Figure 800.100(B)(2) was moved to be under subsection (B)(2)(1)
 - The note was revised to include more specific information.
 - The bonding point that was previously listed as number (2) was moved down to (7) and all others moved up**



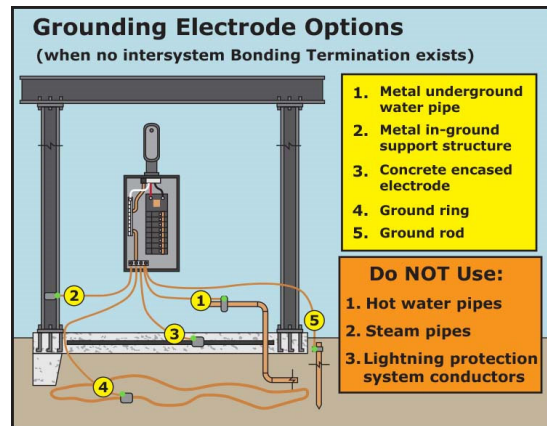
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800.100(B)(3) In Buildings or Structures Without an Intersystem Bonding Termination or Grounding Means

- In the 2023 NEC, there was a very small revision to 800.100(B)(3).
 - This revision added **a bonding** to the uses that steam pipes, hot water pipes, or lighting protection system conductors cannot be used for protectors and grounded metal numbers.



2023 NEC Changes

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Article 800.113 Installations of Cables Used for Communications Circuits, Communications Wires, Cable Routing Assemblies, and Communications Raceways

- Section 800.113 was revised in the 2023 NEC to provide more information
 - It added **Table 800.113**
 - Section (A) the verbiage was revised and removes the reference to 820.48 from the exception
 - Sections (B)-(L) now have two sections (1) which includes **Uses Permitted** and (2) which contains **Uses Not Permitted**

Find the Use-Rating for the Location Needed, as Described in 800.113 (B)-(L)

How to Use Table 800.113	
Use-Ratings (with added Suffix Codes)	Listed Cable Types Used for Communications Circuits
Plenum (P)	CMR, CATVR, OFNP, OFCP
Riser (R)	CMR, CATVR, BMR, BLR, OFNR, OFCR
General-purpose (G or blank)	CMG, CH, CATV, BM, BL, OFNG, OFR, OFCG, OFC
Limited-use (X)	CMX, CATVX, BLX
Undercarpet (UC)	CUNC
Underground (U)	BMU, BLU

Choose Listed Cable Types Bearing these Permanent Markings

Suffix Codes

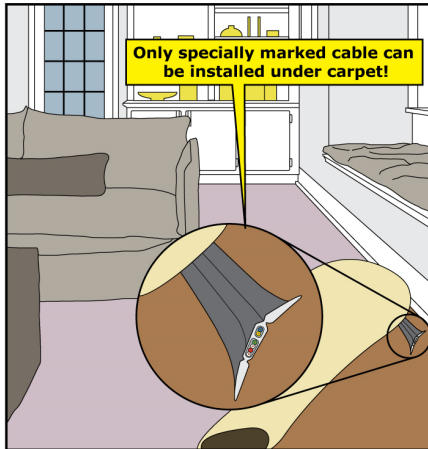
Avoid Hybrid Communications and Power Cables, except in One- and Two-family Dwellings

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800.179 Wires and Cables



- In the 2023 NEC, there were significant changes to 800.179, Wires and Cables.
 - The first, in the general section, there is significantly more information, including ***copper cables for conductors in communications cables (other than coaxial), cables containing optical fibers shall be marked –OF, voltage rating should be not less than 300 volts, etc.***
 - There is also an exception and 3 informational notes added to this section.
 - Subsection (C) is expanded to have two subsections
 - Subsections (E) through (I) are added

2023 NEC Changes

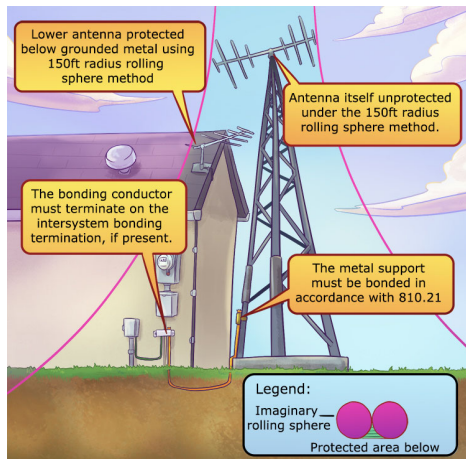
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Article 810 Antenna Systems

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810.15 Grounding or Bonding



- Section 810.15 in the 2020 NEC previously only covered Grounding. Now in the 2023 NEC, ***Bonding is also covered.***
- The informational note has also been updated to reflect the most recent version of NFPA 780.

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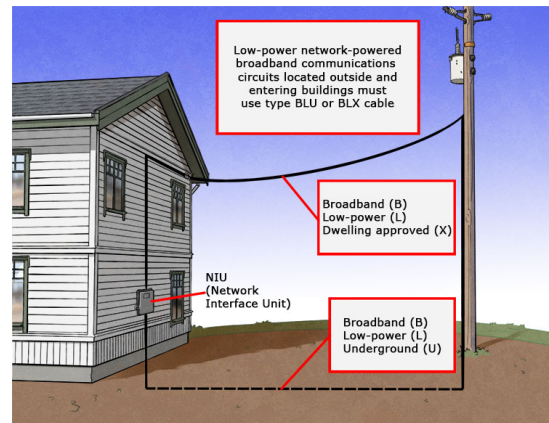
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Article 830 Network-Powered Broadband Communication Systems

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830.40(B) Low-Power Circuits

- In the 2023 NEC, the requirements for section 830.40(B) remain the same.
- The change for this section is the removal of the exception that was previously included in the 2020 NEC.



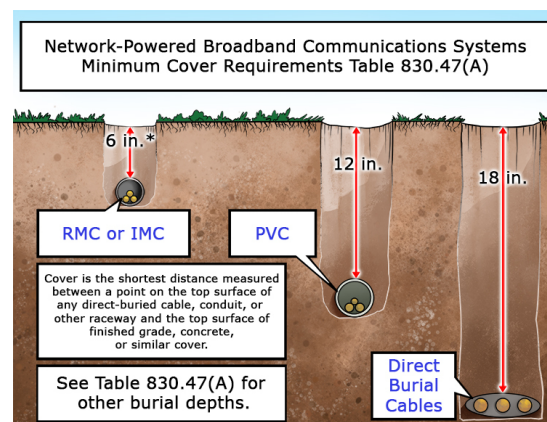
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830.47 Underground Network-Powered Broadband Communications Cables Entering Buildings

- In the 2023 NEC, section 830.47 only has two subsections. These subsections, now (A) and (B), contain the information of subsections (C) and (D) in the 2020 NEC.
 - (A) Protection from Physical Damage
 - (B) Pools
- Additionally, the exception in (A) was revised slightly.



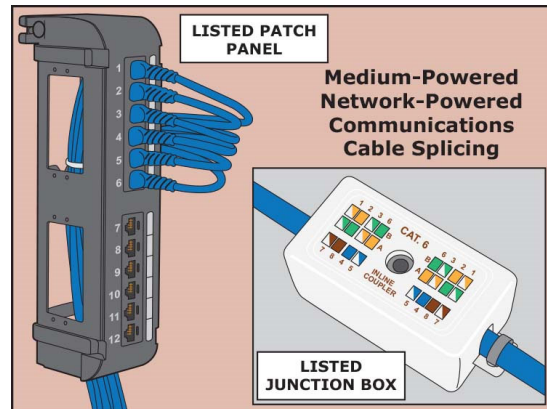
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830.133(C) Splicing of Medium-Powered Network-Powered Communications Cables

- Section 830.133(C) is an all-new section in the 2023 NEC.
 - Where a medium-powered network-powered broadband communications cable is spliced or extended, a listed junction box or listed patch panel shall be used.***



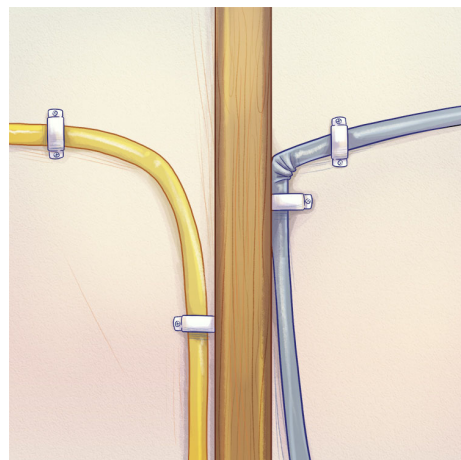
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830.160 Bends

- Section 830.160 has been expanded in the 2023 NEC.
- It contains the same basic requirement as the 2020 NEC, but now also states ***the radius of the curve of the inner edge of any bend shall not be less than 10 times the diameter of the cable***
- There was also an informational note added to see ANSI/TIA-568.0-E.



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2023 NEC Changes Chapter 9 Tables

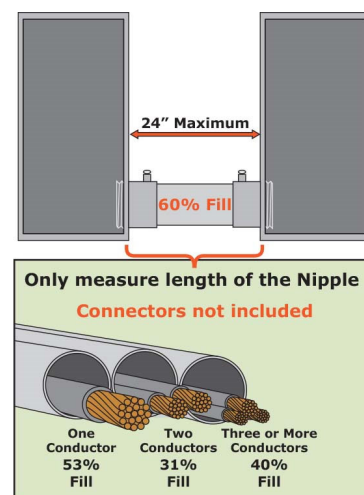
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Chapter 9, Table 1

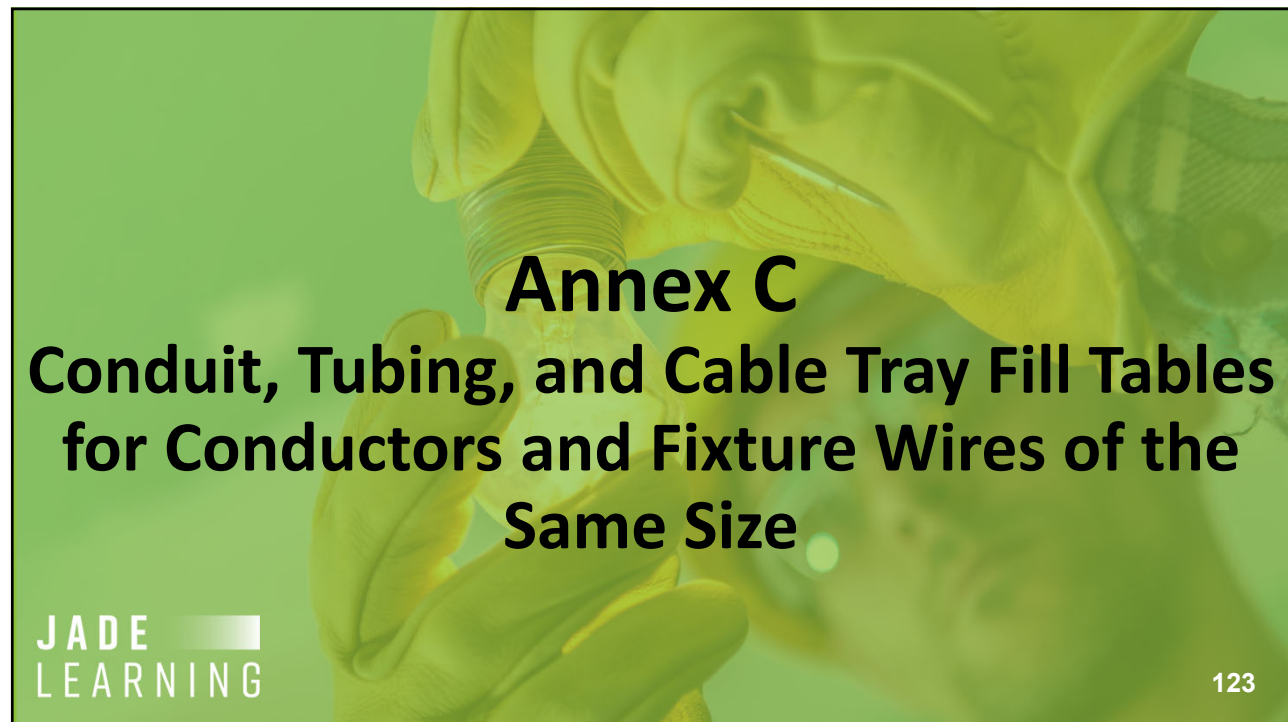
- In the 2023 NEC, Notes to Tables (4), which applies to Table 1, ***has been revised to state not including connectors.***



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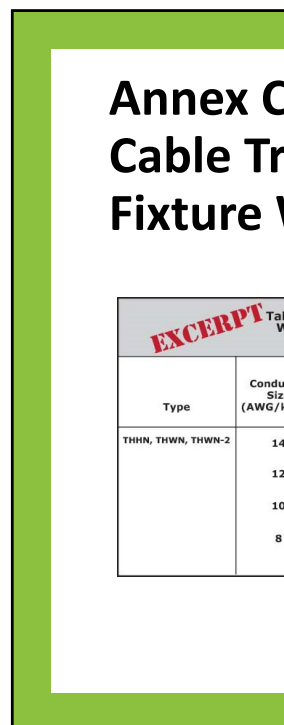
Annex C

Conduit, Tubing, and Cable Tray Fill Tables for Conductors and Fixture Wires of the Same Size

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Annex C, Table C.1 Conduit, Tubing, and Cable Tray Fill Tables for Conductors and Fixture Wires of Same Size

Type	Conductor Size (AWG/kcmil)	3/8 (12)	1/2 (16)	3/4 (21)	4 (103)	5 (129)	6 (155)
THHN, THWN, THWN-2	14	—	12	22	608	914	1290
	12	—	9	16	443	666	941
	10	—	5	10	279	420	593
	8	—	3	6	161	242	342

- In the 2020 NEC, 5- or 6-inch (trade sizes) were not recognized for EMT or IMC conduits
- The 2023 NEC ***adds these items C.1 for EMT and C.4 for IMC.***

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Annex K

Use of Medical Electrical Equipment in Dwellings and Residential Board-and-Care Occupancies

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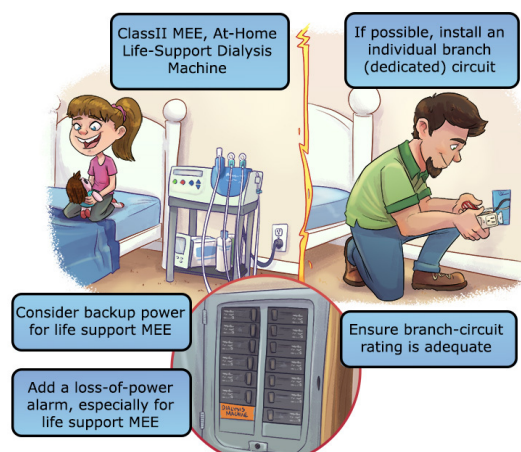
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Annex K Use of Medical Electrical Equipment in Dwellings and Residential Board-and-Care Occupancies

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- Annex K is an all-new addition to the 2023 NEC. While it is ***not part of the requirements*** of the NEC, it is a very helpful informational annex that includes information on Medical Electrical Equipment in dwellings and residential board-and-care occupancies.



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