



2020 NEC Significant Code Changes Part 2

Four (4) Continuing Education Hours
Course #EE2002

Approved Continuing Education for Licensed Professional Engineers

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Course Description:

The 2020 NEC Significant Code Changes Part 2 course satisfies four (4) hours of professional development.

The course is designed as a distance learning course that overviews the significant changes to the updated National Electrical Code (NEC).

Objectives:

The primary objective of this course is to enable the student to understand some of the significant changes including additions, deletions, and modification to Articles 400 of the 2020 Edition of NFPA 70: National Electrical Code (NEC) from the 2017 Edition.

Grading:

Students must achieve a minimum score of 70% on the online quiz to pass this course. The quiz may be taken as many times as necessary to successfully pass and complete the course.

A copy of the quiz questions are attached to last pages of this document.

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Introduction

Every three years, the National Electrical Code® (NEC®) is revised and expanded. Initially the NFPA® received **3,730** public suggestions for changes, which resulted in **1,400** first revisions. There were **1,930** public comments submitted in response to these **1,400** first revisions, resulting in **635** second revisions. Changes included editorial clarification, expanded requirements, new requirements, deleted requirements, and the relocation of other requirements. Nine new articles were proposed, and four new articles were added to the 2020 NEC. With the fast pace of technology, it's more important than ever for anyone participating in the electrical industry to get up to speed with all the changes.

2020 National Electric Code (NEC)

- 5,660 Public Suggestions to 2014 NEC
- 2,035 Revisions Made
- Changes Included
 - Editorial Clarification,
 - Expanded Requirements,
 - New Requirements,
 - Deleted Requirements,
 - Relocation of Requirements
- Four New Articles Added

What to Expect

In this course the student will be presented an overview of the most significant changes found in the 2020 NEC. This is part 2 of a series of courses covering the changes and will progress through each chapter and its articles presenting the many important changes. The changes will be underlined for easy recognition and a short synopsis of the reason for the change is presented as well.

DISCLAIMER:

Although every effort has been made to the accuracy of the material presented, by no means shall the student use or substitute this material for official 2020 NEC. Additionally, Ezekiel Enterprises, LLC shall not be liable for any special, incidental, consequential or exemplary damages resulting, in whole or in part, from the reader's uses of or reliance upon this material.

2020 NEC Major Additions

Article 242 Overvoltage Protection provides the general, installation, and connection requirements for overvoltage protection and overvoltage protective devices.

Article 311 Medium Voltage Conductors and Cable covers the use, installation, construction specifications and ampacities for medium voltage conductors and cable (Type MV).

Article 337 Type P Cable covers the use, installation, and construction specifications for up through 2000-volt Type P cable (armored and unarmored).

Article 800 General Requirements for Communications Systems combines common requirements previously found in Articles 800 (now Article 805) for communications circuits, 820 for community antenna television and radio distribution systems, 830 for network-powered broadband communications systems and 840 for premises-powered broadband communications systems into a new “general” article that applies to all of these articles unless modified by the forenamed articles.

Chapter 4. Equipment for General Use: Articles 400-490

400 – Flexible Cords and Flexible Cables

400.12

Uses Not Permitted, Flexible Cords, flexible cables, cord sets, power supply cords

Reason for Change:

Revisions were made to 400.12 to include “flexible cords” in the “Uses Not Permitted” section along with flexible cables, cord sets, and power supply cords.

400.12 Uses Not Permitted. (Flexible Cords and Flexible Cables)

Unless specifically permitted in 400.10, flexible cords, flexible cables, flexible cord sets, and power supply cords shall not be used for the following:

- (1) As a substitute for the fixed wiring of a structure
- (2) Where run through holes in walls, structural ceilings, suspended ceilings, dropped ceilings, or floors
- (3) Where run through doorways, windows, or similar openings
- (4) Where attached to building surfaces

Exception to (4): Flexible cord and flexible cable shall be permitted to be attached to building surfaces in accordance with 368.56(B) and 590.4.

- (5) Where concealed by walls, floors, or ceilings or located above suspended or dropped ceilings

Exception to (5): Flexible cord and flexible cable cords, flexible cables, and power supply cords shall be permitted if contained within an enclosure for use in other spaces used for environmental air as permitted by 300.22(C)(3).

- (6) Where installed in raceways, except as otherwise permitted in this Code
- (7) Where subject to physical damage

Informational Note: For proper application see UL 817, Cord Sets and Power-Supply Cords, and UL 62, Flexible Cords and Cables.

402 – Fixture Wires

Table 402.3

New Type of Fixture Wire – FFHH-2

Reason for Change:

A new type of heat-resistant rubber-covered fixture wire (FFHH- 2) was added to Table 402.3.

Table 402.3. Fixture Wires

402.3 Types. Fixture wires shall be of a type listed in Table 402.3, and they shall comply with all requirements of that table. The fixture wires listed in Table 402.3 are all suitable for service at 600 volts, nominal, unless otherwise specified.

Informational Note: Thermoplastic insulation may stiffen at temperatures lower than -10°C (+14°F). Thermoplastic insulation may also be deformed at normal temperatures where subjected to pressure, such as at points of support.

Table 402.3 Fixture Wires (See NEC for complete text of table)

404 - Switches

404.7

Visibility Requirements for Switches and Circuit Breakers

Reason for Change:

Revisions were made to clarify that switches and circuit breakers indication must be visible without opening the enclosure to see the open/closed indication.

404.7 Indicating. (Switches)

General-use and motor-circuit switches, circuit breakers, and molded case switches, where mounted in an enclosure as described in 404.3, shall clearly indicate, in a location that is visible when accessing the external operating means, whether they are in the open (off) or closed (on) position. Where these switch or circuit breaker handles are operated vertically rather than rotationally or horizontally, the up position of the handle shall be the closed (on) position.

Exception No. 1: Vertically operated double-throw switches shall be permitted to be in the closed (on) position with the handle in either the up or down position.

Exception No. 2: On busway installations, tap switches employing a center-pivoting handle shall be permitted to be open or closed with either end of the handle in the up or down position. The switch position shall be clearly indicating and shall be visible from the floor or from the usual point of operation.

404.9

General-Use Snap Switches, Dimmers, and Control Switches

Reason for Change:

Revisions were made to include other switches with comparable control functions (not just snap switches) in requirements for faceplates, grounding, and construction.

404.9 Provisions for General-Use Snap Switches, Dimmers, and Control Switches.

(A) Faceplates. Faceplates provided for snap switches, dimmers, and control switches mounted in boxes and other enclosures shall be installed so as to completely cover the opening and, where the switch is flush mounted, seat against the finished surface.

(B) Grounding. Snap switches, including dimmer dimmers and similar control switches, shall be connected to an equipment grounding conductor and shall provide a means to connect metal faceplates to the equipment grounding conductor, whether or not a metal faceplate is installed. Metal faceplates shall be grounded bonded to the equipment grounding conductor. Snap switches, dimmers, control switches, and metal faceplates shall be considered connected to be part of an effective ground-fault current path if an equipment grounding conductor using either of the following conditions is met methods:

(1) The switch is mounted with metal screws to a metal box or metal cover that is connected to an equipment grounding conductor or to a nonmetallic box with integral means for connecting to an equipment grounding conductor.

(2) An equipment grounding conductor or equipment bonding jumper is connected to an equipment grounding termination of the snap switch.

Exception No. 1 to (B): Where no means exists within the snap-switch enclosure for connecting bonding to the equipment grounding conductor, or where the wiring method does not include or provide an equipment grounding conductor, a snap switch without a connection to an equipment grounding conductor shall be permitted for replacement purposes only. A snap switch wired under the provisions of this exception and located within 2.5 m (8 ft) vertically, or 1.5 m (5 ft) horizontally, of ground or exposed grounded metal objects shall be provided with a faceplate of nonconducting noncombustible material with nonmetallic attachment screws, unless the switch mounting strap or yoke is nonmetallic or the circuit is protected by a ground-fault circuit interrupter.

Exception No. 2 to (B): Listed kits or listed assemblies shall not be required to be ~~connected~~ bonded to an equipment grounding conductor if all of the following conditions are met:

(1) The device is provided with a nonmetallic faceplate, ~~that cannot be installed on any other type of device,~~ and the device is designed such that no metallic faceplate replaces the one provided.

(2) The device does not have mounting means to accept other configurations of faceplates,

(3) The device is equipped with a nonmetallic yoke, ~~and~~

(4) All parts of the device that are accessible after installation of the faceplate are manufactured of nonmetallic materials.

Exception No. 3 to (B): A snap switch with integral nonmetallic enclosure complying with 300.15(E) shall be permitted without a bonding connection to an equipment grounding conductor.

(C) Construction. Metal faceplates shall be of ferrous metal not less than 0.76 mm (0.030 in.) in thickness or of nonferrous metal not less than 1.02 mm (0.040 in.) in thickness. Faceplates of insulating material shall be noncombustible and not less than 2.54 mm (0.100 in.) in thickness, but they shall be permitted to be less than 2.54 mm (0.100 in.) in thickness if formed or reinforced to provide adequate mechanical strength.

404.14

Rating and Use of Switches

Reason for Change:

Switches will now be required to be listed and used within their ratings.

404.14 Rating and Use of Switches.

Switches shall be listed and used within their ratings ~~and as indicated in.~~ Switches of the types covered in 404.14(A) through (F) (E) shall be limited to the control of loads as specified accordingly. Switches used to control cord-and-plug-connected loads shall be limited as covered in 404.14(F).

Informational Note No. 1: For switches on signs and outline lighting, see 600.6.

Informational Note No. 2: For switches controlling motors, see 430.83, 430.109, and 430.110.

404.22

Electronic Control Switches

Reason for Change:

Revision removes the word “lighting” from the phrase “electronic lighting control switches” as these switches may supply non-lighting loads.

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

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

406 – Receptacles, Cord Connectors, and Attachment Plugs (Caps)

406.4(D)(4), Ex. No. 1

General Installation Requirements (Receptacles)

Reason for Change:

Previous Ex. No. 1 to AFCI replacements was deleted as it is no longer relevant. Products that comply with the main requirement are now available.

406.4 General Installation Requirements (*Receptacles*)

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

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

(4) Arc-Fault Circuit-Interrupter Protection. ~~Where~~ If a receptacle outlet is located in any areas specified in 210.12(A), ~~or~~ (B), or (C) is replaced, a replacement receptacle at this outlet shall be one of the following:

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

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

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

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

406.4(D)(7)

Installation Requirements of Controlled Receptacles

Reason for Change:

Automatically controlled receptacles are required to be replaced with equivalently controlled receptacles.

406.4 General Installation Requirements.

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

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

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

406.5(G)(2)

Receptacle Mounting Under Sinks

Reason for Change:

Receptacle outlets are prohibited from being installed in the area beneath a sink in the face-up position.

406.5 Receptacle Mounting.

Receptacles shall be mounted in identified boxes or assemblies. The boxes or assemblies shall be securely fastened in place unless otherwise permitted elsewhere in this *Code*. Screws used for the purpose of attaching receptacles to a box shall be of the type provided with a listed receptacle, or shall be machine screws having 32 threads per inch or part of listed assemblies or systems, in accordance with the manufacturer's instructions.

(G) Receptacle Orientation.

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

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

406.9(C)

Receptacle Limitations in Bathrooms

Reason for Change:

Receptacle outlet(s) located in the area around a bathtub or shower stall have been revised to include a restricted “zone” similar to luminaires in said areas with an exception added for smaller space bathrooms.

406.9 Receptacles in Damp or Wet Locations.

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

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

406.12

Tamper-Resistant Receptacles

Reason for Change:

Requirements for tamper-resistant (TR) receptacles were expanded to attached and detached garages and accessory buildings of dwelling units. Common areas of multifamily dwelling units and hotels and motels are included as well. New List Item (8) was added for assisted living facilities.

406.12 Tamper-Resistant Receptacles.

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

- (1)** Dwelling units, in all areas including attached and detached garages and accessory buildings to dwelling units, and common areas of multifamily dwellings specified in 210.52 and 550.13
- (2)** Guest rooms and guest suites of hotels, and motels, and their common areas
- (3)** Child care facilities
- (4)** Preschools and elementary education facilities

- (5) Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices, and outpatient facilities
- (6) Subset of assembly occupancies described in 518.2 to include places of waiting awaiting transportation, gymnasiums, skating rinks, and auditoriums
- (7) ~~Dormitories~~ Dormitory units
- (8) Assisted living facilities

Informational Note No. 1: This requirement would include receptacles identified as 5-15, 5-20, 6-15, and 6-20 in ANSI/NEMA WD 6-2016, Wiring Devices — Dimensional Specifications.

Informational Note No. 2: Assisted living facilities are Institutional Use Group I-1 per IBC 2015.

Exception to (1), (2), (3), (4), (5), (6), and (7) and (8): Receptacles in the following locations shall not be required to be tamper resistant:

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

406.13

Single-Pole Separable-Connector Type

Reason for Change:

New requirements were added to Article 406 at 406.13 pertaining to “single-pole separate connectors.”

406.13 Single-Pole Separable-Connector Type.

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

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

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

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

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

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

(2) Line connectors are of the listed sequential-interlocking type so that load connectors are connected in the following sequence and that disconnection is in the reverse sequence: (a) Equipment grounding conductor connection (b) Grounded circuit conductor connection, if provided (c) Ungrounded conductor connection

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

(a) Equipment grounding conductor connectors

(b) Grounded circuit-conductor connectors, if Provided

(c) Ungrounded conductor connectors

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

408 – Switchboards, Switchgear, and Panelboards

408.4(A)

Approved Locations for Circuit Directory for a Panelboard

Reason for Change:

Revisions were made to allow the circuit directory for a panelboard to be located in an “approved location adjacent” to the panelboard door.

408.4 Field Modification Required. (Switchboards, Switchgear, and Panelboards)

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

408.6

Short-Circuit Current Ratings of Switchboards, Switchgear, and Panelboards

Reason for Change:

New requirement added to Article 408 requiring available fault current and date calculation was performed to be field marked on the enclosure at the point of supply for switchboards, switchgear, and panelboards (other than dwelling units).

408.6 Short-Circuit Current Rating. (Switchboards, Switchgear, and Panelboards)

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

408.8

Reconditioning of Equipment. (Switchboards, Switchgear, and Panelboards)

Reason for Change:

New section added to address reconditioning of panelboards (No) and switchboards and switchgear (Yes).

408.8 Reconditioning of Equipment. (Switchboards, Switchgear, and Panelboards)

Reconditioning of equipment within the scope of this article shall be limited as described in 408.8(A) and (B). The reconditioning process shall use design qualified parts verified under applicable standards and be performed in accordance with any instructions provided by the manufacturer. If equipment has been damaged by fire, products of combustion, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service.

(A) Panelboards. Panelboards shall not be permitted to be reconditioned. This shall not prevent the replacement of a panelboard within an enclosure. In the event the replacement has not been listed for the specific enclosure and the available fault current is greater than 10,000 amperes, the completed work shall be field labeled, and any previously applied listing marks on the cabinet that pertain to the panelboard shall be removed.

(B) Switchboards and Switchgear. Switchboards and switchgear, or sections of switchboards or switchgear, shall be permitted to be reconditioned. Reconditioned switchgear shall be listed or field labeled as reconditioned, and previously applied listing marks, if any, within the portions reconditioned shall be removed.

408.18(C)

Clearances for Switchboards, Switchgear, and Panelboards)

Reason for Change:

New provision will require switchboards and switchgear requiring rear or side access to be marked (by manufacturer) on the front of said equipment indicating rear or side access is needed. Existing 408.3(D) was moved to new 408.18(C) to intensify the requirement that grounded and grounding

terminals be installed such that it is not necessary to reach across ungrounded bus or terminal(s) to make connections.

408.18 Clearances (Switchboards, Switchgear, and Panelboards)

(C) Connections. Each section of equipment that requires rear or side access to make field connections shall be so marked by the manufacturer on the front. Section openings requiring rear or side access shall comply with 110.26. Load terminals for field wiring shall comply with 408.18(C)(1), (C)(2), or (C)(3) as applicable.

(1) Equipment Grounding Conductors. Load terminals for field wiring, including grounded circuit conductor load terminals and connections to the equipment grounding conductor bus for load equipment grounding conductors, shall be so located that it is not necessary to reach across or beyond an uninsulated ungrounded bus in order to make connections.

(2) Grounded Circuit Conductors. Where multiple branch or feeder grounded circuit conductor load terminals for field wiring are grouped together in one location, they shall be so located that it is not necessary to reach across uninsulated ungrounded bus, whether or not energized, in order to make connections. Where only one branch or feeder set of load terminals for field wiring are grouped with its associated ungrounded load terminals, they shall be so located that it is not necessary to reach across energized uninsulated bus including other branch or feeder bus in order to make connections. Bus on the line side of service, branch, or feeder disconnects is considered energized with respect to its associated load side circuits.

(3) Ungrounded Conductors. Load terminals for ungrounded conductors shall be so located that it is not necessary to reach across energized uninsulated bus in order to make connections. Bus on the line side of service, branch, or feeder disconnects is considered energized with respect to its associated load side circuits.

408.36, Ex. No. 1

Overcurrent Protection in Panelboards

2017 Requirement: Panelboards were generally required to be provided with individual overcurrent protected having a rating not greater than that of the panelboard. This overcurrent protective device could be located within the panelboard itself or at any point on the supply side of the panelboard. An exception to this rule gave permission to exclude this individual overcurrent protection if the panelboard was being used as

service equipment with up to six means of disconnect as permitted by 230.71.

408.36 Overcurrent Protection (*Panelboards*)

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

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

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

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

408.43

Panelboard Orientation

Reason for Change:

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

408.43 Panelboard Orientation.

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

410 – Luminaires, Lamp-holders, and Lamps

410.2 and 410.16 Clothes Closet Storage Space

Reason for Change:

The word “clothes” was added at the definition, Figure 410.2 and the requirements of 410.16 to limit these requirements to Clothes Closet Storage Space.

410.2 Definitions. (Luminaires, Lampholders, and Lamps)

Clothes Closet Storage Space. The volume bounded by the sides and back closet walls and planes extending from the closet floor vertically to a height of 1.8 m (6 ft) or to the highest clothes-hanging rod and parallel to the walls at a horizontal distance of 600 mm (24 in.) from the sides and back of the closet walls, respectively, and continuing vertically to the closet ceiling parallel to the walls at a horizontal distance of 300 mm (12 in.) or the width of the shelf, whichever is greater; for a closet that permits access to both sides of a hanging rod, this space includes the volume below the highest rod extending 300 mm (12 in.) on either side of the rod on a plane horizontal to the floor extending the entire length of the rod. See Figure 410.2.

Figure 410.2 Clothes Closet Storage Space.

410.16 Luminaires in Clothes Closets.

(A) Luminaire Types Permitted. Only luminaires of the following types shall be permitted in a clothes closet:

- (1) Surface-mounted or recessed incandescent or LED luminaires with completely enclosed light sources
- (2) Surface-mounted or recessed fluorescent luminaires
- (3) Surface-mounted fluorescent or LED luminaires identified as suitable for installation within the clothes closet storage space

(B) Luminaire Types Not Permitted. Incandescent luminaires with open or partially enclosed lamps and pendant luminaires or lampholders shall not be permitted.

(C) Location. The minimum clearance between luminaires installed in clothes closets and the nearest point of a clothes closet storage space shall be as follows:

- (1) 300 mm (12 in.) for surface-mounted incandescent or LED luminaires with a completely enclosed light source installed on the wall above the door or on the ceiling.
- (2) 150 mm (6 in.) for surface-mounted fluorescent luminaires installed on the wall above the door or on the ceiling.
- (3) 150 mm (6 in.) for recessed incandescent or LED luminaires with a completely enclosed light source installed in the wall or the ceiling.
- (4) 150 mm (6 in.) for recessed fluorescent luminaires installed in the wall or the ceiling.
- (5) Surface-mounted fluorescent or LED luminaires shall be permitted to be installed within the clothes closet storage space where identified for this use.

410.36(A)

Means of Support for Luminaires Supported by Outlet Boxes

Reason for Change:

Luminaires can be supported in accordance with separable attachment fittings and these outlet boxes are considered lighting outlets.

410.36 Means of Support

(A) Luminaires Supported By Outlet Boxes. Luminaires shall be permitted to be supported by outlet boxes or fittings installed as required by 314.23 ~~and complying with the provisions of 314.27(A)(1) and 314.27(A)(2) shall be permitted to support luminaires.~~ The installation shall comply with the following requirements:

- (1) The outlet boxes or fittings shall comply with 314.27(A)(1) and 314.27(A)(2).
- (2) Luminaires shall be permitted to be supported in accordance with 314.27(E).
- (3) Outlet boxes complying with 314.27(E) shall be considered lighting outlets as required by 210.70(A), (B), and (C).

410.44

Methods of Grounding. (Luminaires, Lampholders, and Lamps)

Reason for Change:

Since there is no requirement for a luminaire with no accessible conductive parts, or a luminaire made of insulating material to be grounded, there is

no need to exempt such a luminaire from grounding requirements. Therefore, previous Ex. No. 1 to 410.44 was deleted.

410.44 Methods of Grounding. (Luminaires, Lampholders, and Lamps)

Luminaires and equipment shall be mechanically connected to an equipment grounding conductor as specified in 250.118 and sized in accordance with 250.122.

~~**Exception No. 1:** Luminaires made of insulating material that is directly wired or attached to outlets supplied by a wiring method that does not provide a ready means for grounding attachment to an equipment grounding conductor shall be made of insulating material and shall have no exposed conductive parts.~~

Exception No. 1 2: Replacement luminaires shall be permitted to connect an equipment grounding conductor from the outlet in the same manner as replacement receptacles in compliance with 250.130(C). The luminaire shall then comply with 410.42.

Exception No. 2 3: Where no equipment grounding conductor exists at the outlet, replacement luminaires that are GFCI protected or do not have exposed conductive parts shall not be required to be connected to an equipment grounding conductor.

410.69

Identification of Control Conductor Insulation

Reason for Change:

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

410.69 Identification of Control Conductor Insulation. (Luminaires, Lampholders, and Lamps)

Where control conductors are spliced, terminated, or connected in the same luminaire or enclosure as the branch-circuit conductors, the field-connected control conductor shall not be of a color reserved for the grounded branch-circuit conductor or the equipment grounding conductor. This requirement shall become effective January 1, 2022.

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

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

410.116(C)

Recessed Luminaires Installed in Fire-Resistance Construction

Reason for Change:

The requirements for recessed luminaires installed in fire-resistance construction revised to be consistent with current listing options and relocated to 410.116(C). Requirements were updated with provisions that address the use of recessed LED luminaires.

410.116 Clearance and Installation. (*Flush and Recessed Luminaires*)

(C) Installation in Fire-Resistant Construction. Luminaires marked "FOR USE IN NON-FIRERATED INSTALLATIONS" shall not be used in fire-rated installations. Where a luminaire is recessed in fire-resistant material in a building of fire-resistant construction, a temperature higher than 90°C (194°F) but not higher than 150°C (302°F) shall be considered acceptable if the luminaire is plainly marked for that service. the recessed luminaire shall satisfy one of the following:

- (1)** The recessed luminaire shall be listed for use in a fire resistance-rated construction.
- (2)** The recessed luminaire shall be installed in or used with a luminaire enclosure that is listed for use in a fire resistance-rated construction.
- (3)** The recessed luminaire shall be listed and shall be installed in accordance with a tested fire resistance- rated assembly. When a tested fire resistance- rated assembly allows the installation of a recessed fluorescent luminaire, a recessed LED luminaire of comparable construction shall be permitted.

410.118 Luminaire Access to Other Boxes

Reason for Change:

New section added to clarify that a luminaire cannot be used to access outlet, pull, or junction boxes or conduit bodies that are not associated with wiring for that luminaire.

410.118 Access to Other Boxes. (Luminaires, Etc.)

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

Article 410, Part XVI Horticultural Lighting Equipment

Reason for Change:

A new Part XVI was added to Article 410 for Horticultural Lighting Equipment.

Article 410, Part XVI Special Provisions for Horticultural Lighting Equipment

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

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

410.172 Listing.

410.174 Installation and Use.

410.176 Locations Not Permitted.

(A) General Lighting.

(B) Installed Location.

410.178 Flexible Cord.

410.180 Fittings and Connectors.

410.182 Grounding.

410.184 Ground-Fault Circuit-Interrupter Protection.**410.186 Support.****410.188 Hazardous (Classified) Locations.**

(See NEC for complete text).

422 - Appliances

422.5(A)

GFCI Requirements for Appliances

Reason for Change:

The “provided for public use” condition has been removed from GFCI requirements for both automotive vacuum machines and tire inflation machines. Sump pumps has been added to the list of appliances requiring GFCI protection. Bottle fill stations was added to GFCI requirements for drinking water coolers. GFCI requirements for dishwashers moved from 210.8(D) to 422.5(A)(7).

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

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

- (1)** Automotive vacuum machines ~~provided for public use~~
- (2)** Drinking water coolers and bottle fill stations
- (3)** Cord-and-plug-connected high-pressure spray washing machines- cord-and-plug-connected
- (4)** Tire inflation machines provided for public use
- (5)** Vending machines
- (6)** Sump pumps
- (7)** Dishwashers

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

422.16(B)(2)

Flexible Cords Requirements for Built-in Dishwashers and Trash Compactors

Reason for Change:

A flexible cord to an adjacent space for a dishwasher passing through an opening is now required to be protected in the form of a bushing, grommet or other approved means.

422.16 Flexible Cords. (Appliances)

(B) Specific Appliances

(2) Built-in Dishwashers and Trash Compactors. Built-in dishwashers and trash compactors shall be permitted to be cord-and-plug-connected with a flexible cord identified as suitable for the purpose in the installation instructions of the appliance manufacturer where all of the following conditions are met:

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

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

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

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

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

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

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

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

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

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

422.16(B)(4)

Flexible Cords and Microwave Oven/Range Hood Combinations

Reason for Change:

Revision clarifies that the same conditions are applicable to cord-and-plug-connected, over-the-range microwave ovens incorporating range-hood as a range hood.

422.16 Flexible Cords. (Appliances)

(B) Specific Appliances.

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

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

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

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

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

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

(4) The receptacle is accessible.

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

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

424 – Fixed Electric Space-Heating Equipment

424.20(A)**Thermostatically Controlled Switching Devices, Combination Thermostats, Manually Controlled Switches for Fixed Electric Space-Heating Equipment****Reason for Change:**

Revision requires thermostatically controlled switching devices and combination thermostats and manually controlled switches for fixed electric space-heating equipment to be located in an accessible location.

424.20 Thermostatically Controlled Switching Services. (*Fixed Electric Space-Heating Equipment*)

(A) Serving as Both Controllers and Disconnecting Means. Thermostatically controlled switching devices and combination thermostats and manually controlled switches shall be permitted to serve as both controllers and disconnecting means, provided they meet all of the following conditions:

- (1) Provided with a marked "off" position
- (2) Directly open all ungrounded conductors when manually placed in the "off" position
- (3) Designed so that the circuit cannot be energized automatically after the device has been manually placed in the "off" position
- (4) Located as specified in 424.19
- (5) Located in an accessible location

425 – Fixed Resistance and Electrode Industrial Process Heating Equipment**425.22(B)****Resistance-Type Heating Elements in Fixed Industrial Process Heating Equipment****Reason for Change:**

Resistance-type heating elements in fixed industrial process heating

equipment are now permitted to be subdivided into circuits not exceeding 120 amperes and protected at not more than 150 amperes under certain conditions.

425.22 (Fixed Resistance and Electrode Industrial Process Heating Equipment)

(B) Resistance Elements. Resistance-type heating elements in fixed industrial process heating equipment shall be protected at not more than 60 amperes. Equipment rated more than 48 amperes and employing such elements shall have the heating elements subdivided, and each subdivided load shall not exceed 48 amperes.

Resistance-type heating elements in fixed industrial process heating equipment shall be permitted to be subdivided into circuits not exceeding 120 amperes and protected at not more than 150 amperes where one of the following is met:

- (1)** Elements are integral with and enclosed within a process heating surface.
- (2)** Elements are completely contained within an enclosure identified as suitable for this use.
- (3)** Elements are contained within an ASME-rated and stamped vessel.

Where a subdivided load is less than 48 amperes, the rating of the supplementary overcurrent protective device shall comply with 425.4(B) 425.3(B). A boiler employing resistance-type immersion heating elements contained in an ASME-rated and stamped vessel shall be permitted to comply with 425.72(A).

430 – Motors, Motor Circuits, and Controllers

430.2

Electronically Protected (Motors)

Reason for Change:

A new definition for “Electronically Protected (as applied to motors)” was added to 430.2.

430.2 Definitions. (Motors, Motor Circuits, and Controllers)

Electronically Protected (as 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, overload and failure to start.

430.122(B)

Adjustable-Speed Drive Motors

Reason for Change:

Output conductors between power conversion equipment and a motor are generally required to have an ampacity equal to or larger than 125 percent of the motor full-load current.

430.122 Conductors- Minimum Size and Ampacity (*Adjustable-Speed Drive Motors*)

(B) Output Conductors. The conductors between the power conversion equipment and the motor shall have an ampacity equal to or larger than 125 percent of the motor full-load current as determined by 430.6(A) or (B).

Exception: If the power conversion equipment is listed and marked as "Suitable for Output Motor Conductor Protection," the conductor between the power conversion equipment and the motor shall have an ampacity equal to or greater than the larger of:

- (1) 125 percent of the motor full load current as determined by 430.6(A) or (B)
- (2) The ampacity of the minimum conductor size marked on the power conversion equipment

Informational Note: The minimum ampacity required of output conductors is often different than that of the conductors supplying the power conversion equipment. See 430.130 and 430.131 for branch circuit protection requirements.

430.122(D)

Adjustable-Speed Drive Motors

Reason for Change:

New requirement clarifies sizing of conductors for several motors or motor(s) and other load(s) that include adjustable-speed drive systems and power conversion equipment needs to be based on the rated input current to the power conversion equipment in the calculations (*not HP rating of the motor on the output of the power conversion equipment*).

430.122 Conductors- Minimum Size and Ampacity (*Adjustable-Speed Drive Motors*)

(A) Branch/Feeder Circuit Conductors.

(B) Output Conductors.

(C) Bypass Device.

(D) Several Motors or a Motor and Other Loads. Conductors supplying several motors or a motor and other loads, including power conversion equipment, shall have ampacity in accordance with 430.24, using the rated input current of the power conversion equipment for purposes of calculating ampacity.

440 – Air-Conditioning and Refrigerating Equipment

440.9

Grounding and Bonding HACR Equipment

Reason for Change:

Outdoor metallic raceway systems that use “compression-type fittings” required to contain a wire-type equipment grounding conductor when installed outdoors on a roof to supply HACR equipment.

440.9 Grounding and Bonding. (HACR Equipment)

Where ~~multimotor and combination-load~~ equipment is installed outdoors on a roof, an equipment grounding conductor of the wire type shall be installed in outdoor portions of metallic raceway systems that use ~~non-threaded~~ compression-type fittings.

440.32

Branch-Circuit Conductors Supplying a Single Motor-Compressor

Reason for Change:

Revision clarifies that the 125 percent is to be applied to either the branch-circuit selection current or the rated load current, whichever is greater for the branch-circuit conductors supplying a single motor-compressor.

440.32 Single Motor-Compressor. (HACR Equipment)

Branch-circuit conductors supplying a single motor- compressor shall have an ampacity not less than the greater of:

- (1) 125 percent of either the motor-compressor rated-load current or
- (2) 125 percent of the branch-circuit selection current, ~~whichever is greater.~~

For a wye-start, delta-run connected motor-compressor, the selection of branch-circuit conductors between the controller and the motor-compressor shall be permitted to be based on 72 percent of either the motor-compressor rated-load current or the branch-circuit selection current, whichever is greater.

Informational Note: The individual motor circuit conductors of wye-start, delta-run connected motor- compressors carry 58 percent of the rated load current. The multiplier of 72 percent is obtained by multiplying 58 percent by 1.25.

445 - Generators

445.6

Listing of Stationary Generators of 600 Volts and Less

Reason for Change:

New provisions added to require stationary generators of 600 volts and less to be listed.

445.6 Listing (*Generators*)

Stationary generators 600 volts and less shall be listed.

Exception: One of a kind or custom manufactured generators shall be permitted to be field labeled by a field evaluation body.

Informational Note: For additional information, see UL 2200, Standard for Stationary Engine Generator Assemblies.

445.18(D)**Emergency Shutdown in One- and Two-Family Dwelling Units****Reason for Change:**

New requirements were added to require an outdoor emergency generator shutdown device for generators (*other than cord-and-plug-connected generators*) installed at one- and two-family dwelling units.

445.18 Disconnecting Means and Emergency Shutdown of Prime Mover.

(A) Disconnecting Means.

(B) Emergency Shutdown of Prime Mover.

(C) Remote Emergency Shutdown.

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

~~(E)~~ Generators Installed in Parallel.

(see NEC for complete text.)

450 – Transformers and Transformer Vaults (Including Secondary Ties)

450.9

Horizontal Top Surfaces of Transformers Prohibited as a Storage Area

Reason for Change:

New sentence was added to prohibit horizontal top surfaces of transformers from being used as a storage area.

450.9 Ventilation. (Transformers)

The ventilation shall dispose of the transformer full-load heat losses without creating a temperature rise that is in excess of the transformer rating.

Informational Note No. 1: See ANSI/IEEE C57.12.00-1993 2015, General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers, and ANSI/IEEE C57.12.01-1993 2015, General Requirements for Dry-Type Distribution and Power Transformers.

Informational Note No. 2: Additional losses may occur in some transformers where nonsinusoidal currents are present, resulting in increased heat in the transformer above its rating. See ANSI/IEEE C57.110-1993 2008, Recommended Practice for Establishing Liquid-Filled and Dry-Type Power and Distribution Transformer Capability When Supplying Nonsinusoidal Load Currents, where transformers are utilized with nonlinear loads.

Transformers with ventilating openings shall be installed so that the ventilating openings are not blocked by walls or other obstructions. The required clearances shall be clearly marked on the transformer. Transformer top surfaces that are horizontal and readily accessible shall be marked to prohibit storage.

480 – Storage Batteries

480.7(G)

Directory and Identification of Power Sources for Storage Batteries

Reason for Change:

New requirements were added for directory and identification of power sources for storage batteries.

480.7 DC Disconnect Methods (*Storage Batteries*)

(A) Disconnecting Means. A disconnecting means shall be provided for all ungrounded conductors derived from a stationary battery system with a voltage over 60 volts dc. A disconnecting means shall be readily accessible and located within sight of the battery system.

Informational Note: See 240.21(H) for information on the location of the overcurrent device for battery conductors.

(B) Emergency Disconnect. [see Analysis changes at 230.85 and 445.18(D) for One- and Two-Family Dwelling Emergency Disconnect requirements]

(C) Disconnection of Series Battery Circuits.

~~(B)~~(D) Remote Actuation.

~~(C)~~(E) Busway.

~~(D)~~(F) Notification.

(G) Identification of Power Sources. Battery systems shall be indicated by 480.7(G)(1) and (G)(2).

(1) Facilities with Utility Services and Battery Systems. Plaques or directories shall be installed in accordance with 705.10 and 712.10.

Exception: This requirement does not apply where a disconnect in 480.7(A) is not required.

(2) Facilities with Stand-Alone Systems. A permanent plaque or directory shall be installed in accordance with 710.10.

(see NEC for complete text)

490 – Equipment Over 1000 Volts, Nominal

490.21(A)(5)

Retrofit Trip Units with Circuit-Interrupting Devices

Reason for Change:

Retrofit trip units are now required to be listed for use with the specific circuit breaker with which it is installed.

490.21 Circuit- Interrupting Devices (Equipment Over 1000 Volts, Nominal)

(A) Circuit Breakers

(1) Location.

(2) Operating Characteristics.

(3) Nameplate.

(4) Rating.

(5) Retrofit Trip Units. Retrofit trip units shall be listed for use with the specific circuit breaker with which it is installed.

(see NEC for complete Code text)

Quiz Questions

1. **Which of the following cannot be used as substitutes for fixed wiring of a structure?**
 - Flexible cords
 - Flexible cables
 - Cord sets
 - All of the above

2. **What new type of wire was added to table 402.3?**
 - FFHH-2
 - FFH-2
 - HFF
 - KFF-2

3. **Revisions were made to clarify that switches and circuit breakers indication must be visible _____.**
 - only when installed in locations without direct access
 - with a manufacturer's removable label prior to installation
 - for emergency cut-off applications only
 - without opening the enclosure to see the open/closed indication

4. **Which of the following faceplates require bonding to the EGC?**
 - Ceramic faceplate
 - Metal faceplate
 - Plastic faceplate
 - All of the above

5. **Are switches now required to be listed?**

- Yes
- No
- Depends on load
- Only if used in applications outside the switch rating

6. **Electronic _____ shall not introduce current on the equipment grounding conductor during normal operation.**

- lighting control switches
- control switches
- lighting switches
- All of the above

7. **Are automatically controlled receptacles required to be replaced with equivalently controlled receptacles?**

- Yes
- No

8. **Receptacles shall not be installed _____ in the area below a sink.**

- beyond edge of sinktub
- in a face-up position
- anywhere
- in a face-down position

9. **Receptacles are now prohibited from being installed within how many feet horizontally from of a tub/shower?**

- 1 ft.
- 1.5 ft.
- 3 ft.

- 6 ft.

10. Which of the following areas do not require tamper resistant receptacles?

- Dwelling unit detached garage
- Assisted living facilities
- Dormitory units
- None of the above

11. A new article was added at 406.13 for what type of equipment?

- Tamper-Resistant Receptacles
- Low-voltage receptacles
- Automatic receptacles
- Single-Pole Separable-Connector Type

12. A new requirement was added requiring available fault current and date calculation was performed field marked on panelboard, what article is this?

- 408.6
- 406.8
- 404
- 400

13. Which of the following can now be reconditioned?

- Switchboards
- Switchgear
- Panelboards
- All of the above

14. Can a recessed luminaire be used as an access point for a junction box?

- Yes
- No
- Only if luminaire is less than 250 volts

- Only if luminaire is less than 125 volts

15. Which of the following statements are true regarding cord-n-plug requirements?

- Cord-n-plug is not allowed on any newly installed appliance, except refrigerator
- A Cord-n-plug is not allowed for microwave ovens
- A Cord-n-plug for a dishwasher passing through an opening needs to be protected by a bushing, grommet, or other means
- All of the above

16. What is the terminology used for a motor that has internal protection against damaging itself?

- Self Protected
- Internally Protected
- Automatic Protection
- Electronically Protected

17. Conductor sizing for motors is dependent on what?

- HP rating of the motor on the output of the power conversion equipment
- Rated input current to the power conversion equipment in the calculations
- Power conversion equipment calculation from motor wattage
- All of the above

18. What is the minimum ampacity of a conductor serving a single motor compressor?

- 25% of current
- 75% of current
- 125% of current
- 150% of current

19. Outdoor generators, except than cord-n-plug types, now require what?

- Emergency shutdown device
- GFCI protection
- AFCI protection
- All of the above

20. Do retrofit trips for equipment over 1000 volts need to be listed?

- Yes
- No
- Maybe, depends on ampacity rating
- Does not specify