NEC 2014 Code Changes

Articles 400-408.55

CHANGES FROM 2011 TO 2014 CODE ARE IN RED

Chapter 4 – Equipment for General Use

ARTICLE 400 – Flexible Cords and Cables

400.4 Types

Flexible cords and flexible cables shall conform to the description in Table 400.4. The use of flexible cords and flexible cables other than those in Table 400.4 need to have permission by the authority having jurisdiction.

400.5 Ampacities for Flexible Cords and Cables

(A) Ampacity Tables

Table 400.5(A)(1) shows the allowable ampacities, and Table 400.5(A)(2) shows the ampacities for flexible cords and cables with not more than three current-carrying conductors. These tables will be used in conjunction with applicable end-use product standards to ensure selection of the proper size and type. Where cords and cables are used in ambient temperatures other than 30 degrees Celsius (86 degrees Fahrenheit) the temperature correction factors from Table 310.15(B)(2)(a) that correspond to the temperature rating of the cord or cable will be applied to the ampacity in Table 400.5(A)(1) and Table 400.5(A)(2). Cords and cables rated 105°C must use correction factors in the 90°C column of Table 310.15(B)(2)(a) for temperature correction. Where the number of current carrying conductors is more than three, the allowed ampacity or the ampacity of each conductor will be reduced from the 3-conductor rating as outlined in Table 400.5(A)(3).
Further Information: See Informative Annex B, Table B.310.15(B)(2)(11), for adjustment factors for more than three current carrying conductors in a raceway or cable with load diversity.

A neutral conductor that carries only the unbalanced current from other conductors of the same circuit will not be required to meet the requirements of a current carrying conductor.

In a 3-wire circuit consisting of two phase conductors and the neutral conductor of a 4-wire, 3-phase, wye-connected system, a common conductor carries approximately the same current as the line-to-neutral currents of the other conductors and will be considered a current carrying conductor.

On a 4-wire, 3-phase, wye-circuit where more than 50 percent of the load consists of nonlinear loads, there are harmonic currents present in the neutral conductor and the neutral conductor will be considered a current carrying conductor.

An equipment grounding conductor will not be considered a current carrying conductor.

Where a single conductor is used for both equipment grounding and to carry unbalanced current from other conductors, as allowed for in section 250.140 for electric ranges and electric clothes dryers, it will not be considered a current carrying conductor.

(C) Engineering Supervision

Under engineering supervision, conductor ampacities will be allowed to be calculated according to section 310.15(C).

400.6 Markings

(A) Standard Markings

Flexible cords and cables will be marked by means of a printed tag attached to the coil reel or carton. The tag will contain the information required in section 310.120(A).
Required markings on tags, cords, and cables shall also include the maximum operating temperature of the flexible cord or cable.

400.7 Uses Permitted

(A) Uses. Flexible cords and cables shall be used only for the following:

1. Pendants.
2. Wiring of luminaires.
3. Connection of portable luminaires, portable and mobile signs, or appliances.
4. Elevator cables.
5. Wiring of cranes and hoists.
6. Connection of utilization equipment to facilitate frequent interchange.
7. Prevention of the transmission of noise or vibration.
8. Appliances where the fastening means and mechanical connections are specifically designed to permit ready removal for maintenance and repair, and the appliance is intended or identified for flexible cord connection.
9. Connection of moving parts.
10. Where specifically permitted elsewhere in this Code.
11. Between an existing receptacle outlet and an inlet, where the inlet provides power to an additional single receptacle outlet. The wiring interconnecting the inlet to the single receptacle outlet must be a Chapter 3 wiring method. The inlet, receptacle outlet, and Chapter 3 wiring method, including the flexible cord and fittings, is to be a listed assembly specific for this application.
(B) Attachment Plugs

Where used as allowed in section 400.7(A)(3), (A)(6), and (A)(8), each flexible cord will be equipped with an attachment plug and will be energized from a receptacle outlet or cord connector body.

400.13 Overcurrent Protection

Flexible cords no smaller than 18 AWG and tinsel cords or cords having equivalent characteristics of smaller size approved for use with specific appliances, will be considered protected against overcurrent according to section 240.5.

400.14 Protection from Damage

Flexible cords and cables will be protected by bushings, or fittings where passing through holes in covers, outlet boxes, or similar enclosures.

In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, flexible cords and cables will be allowed to be installed in aboveground raceways that are no longer than 15 mm (50 ft.) to protect the flexible cord or cable from physical damage. Where more than three current carrying conductors are installed within the raceway, the allowable ampacity will be reduced according to Table 400.5(A)(3).

400.23 Equipment Grounding Conductor Identification.

A conductor intended to be used as an equipment grounding conductor shall have a continuous identifying marker readily distinguishing it from the other conductor or conductors.

Conductors having a continuous green color or a continuous green color with one or more yellow stripes shall not be used for other than equipment grounding conductors. Cords or cables consisting of integral insulation and a jacket without a non-integral grounding conductor
are permitted to be green.

III. Portable Cables Over 600 Volts, Nominal

400.30 Scope. Part III applies to single and multi-conductor portable cables used to connect mobile equipment and machinery.

400.31 Construction.

(A) Conductors. The conductors shall be 12 AWG copper or larger and employ flexible stranding.

(B) Equipment Grounding Conductor(s).

An equipment grounding conductor(s) must be provided in cables with three or more conductors. The total area shall not be at least the size of the equipment grounding conductor required in 250.122.

404.1 Scope

The provisions of this article apply to all switches, switching devices, and circuit breakers used as switches, operating at 1000 volts or less, unless referenced elsewhere in the Code for higher voltages.

404.2 Switch Connections

(C) Switches controlling Lighting Loads

The grounded circuit conductor for the controlled lighting circuit must be provided at the location where switches control lighting loads that are supplied by a grounded general-purpose branch circuit for other than the following:

(1) Where conductors enter the box enclosing the switch through a raceway, provided that the raceway is large enough for all contained conductors, including a grounded conductor
(2) Where the box enclosing the switch is accessible for the installation of an additional or replacement cable without removing finish materials

(3) Where snap switches with integral enclosures comply with 300.15(E)

(4) Where a switch does not serve a habitable room or bathroom

(5) Where multiple switch locations control the same lighting space is visible from the single or combined switch locations

(6) Where lighting in the area is controlled by automatic means

(7) Where a switch controls a receptacle load such that the entire floor area of the room or space is visible from the single or combined switch locations

(6) Where lighting in the area is controlled by automatic means

(7) Where a switch controls a receptacle load

404.4 Damp or Wet Locations

(A) Surface-Mounted Switch or Circuit Breaker

A switch or circuit breaker mounted on a surface in damp or wet locations must be enclosed in a weatherproof enclosure or cabinet that will adhere to with section 312.2.

(B) Flush-Mounted Switch or Circuit Breaker

A flush mounted switch or circuit breaker in a damp or wet location will be equipped with a weatherproof cover.

(C) Switches in Tub or Shower Spaces

Switches will not be installed within tubs or showers unless installed as part of a listed tub or shower assembly.
404.7 Indicating

General-use and motor-circuit switches, circuit breakers, and molded case switches, where mounted in an enclosure as described in 404.3, must clearly indicate 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 is to be the closed (on) position.

404.8 Accessibility and Grouping

(C) Multi-pole Snap Switches. A multi-pole, general-use snap switch shall not be permitted to be fed from more than a single circuit unless it is listed and marked as a two circuit or three-circuit switch.

404.9 Provisions for General-Use Snap Switches

(A) Faceplates.

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

(B) Grounding

Exception #1 to (B): Where no means exists within the snap-switch enclosure for connecting to the equipment grounding conductor or where the wiring method does not include or provide an equipment grounding conductor will be allowed for replacement purposes only. A snap switch wired under the provisions of this exception and located 2.5 m (8 ft.) vertically, or 1.5 m (5 ft.) horizontally, of ground or exposed grounded metal objects will be provided with a faceplate of non-conducting, 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 #2 to (B): Listed kits or listed assemblies will not be required to be connected 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.

(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 in nonmetallic materials.

Exception #3 to (B): A snap switch with integral nonmetallic enclosure adhering to section 300.15(E) will be allowed without a connection to an equipment grounding conductor.

(C) Construction

Metal faceplates will be of ferrous metal no less than 0.76 mm (0.030 in.) in thickness or of nonferrous metal no less than 1.02 mm (0.040 in.) in thickness. Faceplates on insulating material must be noncombustible and no less than 2.54 mm (0.100 in.) in thickness, but that will be allowed to be less than 2.54 mm (0.100 in.) in thickness if formed or reinforced to provide adequate mechanical strength.

404.10 Mounting of Snap Switches

(B) Box Mounted.

Flush-type snap switches mounted in boxes that are set back of the finished surface as permitted in 314.20 must be installed so that the extension plaster ears are seated against the surface. Flush-type snap switches mounted in boxes that are flush with the finished surface or project from it
are to be installed so that the mounting yoke or strap of the switch is seated against the box. Screws used for the purpose of attaching a snap switch to a box must be of the type provided with a listed snap switch, or be machine screws having 32 threads per inch or part of listed assemblies or systems, in accordance with the manufacturer’s instructions.

404.13 Knife Switches

(A) Isolating Switches. Knife switches rated at over 1200 amperes at 250 volts or less, and at over 1000 amperes at 251 to 1000 volts, shall be used only as isolating switches and shall not be opened under load.

404.14 Rating and Use of Snap Switches

Snap switches will be used within their ratings and as listed in section 404.10(A) through (F).

(A) Alternating-Current General-Use Snap Switch

(1) Resistive and inductive loads not to exceed the ampere rating of the switch at the voltage applied.

(F) Cord-and-Plug-Connected Loads

Where a snap switch is used to control cord-and-plug-connected equipment on a general-purpose branch circuit, each snap switch controlling receptacle outlets or cord connectors that are supplied by permanently connected cord pendants will be rated at no less than the rating of the maximum allowed ampere rating or setting of the overcurrent device protecting the receptacles or cord connectors, as shown in section 210.21(B).

Further Information: See 210.50(A) and 400.7(A)(1) for equivalency to a receptacle outlet of a cord connector that is supplied by a permanently connected cord pendant.

Exception: Where a snap switch is used to control not more than one receptacle on a branch circuit, the switch will be allowed to be rated at no less than the rating of the receptacle.
II. Construction Specifications

404.16 Knife Switches Rated 600 to 1000 Volts

Auxiliary contacts of a renewable or quick-break type or the equivalent are to be provided on all knife switches rated 600 to 1000 volts and designed for use in breaking current over 200 amperes.

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

406.2 Definition

Child Care Facility

A building, or portion of a building, used for educational, supervisory, or personal care services for more than four children seven years old or younger.

406.3 Receptacle Rating and Type

(E) Controlled Receptacle Marking.

All non-locking type, 125-volt, 15- and 20-ampere receptacles that are controlled by an automatic control device, or that incorporate control features that remove power from the outlet for the purpose of energy management or building automation, shall be marked with the symbol shown in Figure 406.3(E) and located on the controlled receptacle outlet where visible after installation.

406.4 General Installation Requirements

Receptacle outlets will be located in branch circuits according to Part III of Article 210. General installation requirements will be according to section 406.4(A) through (F).
(D) Replacements

Replacement of receptacles will adhere to section 406.4(D)(1), (D)(2), and (D)(3) where it applies. Arc fault circuit-interrupter type and ground-fault circuit interrupter type receptacles must be installed in a readily accessible location.

(3) Ground-Fault Circuit Interrupters

Ground-fault circuit-interrupter protected receptacles must be provided where replacements are made at receptacle outlets that are required to be so protected elsewhere in this Code.

Exception: Where replacement of the receptacle type is impracticable, such as where the outlet box size will not permit the installation of the GFCI receptacle, the receptacle is permitted to be replaced with a new receptacle of the existing type, where GFCI protection is provided and the receptacle is marked “GFCI protected” and “no equipment ground,” in accordance with 406.4(D)(2) (a), (b), or (c).

(4) Arc-fault Circuit Interrupter Protection

Where a receptacle outlet is supplied by a branch circuit that requires arc-fault circuit interrupter protection as specified elsewhere in this Code, a replacement receptacle at this outlet will 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.

The requirement becomes effective on January 1, 2014

(5) Tamper-resistant Receptacles
Listed tamper resistant receptacles will be provided where replacements are made at receptacle outlets that are required to be tamper resistant elsewhere in this Code.

(6) Weather-Resistant Receptacles

Weather resistant receptacles will be allowed where replacements are made at receptacle outlets that are required to be protected elsewhere in this Code.

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

(E) Receptacles in Countertops and Similar Work Surfaces.

Receptacles, unless listed as receptacle assemblies for countertop applications, are not to be installed in a face-up position in countertops or similar work surfaces. Where receptacle assemblies for countertop applications are required to provide ground-fault circuit-interrupter protection for personnel in accordance with 210.8, such assemblies are permitted to be listed as GFCI receptacle assemblies for countertop applications.

(F) Receptacles in Seating Areas and Other Similar Surfaces.

In seating areas or similar surfaces, receptacles are not to be installed in a face-up position unless the receptacle is any of the following:

(1) Part of an assembly listed as a furniture power distribution unit, if cord-and plug-connected
(2) Part of an assembly listed either as household furnishings or as commercial furnishings
(3) Listed either as a receptacle assembly for countertop applications or as a GFCI receptacle assembly for countertop applications

(4) Installed in a listed floor box

(G) Exposed Terminals. Receptacles shall be enclosed so that live wiring terminals are not exposed to contact.

(H) Voltage Between Adjacent Devices.

A receptacle shall not be grouped or ganged in enclosures with other receptacles, snap switches, or similar devices, unless they are arranged so that the voltage between adjacent devices does not exceed 300 volts, or unless they are installed in enclosures equipped with identified, securely installed barriers between adjacent devices.

406.6 Receptacle Faceplates (Cover Plates)

Receptacle faceplates will be installed so that they completely cover the opening and seat against the mounting surface.

Receptacle faceplates mounted inside of a box and having a recess mounted receptacle must effectively close the opening and seat against the mounting surface.

406.9 Receptacles in Damp or Wet Locations

(B) Wet Locations

(1) 15- and 20-Ampere Receptacles in a Wet Location

15- and 20-ampere, 125- and 250-volt receptacles installed in a wet location will have an enclosure that is weatherproof whether or not the attachment plug cap is inserted. For other than one- or two-family dwellings, An outlet box hood installed for this purpose will be listed, and where installed on an enclosure supported from grade as described in section 314.23(B) or as
described in section 314.23(F) will be identified as “extra-duty.” All 15- and 20-ampere, 125- and 250-volt non-locking-type receptacles will be listed weather resistant type.

Further Information #1: The types of receptacles covered by this requirement are identified as 5-15, 5-20, 6-15, and 6-20 in ANSI/NEMA WD 6-2002, National Electric Manufacturers Association Standard for Dimensions of Attachment Plugs and Receptacles.

406.12 Tamper-Resistant Receptacles in Dwelling Units

Tamper-resistant receptacles shall be installed as specified in 406.12(A) through (C).

(A) Dwelling Units.

In all areas specified in 210.52, all Non-locking-type 125-volt, 15- and 20-ampere receptacles must be listed tamper-resistant receptacles.

(B) Guest Rooms and Guest Suites of Hotels and Motels.

All non-locking-type 125-volt, 15- and 20-ampere receptacles located in guest rooms and guest suites of hotels and motels must be listed tamper-resistant receptacles.

(C) Child Care Facilities.

In all child care facilities, all non-locking-type 125-volt, 15- and 20-ampere receptacles are to be listed tamper-resistant receptacles.

Exception to (A), (B), and (C): Receptacles in the following locations will not be required to be tamper resistant.

(1) Receptacles located more than 1.7 m (5 ½ 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 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 according to section 400.7(A)(6), (A)(7), or (A)(8).

(4) Non-grounding receptacles used for replacements as allowed in section 406.4(D)(2)(a).

406.13 Tamper-Resistant Receptacles in Guest Rooms and Great Suites (2011)

All non-locking-type, 125-volt, 15- and 20-ampere receptacles located in guest rooms will be listed as tamper resistant receptacles.

406.14 Tamper-Resistant Receptacles in Child Care Facilities (NEC 2011)

In all child care facilities, all non-licking-type, 125-volt, 15- and 20-ampere receptacles will be listed as tamper resistant receptacles.

406.15 Dimmer-Controlled Receptacles.

A receptacle supplying lighting loads is not to be connected to a dimmer unless the plug/receptacle combination is a nonstandard configuration type that is specifically listed and identified for each such unique combination.

Article 408 – Switchboards and Panelboards

408.1 Scope

This article covers all switchboards, panelboards and switchgear. It does not apply to equipment operating at over 1000 volts, except as shown elsewhere in this Code.

408.2 Other Articles

Switches, circuit breakers, and over-current devices used on switchboards, panelboards and switchgear, and their enclosures will adhere to this article and also with the requirements of Article 240, 250, 312, 314, 404, and other articles that apply. Switchboards, panelboards and
switchgear in hazardous locations must adhere to the applicable provisions of Articles 500 through 517.

408.3 Support and Arrangement of Busbars on a Switchboard or Panelboard

(A) Conductors and Busbars on a Switchboard, Switchgear, or Panelboard.

Conductors and busbars on a switchboard, switchgear, or panelboard shall comply with 408.3(A)(1), (A)(2), and (A)(3) as applicable.

(1) Location. Conductors and busbars shall be located so as to be free from physical damage and shall be held firmly in place.

(2) Service Switchboards and Switchgear. Barriers must be placed in all service switchboards and switchgear such that no un-insulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations.

(E) Bus Arrangement

(1) AC Phase Arrangement.

Alternating-current phase arrangement on 3-phase buses must be A, B, C from front to back, top to bottom, or left to right, as viewed from the front of the switchboard, switchgear, or panelboard.

(2) DC Bus Arrangement.

Direct-current ungrounded buses are permitted to be in any order. Arrangement of dc buses shall be field marked as to polarity, grounding system, and nominal voltage.

(F) Switchboard, Panelboard or Switchgear Identification

(1) High-Leg Identification
A switchboard, panelboard or switchgear containing a 4-wire, delta-connected system where the midpoint of one phase winding is grounded will be legibly and permanently field marked “CAUTION ______ PHASE HAS ________ Volts to Ground”

(2) **Underground AC Systems**

A switchboard, switchgear, or panelboard containing an ungrounded ac electrical system as permitted in 250.21 shall be legibly and permanently field marked as follows:

“Caution Ungrounded System Operating — ______ Volts Between Conductors”

(3) **High-Impedance Grounded Neutral AC System.**

A switchboard, switchgear, or panelboard containing a high-impedance grounded neutral ac system in accordance with 250.36 shall be legibly and permanently field marked as follows:

CAUTION: HIGH-IMPEDANCE GROUNDED NEUTRAL AC SYSTEM OPERATING — ____ VOLTS BETWEEN CONDUCTORS AND MAY OPERATE — ______ VOLTS TO GROUND FOR INDEFINITE PERIODS UNDER FAULT CONDITIONS

(4) **Ungrounded DC Systems.** A switchboard, switchgear, or panelboard containing an ungrounded dc electrical system in accordance with 250.169 shall be legibly and permanently field marked as follows:

CAUTION: UNGROUNDED DC SYSTEM OPERATING — ______ VOLTS BETWEEN Conductors

(5) **Resistively Grounded DC Systems.** A switchboard, switchgear, or panelboard containing a resistive connection between current-carrying conductors and the grounding system to stabilize voltage to ground shall be legibly and permanently field marked as follows:

CAUTION: DC SYSTEM OPERATING — _____ VOLTS BETWEEN CONDUCTORS AND
MAY OPERATE — _____ VOLTS TO GROUND FOR INDEFINITE PERIODS UNDER FAULT CONDITIONS

(G) Minimum Wire-Bending Space.

The minimum wire-bending space at terminals and minimum gutter space provided in switchboards, switchgear, and panelboards shall be as required in 312.6.

408.4 Field Identification Required

(A) Circuit Directory or Circuit Identification

Every circuit and circuit modification will be identified as to clear, evident, and specific usage. The identification will include an approved degree of detail that allows that each circuit is distinguishable from the others. Spare positions that contain unused overcurrent devices or switches will be described accordingly. The identification will be included in a circuit directory that is located on the face or inside of the panel door in the case of a panelboard, and located at each switch on a switchboard or switchgear. No circuit will be described in a manner that depends on transient conditions of occupancy.

(B) Source of Supply

All switchboards, switchgear and panelboards supplied by a feeder(s) in other than one or two family dwellings will be marked to indicate each device or equipment where the power supply originates.

III. Panelboards

408.30 General

All panelboards will have a rating no less than the minimum feeder capacity required for the load calculated according to Part III, IV, or V of Article 220.

408.38 Enclosure.

Panelboards must be mounted in cabinets, cutout boxes, or identified enclosures and shall be
IV. Construction Specifications

408.55 Wire-Bending Space Within an Enclosure Containing a Panelboard

(A) *Top and Bottom Wire-Bending Space.*

The enclosure for a panelboard will have the top and bottom wire bending space sized according to Table 312.6(B) for the largest conductor entering or leaving the enclosure. Side wire bending space will be according to Table 312.6(A) for the largest conductor entering or leaving the enclosure.

(B) *Side Wire-Bending Space.*

Side wire-bending space is to be in accordance with Table 312.6(A) for the largest conductor to be terminated in that space.

(C) *Back Wire-Bending Space.*

Where a raceway or cable entry is in the wall of the enclosure opposite a removable cover, the distance from that wall to the cover is permitted to comply with the distance required for one wire per terminal in Table 312.6(A). The distance between the center of the rear entry and the nearest termination for the entering conductors shall not be less than the distance given in Table 312.6(B).