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2014 NEC Code Change

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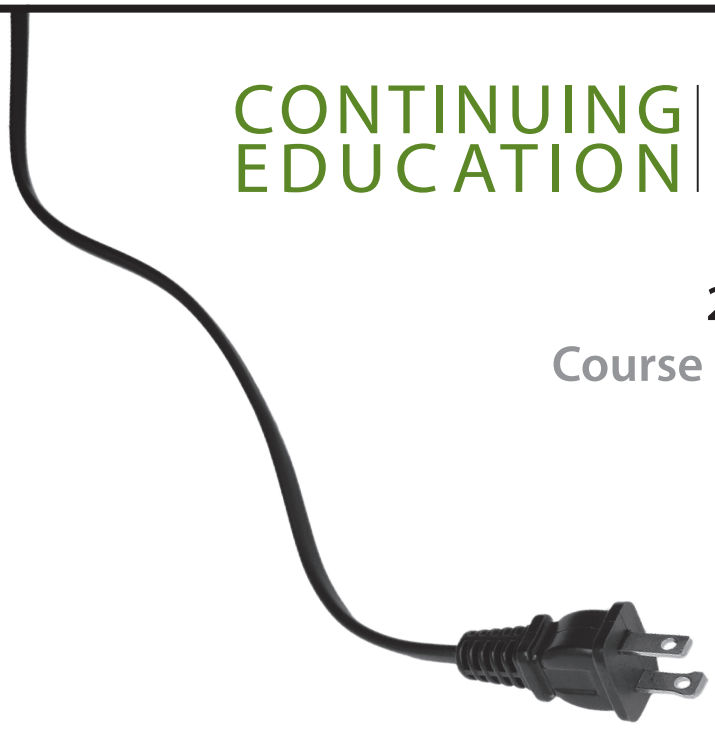

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2014 NEC Code Change

The following course will summarize many of the important changes to the NEC code.

The 2014 code has added four new articles as listed below:

(NEW): Article 393. Low-Voltage Suspended Ceiling Power Distribution Systems: These systems are used as a support for a finished ceiling surface and contain a busbar and busbar support system to distribute power to utilization equipment supplied by a Class 2 power supply.

(NEW): Article 646. Modular Data Centers: These contain customizable equipment to provide data center operations that are not always permanently installed.

(NEW): Article 728. Fire-Resistive Cable Systems: These must be installed with very specific materials, requirements, and supports which are crucial for the survivability of life safety circuits.

(NEW): Article 750. Energy Management Systems: These systems provide general requirements and address the types of loads to be controlled through energy management.

(REVISED): 90(A) Practical Safeguarding. The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity. This Code is not intended as a design specification or an instruction manual for untrained persons.

Article 100. Definitions:

(NEW): Adjustable Speed Drive. Power conversion equipment that provides a means of adjusting the speed of an electric motor.

Informational Notes

(NEW): Informational Note: A variable frequency drive is one type of electronic adjustable speed drive that controls the rotational speed of an ac electric motor by controlling the frequency and voltage of the electrical power supplied to the motor.

(NEW): Adjustable Speed Drive System. A combination of an adjustable speed drive, its associated motor(s), and auxiliary equipment.

(NEW): Battery System. Interconnected battery subsystems consisting of one or more storage batteries and battery chargers, and can include inverters, converters, and associated electrical equipment.

Exam Questions:

1. **A _____is one type of electronic adjustable speed drive that controls the rotational speed of an ac electric motor by controlling the frequency.**
   A. Variable frequency drive
   B. Adjustable Speed Drive System
   C. Battery System
   D. Energy Management Systems

2. **A busbar and busbar support system used to distribute power utilization equipment supplied by a _____ power supply.**
   A. All listed answers
   B. Class 1
   C. Class 3
   D. Class 2

3. When using cable systems for the survivability of life safety circuits, article _____ should be used.

A. 392
B. 393
C. 750
D. 728

4. A combination of an adjustable speed drive, its associated motor(s), and auxiliary equipment is known as a _____.

A. Variable speed Drive
B. Variable frequency drive
C. Adjustable Speed Drive System
D. Variable Speed Drive System

5. Power conversion equipment that provides a means of adjusting the speed of an electric motor is known as a _____.

A. Variable Speed Drive System
B. Battery System
C. Variable frequency drive
D. Adjustable Speed Drive

(NEW): Cable Routing Assembly. A single channel or connected multiple channels, as well as associated fittings, forming a structural system that is used to support and route communications wires and cables, optical fiber cables, data cables associated with information technology and communications equipment, Class 2 and Class 3 cables, and power-limited fire alarm cables.

(NEW): Charge Controller. Equipment that controls dc voltage or dc current, or both, and that is used to charge a battery or other energy storage device.

(NEW): Communications Raceway. An enclosed channel of nonmetallic materials designed expressly for holding communications wires and cables, typically communications wires and cables and optical fiber and data (Class 2 and Class 3) in plenum, riser, and general-purpose applications.

(NEW): Control Circuit. The circuit of a control apparatus or system that carries the electric signals directing the performance of the controller but does not carry the main power current.

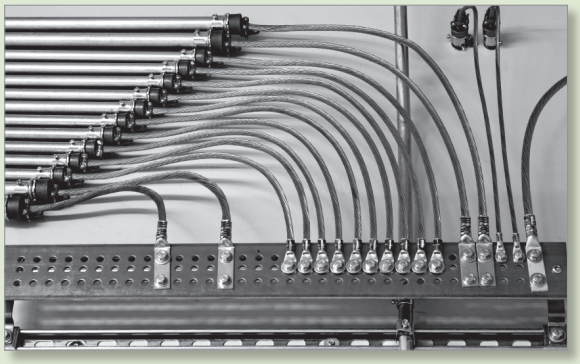
(REVISED): Coordination (Selective). Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the selection and installation of overcurrent protective devices and their ratings or settings for the full range of available overcurrents, from overload to the maximum available fault current, and for the full range of overcurrent protective device opening times associated with those overcurrents.

(NEW): Effective Ground-Fault Current Path. An intentionally constructed, low-impedance electrically conductive path designed and intended to carry current under ground-fault conditions from the point of a ground fault on a wiring system to the electrical supply source and that facilitates the operation of the overcurrent protective device or ground-fault detectors.

(NEW): Electric-Discharge Lighting. Systems of illumination utilizing fluorescent lamps, high-intensity discharge (HID) lamps, or neon tubing.

(NEW): Electronically Actuated Fuse. An overcurrent protective device that generally consists of a control module that provides current-sensing, electronically derived time–current characteristics, energy to initiate tripping, and an interrupting module that interrupts current when an overcurrent occurs. Such fuses may or may not operate in a current-limiting fashion, depending on the type of control selected.

(MOVED TO ARTICLE 100): Ground-Fault Current Path: An electrically conductive path from the point of a ground fault on a wiring system through normally non–current-carrying conductors, equipment, or the earth to the electrical supply source.



Informational Notes

(NEW): Informational Note: Examples of ground-fault current paths are any combination of equipment grounding conductors, metallic raceways, metallic cable sheaths, electrical equipment, and any other electrically conductive material such as metal, water, and gas piping; steel framing members; stucco mesh; metal ducting; reinforcing steel; shields of communications cables; and the earth itself.

Exam Questions:

6. A type of fuse depending on the type of control selected may or may not operate in a current-limiting fashion.

A. Electronically Actuated Fuse
B. Edison Fuse
C. Fixed Trip Fuse
D. Adjustable Trip Fuse

7. A _____ is used to charge a battery or other energy storage device.

A. Battery pack
B. Charge Controller
C. Charge System
D. Rectifier Controller

8. A ground-fault current path could be a _____.

A. Metal Duct
B. Metallic raceway
C. All Listed answers
D. Gas Pipe

9. A structural system that is used to support and route communications wires and cables, optical fiber cables, data cables associated with information technology and communications equipment is known as a _____.

A. All listed answers
B. Routing Assembly
C. Routing Cable Assembly
D. Cable Routing Assembly

10. Neon tubing is a type of _____.

A. Resonance Gas Discharge Lighting (RGDL)
B. Inert Gas Discharge Lighting
C. Ion Discharge Lighting
D. Electric-Discharge Lighting

(NEW): Hermetic Refrigerant Motor-Compressor. A combination consisting of a compressor and motor, both of which are enclosed in the same housing, with no external shaft or shaft seals, with the motor operating in the refrigerant.

(NEW): Industrial Control Panel: An assembly of two or more components consisting of one of the following: (1) power circuit components only, such as motor controllers, overload relays, fused disconnect switches, and circuit breakers; (2) control circuit components only, such as push buttons, pilot lights, selector switches, timers, switches, and control relays; (3) a combination of power and control circuit components. These components, with associated wiring and terminals, are mounted on, or contained within, an enclosure or mounted on a subpanel. The industrial control panel does not include the controlled equipment.

(NEW): Lighting Track (Track Lighting): A manufactured assembly designed to support and energize luminaires that are capable of being readily repositioned on the track. Its length can be altered by the addition or subtraction of sections of track.

(NEW): Photovoltaic (PV) System: The total components and subsystem that, in combination, convert solar energy into electric energy suitable for connection to a utilization load.

(NEW): Retrofit Kit: A general term for a complete subassembly of parts and devices for field conversion of utilization equipment.

(REVISED): Separately Derived System: An electrical source, other than a service, having no direct connection(s) to circuit conductors of any other electrical source other than those established by grounding and bonding connections.

(NEW): Substation: An enclosed assemblage of equipment (e.g., switches, interrupting devices, circuit breakers, buses, and transformers) through which electric energy is passed for the purpose of distribution, switching, or modifying its characteristics.

(NEW): Switchgear: An assembly completely enclosed on all sides and top with sheet metal (except for ventilating openings and inspection windows) and containing primary power circuit switching, interrupting devices, or both, with buses and connections. The assembly may include control and auxiliary devices. Access to the interior of the enclosure is provided by doors, removable covers, or both.

Informational Notes

(NEW): Informational Note: All switchgear subject to NEC requirements is metal enclosed. Switchgear rated below 1000 V or less may be identified as "low-voltage power circuit breaker switchgear." Switchgear rated over 1000 V may be identified as "metal-enclosed switchgear" or "metal-clad switchgear." Switchgear is available in non–arc-resistant or arc-resistant constructions.

(REVISED): Part II contains definitions applicable only to the articles and parts of articles specifically covering installations and equipment operating at over 600 volts, nominal. The definitions in Part I are intended to apply wherever the terms are used throughout this Code. The definitions in Part II are applicable only to articles and parts of articles specifically covering installations and equipment operating at over 600 volts, nominal.

(REVISED): 110.21 Marking: (A) Manufacturer's Markings: The manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product can be identified shall be placed on all electrical equipment. Other markings that indicate voltage, current, wattage, or other ratings shall be provided as specified elsewhere in this Code. The marking or label shall be of sufficient durability to withstand the environment involved.

Exam Questions:

11. A descriptive marking by which an organization responsible for an electrical product is required to be identified on all electrical equipment is referenced in article _____ of the 2014 code.

A. 110.22 (A)
B. 110.21 (B)
C. 110.21 (C)
D. 110.21 (A)

12. An example of a separately derived system could be a _____.

A. Photovoltaic System
B. Transformer
C. Generator
D. All listed answers

13. All switchgear subject to NEC requirements is _____ enclosed.

A. Always
B. Metal
C. Partially
D. Never

14. Solar energy that is converted into electric energy for use in utilization loads is considered a _____.

A. Fuel Cell System
B. Solar Cell System
C. Photovoltaic System
D. Energy Conversion System

15. A compressor and motor housed together with the motor operating in the refrigerant would be best defined as a _____.

A. Hermetic Motor
B. Hermetic Refrigerant Motor-Compressor
C. Hermetic Refrigerant Compressor
D. No listed answers

(NEW): 110.21 Marking: (B) Field-Applied Hazard Markings: Where caution, warning, or danger signs or labels are required by this Code, the labels shall meet the following requirements:

(1) The marking shall adequately warn of the hazard using effective words and/or colors and/or symbols.

Informational Notes

Informational Note: ANSI Z535.4-2011, Product Safety Signs and Labels, provides guidelines for suitable font sizes, words, colors, symbols, and location requirements for labels.

(2) The label shall be permanently affixed to the equipment or wiring method and shall not be hand written.

Exception to (2): Portions of labels or markings that are variable, or that could be subject to changes, shall be permitted to be hand written and shall be legible.

(3) The label shall be of sufficient durability to withstand the environment involved.

(NEW): 110.25 Lockable Disconnecting Means: Where a disconnecting means is required to be lockable open elsewhere in this Code, it shall be capable of being locked in the open position. The provisions for locking shall remain in place with or without the lock installed.

(NEW): 110.26 (E) (2) Outdoor. Outdoor installations shall comply with 110.26(E) (2)(a) and (b).

(a) Installation Requirements. Outdoor electrical equipment shall be installed in suitable enclosures and shall be protected from accidental contact by unauthorized personnel, or by vehicular traffic, or by accidental spillage or leakage from piping systems. The working clearance space shall include the zone described in 110.26(A). No architectural appurtenance or other equipment shall be located in this zone.

(b) Dedicated Equipment Space. The space equal to the width and depth of the equipment, and extending from grade to a height of 1.8 m (6 ft) above the equipment, shall be dedicated to the electrical installation. No piping or other equipment foreign to the electrical installation shall be located in this zone.

Exception: Cord-and-plug connection locking provisions shall not be required to remain in place without the lock installed.

(New): 110.27 Guarding of Live Parts. (A) (4) Live Parts are required to be guarded against accidental contact by the elevation above the floor or other working surface as shown in (a) or (b) below:

a. A minimum of 2.5 m (8 ft) for 50 to 300 volts
b. A minimum of 2.6 m (81⁄2 ft) for 301 to 600 volts

(NEW/REVISED): 200.4 Neutral conductors shall be installed in accordance with 200.4(A) and (B).

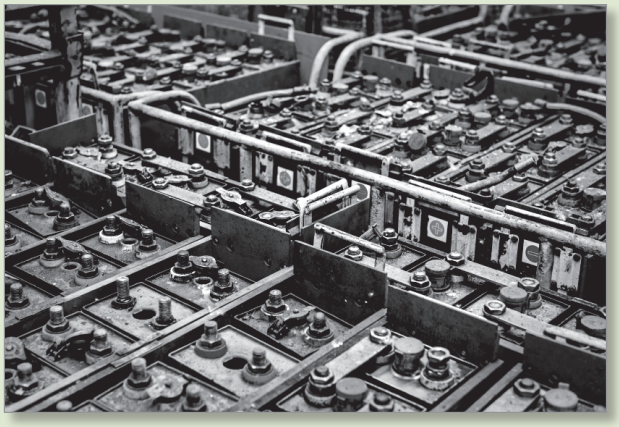
(A) Installation. Neutral conductors shall not be used for more than one branch circuit, for more than one multiwire branch circuit, or for more than one set of ungrounded feeder conductors unless specifically permitted elsewhere in this Code.

(B) Multiple Circuits. Where more than one neutral conductor associated with different circuits is in an enclosure, grounded circuit conductors of each circuit shall be identified or grouped to correspond with the ungrounded circuit conductor(s) by wire markers, cable ties, or similar means in at least one location within the enclosure.

Exception No. 1: The requirement for grouping or identifying shall not apply if the branch-circuit or feeder conductors enter from a cable or a raceway unique to the circuit that makes the grouping obvious.

Exception No. 2: The requirement for grouping or identifying shall not apply where branch-circuit conductors pass through a box or conduit body without a loop as described in 314.16(B)(1) or without a splice or termination.

(NEW): 210.5 (C) (2) Branch Circuits Supplied From Direct-Current Systems. Where a branch circuit is supplied from a dc system operating at more than 50 volts, each ungrounded conductor of 4 AWG or larger shall be identified by polarity at all termination, connection, and splice points by marking tape, tagging, or other approved means; each ungrounded conductor of 6 AWG or smaller shall be identified by polarity at all termination, connection, and splice points in compliance with 210.5(C)(2)(a) and (b). The identification methods utilized for conductors originating within each branchcircuit panelboard or similar branch-circuit distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each branchcircuit panelboard or similar branch-circuit distribution equipment.



(a) Positive Polarity, Sizes 6 AWG or Smaller. Where the positive polarity of a dc system does not serve as the connection point for the grounded conductor, each positive ungrounded conductor shall be identified by one of the following means:

(1) A continuous red outer finish
(2) A continuous red stripe durably marked along the conductor's entire length on insulation of a color other than green, white, gray, or black
(3) Imprinted plus signs (+) or the word POSITIVE or POS durably marked on insulation of a color other than green, white, gray, or black, and repeated at intervals not exceeding 610 mm (24 in.) in accordance with310.120(B)

(b) Negative Polarity, Sizes 6 AWG or Smaller. Where the negative polarity of a dc system does not serve as the connection point for the grounded conductor, each negative ungrounded conductor shall be identified by one of the following means:

(1) A continuous black outer finish
(2) A continuous black stripe durably marked along the conductor's entire length on insulation of a color other than green, white, gray, or red
(3) Imprinted minus signs (–) or the word NEGATIVE or NEG durably marked on insulation of a color other than green, white, gray, or red, and repeated at intervals not exceeding 610 mm (24 in.) in accordance with 310.120(B)

Exam Questions:

16. Outdoor electrical equipment is required to be installed and protected from accidental contact by _____.

A. Piping systems
B. Vehicular traffic
C. Accidental spillage
D. All listed answers

17. Live parts are required to be guarded against accidental contact for a 240 circuit to a minimum height of _____.

A. 8 1/2 ′
B. 8′
C. 6′ 8″
D. 72″

18. A field applied warning label is required to be of sufficient durability to withstand the _____involved.

A. Temperature
B. Environment
C. Location
D. All listed answers

19. True or False, DC systems operating at over 50 volts are not required to indicate polarity makings so long as they are phased.

A. False
B. True

20. When multiple neutrals share the same enclosure, they are required to be _____ with their corresponding phase conductors.

A. Listed
B. Grouped
C. Marked white with a black stripe
D. Marked the same

21. If a conductor is 6 AWG and smaller serving a DC branch circuit, the negative conductor is required to be_____ in color or have a _____continuous stripe down its entire length.

A. Black, Red
B. Red. Black
C. Black, Black
D. Yellow, Red

22. Live parts are required to be guarded against accidental contact for a 480 circuit to a minimum height of _____.

A. 6′ 8″
B. 8′
C. 8 1/2 ′
D. 72″

23. What 2014 code section requires that where a disconnecting means is required to be lockable elsewhere in this Code, it shall be capable of being locked in the open position?

A. 240.36 (B)
B. 110.24 (A)
C. 110.25
D. 100.25

(NEW): 210.8 (D) Kitchen Dishwasher Branch Circuit. The 2014 Code added this section to 210.8. GFCI protection shall be provided for outlets that supply dishwashers installed in dwelling unit locations.

(NEW): 210.12 Arc-Fault Circuit-Interrupter Protection. Arcfault circuit-interrupter protection shall be provided as required in 210.12(A) (B), and (C). The arc-fault circuit interrupter shall be installed in a readily accessible location.

(ADDED 3 NEW METHODS): 210.12 Arc-Fault Circuit-Interrupter Protection (A)(1) Through (A)(6):

(A) Dwelling Units. All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

(1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of the entire branch circuit.

(2) A listed branch/feeder-type AFCI installed at the origin of the branch-circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

(3) A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:

a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.

c. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

(4) A listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:

a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.

c. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

d. The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination–type AFCI and shall be listed as such.

(5) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

(6) Where a listed metal or nonmetallic conduit or tubing or Type MC cable is encased in not less than 50 mm (2 in.) of concrete for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

(REVISED): 210.12 Arc-Fault Circuit-Interrupter Protection (C) Dormitory Units. All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets installed in dormitory unit bedrooms, living rooms, hallways, closets, and similar rooms shall be protected by a listed arc-fault circuit interrupter meeting the requirements of 210.12(A)(1) through (6) as appropriate.

(NEW): 210.13 Ground-Fault Protection of Equipment. Each branch-circuit disconnect rated 1000 A or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but

not exceeding 600 volts phase-to phase, shall be provided with ground-fault protection of equipment in accordance with the provisions of 230.95.

(NEW): 210.17 Electric Vehicle Branch Circuit. An outlet(s) installed for the purpose of charging electric vehicles shall be supplied by a separate branch circuit. This circuit shall have no other outlets.

(NEW): 210.22 Permissible Loads, Individual Branch Circuits. An individual branch circuit shall be permitted to supply any load for which it is rated, but in no case shall the load exceed the branch-circuit ampere rating.

Exam Questions:

24. An ARC fault circuit interrupter is required to be instated where it is?

A. Accessible
B. Readily accessible
C. Convenient
D. No requirement

25. True or false, only metal raceway systems and cables are allowed to protect an AFCI circuit to the first box from its breaker.

A. True
B. False

26. True or False, the 2014 Code requires Laundry facilities to be Arc Fault protected.

A. True
B. False

27. A branch-circuit disconnect rated 1000 A or more and installed on solidly grounded wye electrical system is required to have _____ of equipment.

A. Ground-fault protection
B. Arc-Fault Circuit-Interrupter Protection
C. No protection required
D. Both A and B

28. AFCI protection is permitted to be provided in one of _____ ways or methods.

A. 5
B. 6
C. 12
D. 8

29. The 2014 Code requires all dish washer outlets to be.

A. Water proof
B. AFCI protected
C. GFCI protected
D. Weather proof

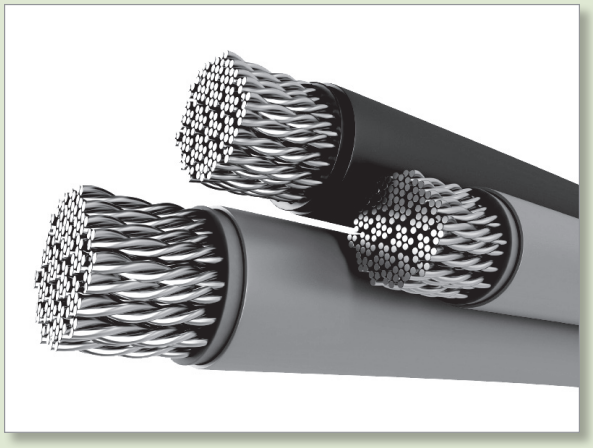
30. A listed _____ arc-fault circuit interrupter is to provide protection for the entire branch circuit.

A. All listed answers
B. Rated
C. Engineered
D. Combination-type

(NEW): 210.64 Electrical Service Areas. At least one 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed within 15 m (50 ft) of the electrical service equipment.

(REVISED): 215.2 Minimum Rating and Size. (A) Feeders Not More Than 600 Volts.

(1) General. Feeder conductors shall have an ampacity not less than required to supply the load as calculated in Parts III, IV, and V of Article 220. Conductors shall be sized to carry not less than the larger of 215.2(A)(1)(a) or (b).



(a) Where a feeder supplies continuous loads or any combination of continuous and non-continuous loads, the minimum feeder conductor size shall have an allowable ampacity not less than the non-continuous load plus 125 percent of the continuous load.

(b) The minimum feeder conductor size shall have an allowable ampacity not less than the maximum load to be served after the application of any adjustment or correction factors.

(NEW): 215.12 Identification for Feeders (C)(2)(a) and (b).

(2) Feeders Supplied from Direct-Current Systems. Where a feeder is supplied from a dc system operating at more than 50 volts, each ungrounded conductor of 4 AWG or larger shall be identified by polarity at all termination, connection, and splice points by marking tape, tagging, or other approved means; each ungrounded conductor of 6 AWG or smaller shall be identified by polarity at all termination, connection, and splice points in compliance with 215.12(C)(2)(a) and (b). The identification methods utilized for conductors originating within each feeder panelboard or similar feeder distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each feeder panelboard or similar feeder distribution equipment.

(a) Positive Polarity, Sizes 6 AWG or Smaller. Where the positive polarity of a dc system does not serve as the connection for the grounded conductor, each positive ungrounded conductor shall be identified by one of the following means:

(1) A continuous red outer finish

(2) A continuous red stripe durably marked along the conductor's entire length on insulation of a color other than green, white, gray, or black

(3) Imprinted plus signs (+) or the word POSITIVE or POS durably marked on insulation of a color other than green, white, gray, or black, and repeated at intervals not exceeding 610 mm (24 in.) in accordance with 310.120(B)

(b) Negative Polarity, Sizes 6 AWG or Smaller. Where the negative polarity of a dc system does not serve as the connection for the grounded conductor, evach negative ungrounded conductor shall be identified by one of the following means:

(1) A continuous black outer finish

(2) A continuous black stripe durably marked along the conductor's entire length on insulation of a color other than green, white, gray, or red

(3) Imprinted minus signs (–) or the word NEGATIVE or NEG durably marked on insulation of a color other than green, white, gray, or red, and repeated at intervals not exceeding 610 mm (24 in.) in accordance with 310.120(B)

220.12 Lighting Load for Specified Occupancies. The 2014 has added an exception for calculating lighting loads based on energy codes.

(NEW): Exception: Where the building is designed and constructed to comply with an energy code adopted by the local authority, the lighting load shall be permitted to be calculated at the values specified in the energy code where the following conditions are met:

(1) A power monitoring system is installed that will provide continuous information regarding the total general lighting load of the building.

(2) The power monitoring system will be set with alarm values to alert the building owner or manager if the lighting load exceeds the values set by the energy code.

(3) The demand factors specified in 220.42 are not applied to the general lighting load.

(NEW): 225.11 Feeder and Branch-Circuit Conductors Entering, Exiting, or Attached to Buildings or Structures. Feeder and branch-circuit conductors entering or exiting buildings or structures shall be in installed in accordance with the requirements of 230.52. Overhead branch circuits and feeders attached to buildings or structures shall be installed in accordance with the requirements of 230.54.

(REVISED): 225.17 Masts as Supports (A) and (B). Only feeder or branch-circuit conductors specified within this section shall be permitted to be attached to the feeder and/or branch-circuit mast. Masts used for the support of final spans of feeders or branch circuits shall be installed in accordance with 225.17(A) and (B).

(A) Strength. The mast shall be of adequate strength or be supported by braces or guys to withstand safely the strain imposed by the overhead feeder or branch-circuit conductors. Hubs intended for use with a conduit that serves as a mast for support of feeder or branch-circuit conductors shall be identified for use with a mast.

(B) Attachment. Feeder and/or branch-circuit conductors shall not be attached to a mast between a weatherhead or the end of the conduit and a coupling where the coupling is located above the last point of securement to the building or other structure or is located above the building or other structure.

(REVISED): 225.36 Type. The disconnecting means specified in 225.31 shall be comprised of a circuit breaker, molded case switch, general-use switch, snap switch, or other approved means. Where applied in accordance with 250.32(B), Exception, the disconnecting means shall be suitable for use as service equipment. Section

225.31 simply states that a means shall be provided for disconnecting all ungrounded conductors that supply or pass through the building or structure.

Exam Questions:

31. If installing overhead feeders that attach to a building, the 2014 code requires using _____.

A. 225.12
B. 230.52
C. 230.54
D. 225.10

32. Masts used for the support of final spans of feeders or branch circuits are required to be be installed in accordance with _____.

A. 225.17(A)and (B)
B. 225.11(A)and (B)
C. 225.15(A)and (B)
D. 225.11(B) and (C)

33. A feeder _____ be attached to a mast between a weather head or the end of the conduit and a coupling where the coupling is located above the last point of securement to the building.

A. Can
B. Shall
C. Shall not
D. Must

34. After all the adjustment correction factors for determining the minimum conductor feeder size have been done, the _____ feeder conductor size shall not be less than the maximum load to be served.

A. The lesser
B. Maximum
C. Minimum
D. No listed answer

35. If installing new feeders that exit the building you're in, the 2014 code requires the provisions of _____ be used.

A. 225.12
B. 230.54
C. 225.10
D. 230.52

36. If a conductor is 6 AWG and smaller serving a DC feeder, the positive conductor is required to be_____ in color or have a _____continuous stripe down its entire length.

A. Red, Red
B. Blue, Yellow
C. Orange, Red
D. Yellow, Gray

37. Hubs used with conduit that serves as a mast for support of feeder or branch-circuit conductors is required to be _____ for use with a mast.

A. All listed answers
B. A single assembly
C. A listed assembly
D. Identified

(REVISED): 225.52 Disconnecting Means. (A) Location. A building or structure disconnecting means shall be located in accordance with 225.32, or, if not readily accessible, it shall be operable by mechanical linkage from a readily accessible point. For multibuilding industrial installations under single management, it shall be permitted to be electrically operated by a readily accessible, remote-control device in a separate building or structure.

(REVISED): 225.56 Inspections and Tests. (A) Pre-Energization and Operating Tests. The complete electrical system design, including settings for protective, switching, and control circuits, shall be prepared in advance and made available on request to the authority having jurisdiction and shall be performance tested when first installed on-site. Each protective, switching, and control circuit shall be adjusted in accordance with the system design and tested by actual operation using current injection or equivalent methods as necessary to ensure that each and every such circuit operates correctly to the satisfaction of the authority having jurisdiction.

(REVISED): 230.6 (5) Conductors Considered Outside the Building. Where installed within rigid metal conduit (Type RMC) or intermediate metal conduit (Type IMC) used to accommodate the clearance requirements in 230.24 and routed directly through an eave but not a wall of a building.

(REVISED): 230.24 Clearances. Overhead service conductors shall not be readily accessible and shall comply with 230.24(A) through (E) for services not over 1000 volts, nominal.

(REVISED): 230.26 Point of Attachment. The point of attachment of the overhead service conductors to a building or other structure shall provide the minimum clearances as specified in 230.9 and 230.24. In no case shall this point of attachment be less than 3.0 m (10 ft) above finished grade.

(REVISED): 230.28 Service Masts as Supports. Only power service drop or overhead service conductors shall be permitted to be attached to a service mast. Service masts used for the support of service-drop or overhead service conductors shall be installed in accordance with 230.28(A) and (B).

(A) Strength. The service mast shall be of adequate strength or be supported by braces or guys to withstand safely the strain imposed by the service-drop or overhead service conductors. Hubs intended for use with a conduit that serves as a service mast shall be identified for use with service-entrance equipment.

(B) Attachment. Service-drop or overhead service conductors shall not be attached to a service mast between a weatherhead or the end of the conduit and a coupling, where the coupling is located above the last point of securement to the building or other structure or is located above the building or other structure.

(NEW): 230.30 Installation (B) Wiring Methods. Underground service conductors shall be installed in accordance with the applicable requirements of this Code covering the type of wiring method used and shall be limited to the following methods:

(1) Type RMC conduit
(2) Type IMC conduit
(3) Type NUCC conduit
(4) Type HDPE conduit
(5) Type PVC conduit
(6) Type RTRC conduit
(7) Type IGS cable
(8) Type USE conductors or cables
(9) Type MV or Type MC cable identified for direct burial applications
(10) Type MI cable, where suitably protected against physical damage and corrosive conditions

Exam Questions:

38. Overhead service conductors _____ be attached to a service mast between a weatherhead or the end of the conduit and coupling.

A. Must
B. Will
C. Shall not
D. Will

39. What 2014 code section gives the installation requirements for installing service masts as supports?

A. 230.26
B. 230.31
C. 230.28
D. 240.32

40. Would it be considered acceptable or a violation of this code to use Intermediate Metal Conduit as a raceway for service conductors if buried directly in the ground?

A. Acceptable
B. Violation

41. True or False, Service conductors are considered outside a building if installed in RMC and installed on the wall of a building.

A. False
B. True

42. If a disconnect is not installed in a readily accessible location, then _____ must be provided making it operable from a readily accessible point.

A. Electrical motors
B. Mechanical linkage
C. Servos
D. All listed answers

43. Each disconnect and control circuit is required to be adjusted in accordance with the system design and tested by _____ using current injection.

A. A soft start
B. Simulation
C. Actual operation
D. The program

44. Service conductors installed overhead are not required to be readily accessible if not operating over _____.

A. 600
B. 1000
C. 300
D. 240

(REVISED): 230.44 Cable Trays. The code requires cable trays with service entrance conductors to be identified with permanently affixed labels with the wording "Service-Entrance Conductors." The labels shall be located so as to be visible after installation with a spacing not to exceed 3 m (10 ft) so that the service-entrance conductors are able to be readily traced through the entire length of the cable tray.

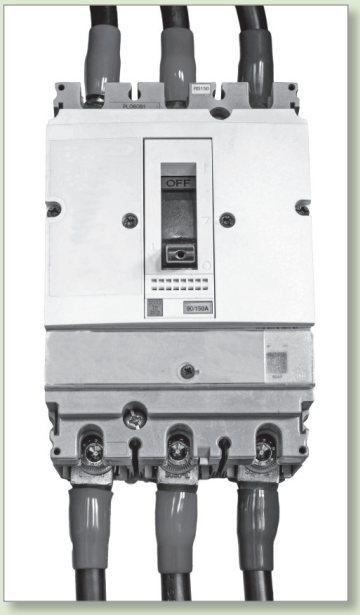
(REVISED): 230.82 Equipment Connected to the Supply Side of Service Disconnect. (3) Meter disconnect switches nominally rated not in excess of 1000 V that have a short-circuit current rating equal to or greater than the available short-circuit current, provided that all metal housings and service enclosures are grounded in accordance with Part VII and bonded in accordance with Part V of Article 250. A meter disconnect switch shall be capable of interrupting the load served. A meter disconnect shall be legibly field marked on its exterior in a manner suitable for the environment as follows:

METER DISCONNECT
NOT SERVICE EQUIPMENT

230.208 Protection Requirements. (B) Enclosed Overcurrent Devices. The restriction to 80 percent of the rating for an enclosed overcurrent device for continuous loads shall not apply to overcurrent devices installed in systems operating at over 1000 volts.

(REVISED): 230.212 Over 35,000 Volts. Where the voltage exceeds 35,000 volts between conductors that enter a building, they shall terminate in a switchgear compartment or a vault conforming to the requirements of 450.41 through 450.48.

(REVISED): 240.1 Scope. Parts I through VII of this article provide the general requirements for overcurrent protection and overcurrent protective devices not more than 1000 volts, nominal. Part VIII covers overcurrent protection for those portions of supervised industrial installations operating at voltages of not more than 1000 volts, nominal. Part IX covers overcurrent protection over 1000 volts, nominal.



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

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

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

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

(NEW): 240.87 Informational Note No. 2: An energy-reducing active arc flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the circuit breaker or the settings of other devices is required during maintenance when a worker is working within an arc flash boundary as defined in NFPA 70E-2012, Standard for Electrical Safety in the Workplace.

(REVISED): 250.10 Protection of Ground Clamps and Fittings. Ground clamps or other fittings exposed to physical damage shall be enclosed in metal, wood, or equivalent protective covering.

Exam Questions:

45. What is the maximum voltage rating of a meter disconnect switch that will comply with article 230.82?

A. 300V
B. 600V
C. 1000V
D. 575V

46. A meter disconnect is required to be legibly field marked on its _____ in a manner suitable for the environment.

A. Load Side
B. Interior
C. Exterior
D. Line Side

47. The metal housing of a service enclosure is required to be grounded in accordance with Part _____of article 250.

A. V
B. VII
C. IV
D. III

48. A meter disconnect is required to be marked with the words _____.

A. METER DISCONNECT NOT SERVICE EQUIPMENT
B. METER NOT SERVICE EQUIPMENT
C. METER DISCONNECT FOR SERVICE EQUIPMENT
D. METER DISCONNECT SERVICE EQUIPMENT

49. A ground clamp exposed to physical damage can be protected by a _____ encasement.

A. Wood
B. Metal
C. All listed answers
D. Fiberglass

50. How many methods does the 2014 code list with regards to arc energy reduction, and Reduced Clearing Time?

A. 3
B. 7
C. 5
D. 2

51. If installing cable tray Service-Entrance conductors labels on a cable tray system, the labels can be placed no further than _____ apart.

A. 25 ft.
B. 15 ft.
C. 20 ft.
D. 10 ft.

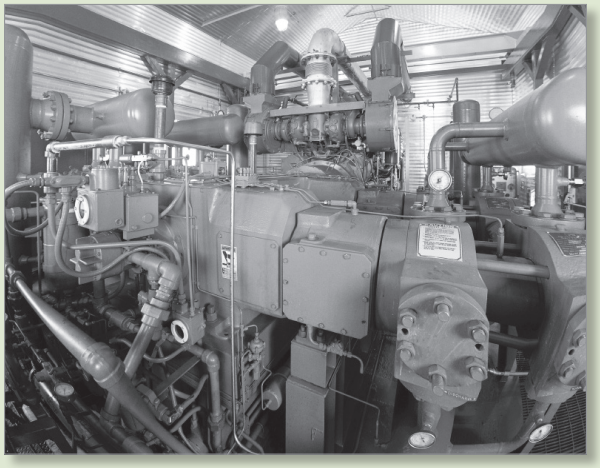
(REVISED): 250.21 Alternating-Current Systems of 50 Volts to 1000 Volts Not Required to Be Grounded (C) Marking. Ungrounded systems shall be legibly marked "Caution: Ungrounded System Operating — _____ Volts Between Conductors" at the source or first disconnecting means of the system. The marking shall be of sufficient durability to withstand the environment involved.

(REVISED): 250.24 Grounding Service-Supplied Alternating-Current Systems. (A)(1) General. The grounding electrode conductor connection shall be made at any accessible point from the load end of the overhead service conductors, service drop, underground service conductors, or service lateral to, including the terminal or bus to which the grounded service conductor is connected at the service disconnecting means.

(REVISED): 250.24 Grounding Service-Supplied Alternating-Current Systems. (C)(1) General. Sizing for a Single Raceway. The grounded conductor shall not be smaller than specified in Table 250.102(C)(1).

(REVISED): 250.24 Grounding Service-Supplied Alternating-Current Systems. (E) Ungrounded System Grounding Connections. A premises wiring system that is supplied by an ac service that is ungrounded shall have, at each service, a grounding electrode conductor connected to the grounding electrode(s) required by Part III of this article. The grounding electrode conductor shall be connected to a metal enclosure of the service conductors at any accessible

point from the load end of the overhead service conductors, service drop, underground service conductors, or service lateral to the service disconnecting means.



(REVISED): 250.30 Grounding Separately Derived Alternating- Current Systems. In addition to complying with 250.30(A) for grounded systems, or as provided in 250.30(B) for ungrounded systems, separately derived systems shall comply with 250.20, 250.21, 250.22, or 250.26, as applicable. Multiple separately derived systems that are connected in parallel shall be installed in accordance with 250.30.

(REVISED): 250.36 High-Impedance Grounded Neutral Systems. (F) Grounding Electrode Conductor Connection Location. For services or separately derived systems, the grounding electrode conductor shall be connected at any point from the grounded side of the grounding impedance to the equipment grounding connection at the service equipment or the first system disconnecting means of a separately derived system.

(REVISED): 250.62 Grounding Electrode Conductor Material. The grounding electrode conductor shall be of copper, aluminum, copper-clad aluminum, or the items as permitted in 250.68(C). The material selected shall be resistant to any corrosive condition existing at the installation or shall be protected against corrosion. Conductors of the wire type shall be solid or stranded, insulated, covered, or bare.

(REVISED): 250.64 Grounding Electrode Conductor Installation. (D) Building or Structure with Multiple Disconnecting Means in Separate Enclosures. For a service or feeder with two or more disconnecting means in separate enclosures supplying a building or structure, the grounding electrode connections shall be made in accordance with 250.64(D)(1), (D)(2), or (D)(3).

(REVISED): 250.64 Grounding Electrode Conductor Installation. (D)(1) Common Grounding Electrode Conductor and Taps. A common grounding electrode conductor and grounding electrode conductor taps shall be installed. The common grounding electrode conductor shall be sized in accordance with 250.66, based on the sum of the circular mil area of the largest ungrounded conductor(s) of each set of conductors that supplies the disconnecting means. If the service-entrance conductors connect directly to the overhead service conductors, service drop, underground service conductors, or service lateral, the common grounding electrode conductor shall be sized in accordance with Table 250.66, note 1. A grounding electrode conductor tap shall extend to the inside of each disconnecting means enclosure. The grounding electrode conductor taps shall be sized in accordance with 250.66 for the largest service-entrance or feeder conductor serving the individual enclosure. The tap conductors shall be connected to the common grounding electrode conductor by one of the following methods in such a manner that the common grounding electrode conductor remains without a splice or joint:

(1) Exothermic welding.

(2) Connectors listed as grounding and bonding equipment.

(3) Connections to an aluminum or copper busbar not less than 6 mm thick × 50 mm wide (1⁄4 in. thick × 2 in. wide) and of sufficient length to accommodate the number of terminations necessary for the installation. The busbar shall be securely fastened and shall be installed in an accessible location. Connections shall be made by a listed connector or by the exothermic welding process. If aluminum busbars are used, the installation shall comply with 250.64(A).

Exam Questions:

52. A common grounding electrode conductor is required to be sized in accordance with _____.

A. 250.52
B. 250.122
C. 250.66
D. 250.64(D)

53. Ungrounded systems are required to be legibly marked _____at the source or first disconnecting means of the system.

A. "Caution: Ungrounded System Operating — _____ Volts Per Conductor"
B. "Caution: Ungrounded System With — _____ Volts Between Conductors"
C. "Caution: System Operating — _____ Volts Between Conductors"
D. "Caution: Ungrounded System Operating — _____ Volts Between Conductors"

54. The grounding electrode conductor is required to resist _____.

A. Faults
B. Theft
C. Lightning
D. Corrosion

55. The grounding electrode conductor is sized based on the sum of the _____ of the largest ungrounded conductor(s) of each set that supplies the disconnecting means.

A. Circular mil area
B. Lug size
C. Cross sectional area
D. Both A and C

56. A grounding electrode conductor tap is required to extend inside each _____ enclosure.

A. Service panel
B. Service
C. Sub panel
D. Disconnecting means

57. The 2014 code has _____ provisions when a grounding electrode connection for a service or feeder has two or more disconnecting means with separate enclosures.

A. 4
B. 2
C. 3
D. 1

58. What table is referenced in the 2014 with regards to the grounded conductor and its minimum size?

A. 250.122(C)(1)
B. 250.101(C)(1)
C. 250.102(C)(1)
D. 250.52(C)(1)

59. A common grounding electrode conductor that serves multiple taps is _____ by the 2014 Code.

A. A violation
B. Allowed
C. No Listed Answer
D. Not allowed

60. An aluminum busbar used for multiple grounding electrode conductor taps must have a minimum thickness of _____.

A. 1 inch
B. 3/8 inch
C. ¼ inch
D. 2 inches

(REVISED): 250.64 Grounding Electrode Conductor Installation. (D)(2) Individual Grounding Electrode Conductors. A grounding electrode conductor shall be connected between the grounding electrode system and one or more of the following, as applicable:

(1) Grounded conductor in each service equipment disconnecting means enclosure

(2) Equipment grounding conductor installed with the feeder

(3) Supply-side bonding jumper

Each grounding electrode conductor shall be sized in accordance with 250.66 based on the service-entrance or feeder conductor(s) supplying the individual disconnecting means.

(REVISED): 250.64 Grounding Electrode Conductor Installation. (D)(3) Common Location. A grounding electrode conductor shall be connected in a wireway or other accessible enclosure on the supply side of the disconnecting means to one or more of the following, as applicable:

(1) Grounded service conductor(s)

(2) Equipment grounding conductor installed with the feeder

(3) Supply-side bonding jumper

(REVISED): 250.64 Grounding Electrode Conductor Installation.(E) Raceways and Enclosures for Grounding Electrode Conductors. (1) General. Ferrous metal raceways and enclosures for grounding electrode conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode and shall be securely fastened to the ground clamp or fitting. Ferrous metal raceways and enclosures shall be bonded at each end of the raceway or enclosure to the grounding electrode or grounding electrode conductor. Nonferrous metal raceways and enclosures shall not be required to be electrically continuous.

(2) Methods. Bonding shall be in compliance with 250.92(B) and ensured by one of the methods in 250.92(B)(2) through (B)(4).

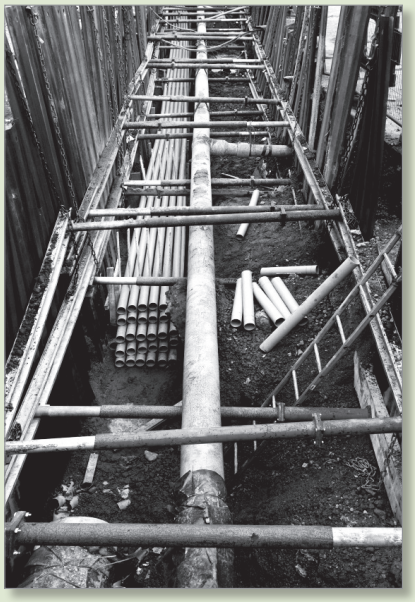
(3) Size. The bonding jumper for a grounding electrode conductor raceway or cable armor shall be the same size as, or larger than, the enclosed grounding electrode conductor.

(4) Wiring Methods. If a raceway is used as protection for a grounding electrode conductor, the installation shall comply with the requirements of the appropriate raceway article.

(REVISED): 250.66 Size of Alternating-Current Grounding Electrode Conductor.

(A) Connections to a Rod, Pipe, or Plate Electrode(s). Where the grounding electrode conductor is connected to a single or multiple rod, pipe, or plate electrode(s), or any combination thereof, as permitted in 250.52(A)(5) or (A)(7), that portion of the conductor that is the sole connection to the grounding electrode(s) shall not be required to be larger than 6 AWG copper wire or 4 AWG aluminum wire.

(B) Connections to Concrete-Encased Electrodes. Where the grounding electrode conductor is connected to a single or multiple concrete-encased electrode(s) as permitted in 250.52(A)(3), that portion of the conductor that is the sole connection to the grounding electrode(s) shall not be required to be larger than 4 AWG copper wire.



(REVISED): 250.68 Grounding Electrode Conductor and Bonding Jumper Connection to Grounding Electrodes. (C) Grounding Electrode Connections. Grounding electrode conductors and bonding jumpers shall be permitted to be connected at the following locations and used to extend the connection to an electrode(s):

(1) Interior metal water piping located not more than 1.52 m (5 ft) from the point of entrance to the building shall be permitted to be used as a conductor to interconnect electrodes that are part of the grounding electrode system.

Exception: In industrial, commercial, and institutional buildings or structures, if conditions of maintenance and supervision ensure that only qualified persons service the installation, interior metal water piping located more than 1.52 m (5 ft) from the point of entrance to the building shall be permitted as a bonding conductor to interconnect electrodes that are part of the grounding electrode system, or as a grounding electrode

conductor, if the entire length, other than short sections passing perpendicularly through walls, floors, or ceilings, of the interior metal water pipe that is being used for the conductor is exposed.

(2) The metal structural frame of a building shall be permitted to be used as a conductor to interconnect electrodes that are part of the grounding electrode system, or as a grounding electrode conductor.

(3) A concrete-encased electrode of either the conductor type, reinforcing rod or bar installed in accordance with 250.52(A)(3) extended from its location within the concrete to an accessible location above the concrete shall be permitted.

Exam Questions:

61. _____ metal raceways and enclosures are required to be bonded at each end of the raceway or enclosure to the grounding electrode or grounding electrode conductor.

A. Aluminum
B. Nonferrous
C. Nickel Clad
D. Ferrous

62. A grounding electrode conductor is required to be sized in accordance with 250.66 based on the service-entrance or feeder conductor(s) supplying an individual_____.

A. Enclosure
B. Fuse
C. Disconnect
D. Gear section

63. In an industrial facility, the 250.68(C)(1) requirement can be ignored if they can ensure that only _____ service the installation.

A. Supervisors
B. Qualified persons
C. Communication Techs
D. No requirement

64. The _____ of a building can be used to inter connect grounding electrodes.

A. Mechanical system
B. Metal structural frame
C. Light poles
D. All listed answers

65. A grounding electrode conductor that is connected to a single ground rod and the sole connection to the grounding electrode is not required to be larger than _____ AWG copper.

A. 2
B. 4
C. 3
D. 6

66. True or False, there are no exceptions to 250.68(C)(1) with regards to bonding a water pipe within the specified footage.

A. True
B. False

(NEW TABLE/REVISED): 250.102 Bonding Conductors and Jumpers. (C) Size — Supply-Side Bonding Jumper.

(1) Size for Supply Conductors in a Single Raceway or Cable. The supply-side bonding jumper shall not be smaller than specified in Table 250.102(C)(1).

(2) Size for Parallel Conductor Installations in Two or More Raceways. Where the ungrounded supply conductors are paralleled in two or more raceways or cables, and an individual supply-side bonding jumper is used for bonding these raceways or cables, the size of the supply-side bonding jumper for each raceway or cable shall be selected from Table 250.102(C)(1) based on the size of the ungrounded supply conductors in each raceway or cable. A single supply-side bonding jumper installed for bonding two or more raceways or cables shall be sized in accordance with 250.102(C)(1).

Informational Notes

(NEW): Informational Note: The term supply conductors includes ungrounded conductors that do not have overcurrent protection on their supply side and terminate at service equipment or the first disconnecting means of a separately derived system.

(NEW): Informational Note: See Chapter 9, Table 8, for the circular mil area of conductors 18 AWG through 4/0 AWG.

(REVISED): 250.104 Bonding of Piping Systems and Exposed Structural Metal. (B) Other Metal Piping. If installed in, or attached to, a building or structure, a metal piping system(s), including gas piping, that is likely to become energized shall be bonded to any of the following:

(1) Equipment grounding conductor for the circuit that is likely to energize the piping system

(2) Service equipment enclosure

(3) Grounded conductor at the service

(4) Grounding electrode conductor, if of sufficient size

(5) One or more grounding electrodes used

(REVISED): 250.112 Specific Equipment Fastened in Place (Fixed) or Connected by Permanent Wiring Methods. The normally non–current-carrying metal parts of equipment and enclosures described in 250.112(L) and (M), are required to be connected to an equipment grounding conductor. 250.112(A) has added "Switchgear and Switchboard" to the article.

(A) Switchgear and Switchboard Frames and Structures. Switchgear or switchboard frames and structures supporting switching equipment, except frames of 2-wire dc switchgear or switchboards where effectively insulated from ground.

(REVISED): 250.119 Identification of Equipment Grounding Conductors. The 2014 code allows an equipment grounding conductor to be bare, covered, or insulated. Article 250.119 has added 2 new exceptions and an informational note.

(NEW): Exception No. 2: Flexible cords having an integral insulation and jacket without an equipment grounding conductor shall be permitted to have a continuous outer finish that is green.

Informational Notes

(NEW): Informational Note: An example of a flexible cord with integral-type insulation is Type SPT-2, 2 conductor.

(NEW): Exception No. 3: Conductors with green insulation shall be permitted to be used as ungrounded signal conductors where installed between the output terminations of traffic signal control and traffic signal indicating heads. Signaling circuits installed in accordance with this exception shall include an equipment grounding conductor in accordance with 250.118. Wire-type equipment grounding conductors shall be bare or have insulation or covering that is green with one or more yellow stripes.

(REVISED): 250.119 Identification of Equipment Grounding Conductors. (A) Conductors 4 AWG and Larger. Equipment grounding conductors 4 AWG and larger shall comply with 250.119(A)(1) and (A)(2).

(1) An insulated or covered conductor 4 AWG and larger shall be permitted, at the time of installation, to be permanently identified as an equipment grounding conductor at each end and at every point where the conductor is accessible.

Exception: Conductors 4 AWG and larger shall not be required to be marked in conduit bodies that contain no splices or unused hubs.

250.121 Use of Equipment Grounding Conductors. An equipment grounding conductor shall not be used as a grounding electrode conductor.

(NEW): Exception: A wire-type equipment grounding conductor installed in compliance with 250.6(A) and the applicable requirements for both the equipment grounding conductor and the grounding electrode conductor in Parts II, III, and VI of this article shall be permitted to serve as both an equipment grounding conductor and a grounding electrode conductor.

Exam Questions:

67. The 2014 code allows conductors with green insulation to be used as_____.

A. Service Conductors
B. Phase conductors
C. Grounded conductors
D. Ungrounded signal conductors

68. If using 250.119 exception 3, a traffic signal indicating head is required to have a?

A. Green phase conductors
B. Grounded Conductor
C. Equipment grounding conductor
D. All listed answers

69. What chapter contains helpful tables to find the circular mil area of conductors up to 4/0?

A. 10
B. 8
C. 9
D. 9 annex J

70. A wire-type equipment grounding conductor installed as per _____ and meeting the requirements of part II, III, and VI of article 250 can be used as both an equipment grounding conductor and a grounding electrode conductor.

A. 250.122
B. 250.5(A)
C. 250.66
D. 250.6(A)

71. If an equipment grounding conductor _____ and larger is installed, it must be marked at each end and at every point where the conductor is accessible.

A. 6 AWG
B. 4 AWG
C. 2 AWG
D. 8 AWG

72. An equipment grounding conductor _____ be used as a grounding electrode conductor under normal circumstances.

A. May
B. Shall
C. Must
D. Shall not

73. A metal natural gas pipe installed in a 15 story building needs to be bonded to _____.

A. The grounding electrode system
B. The service equipment enclosure
C. The grounding electrode conductor
D. All listed answers

(REVISED): 250.122 Size of Equipment Grounding Conductors. (B) Increased in Size. Where ungrounded conductors are increased in size from the minimum size that has sufficient ampacity for the intended installation, wire-type equipment grounding conductors, where installed, shall be increased in size proportionately according to the circular mil area of the ungrounded conductors.

(REVISED): 250.146 Connecting Receptacle Grounding Terminal to Box. (B) Contact Devices or Yokes. Contact devices or yokes designed and listed as self-grounding shall be permitted in conjunction with the supporting screws to establish equipment bonding between the device yoke and flush-type boxes.

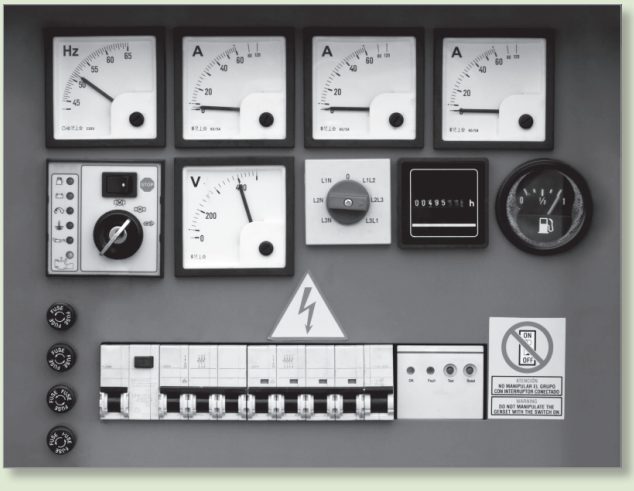
(REVISED): 250.166 Size of the Direct-Current Grounding Electrode Conductor. The size of the grounding electrode conductor for a dc system shall be as specified in 250.166(A) and (B), except as permitted by 250.166(C) through (E). The grounding electrode conductor for a dc system shall meet the sizing requirements in this section but shall not be required to be larger than 3/0 copper or 250 kcmil aluminum.

(NEW): 250.167 Direct-Current Ground-Fault Detection.

(A) Ungrounded Systems. Ground-fault detection systems shall be required for ungrounded systems.

(B) Grounded Systems. Ground-fault detection shall be permitted for grounded systems.

(C) Marking. Direct-current systems shall be legibly marked to indicate the grounding type at the dc source or the first disconnecting means of the system. The marking shall be of sufficient durability to withstand the environment involved.



(REVISED): 250.170 Instrument Transformer Circuits. Secondary circuits of current and potential instrument transformers shall be grounded where the primary windings are connected to circuits of 300 volts or more to ground and, where installed on or in switchgear and on switchboards, shall be grounded irrespective of voltage.

(REVISED): 250.174 Cases of Instruments, Meters, and Relays Operating at 1000 Volts or Less. Instruments, meters, and relays operating with windings or working parts at 1000 volts or less shall be connected to the equipment grounding conductor as specified in 250.174(A), (B), or (C)

(A) Not on Switchgear or Switchboards. Instruments, meters, and relays not located on switchgear or switchboards operating with windings or working parts at 300 volts or more to ground, and accessible to other than qualified persons, shall have the cases and other exposed metal parts connected to the equipment grounding conductor.

(B) On Switchgear or Dead-Front Switchboards. Instruments, meters, and relays (whether operated from current and potential transformers or connected directly in the circuit) on switchgear or switchboards having no live parts on the front of the panels shall have the cases connected to the equipment grounding conductor.

(NEW): 250.186 Ground-Fault Circuit Conductor Brought to Service Equipment. (A) Systems with a Grounded Conductor at the Service Point. Where an ac system operating at over 1000 volts is grounded at any point and is provided with a grounded conductor at the service point, a grounded conductor(s) shall be installed and routed with the ungrounded conductors to each service disconnecting means and shall be connected to each disconnecting means grounded conductor(s) terminal or bus. A main bonding jumper shall connect the grounded conductor(s) to each service disconnecting means enclosure. The grounded conductor(s) shall be installed in accordance with 250.186(A)(1) through (A)(4). The size of the solidly grounded circuit conductor(s) shall be the larger of that determined by 250.184 or 250.186(A)(1) or (A)(2).

(NEW): 250.186 Ground-Fault Circuit Conductor Brought to Service Equipment.

(A) Exception: Where two or more service disconnecting means are located in a single assembly listed for use as service equipment, it shall be permitted to connect the grounded conductor(s) to the assembly common grounded conductor(s) terminal or bus. The assembly shall include a main bonding jumper for connecting the grounded conductor(s) to the assembly enclosure.

(NEW): 250.186 Ground-Fault Circuit Conductor Brought to Service Equipment. (A) (1) Sizing for a Single Raceway or Overhead Conductor. The grounded conductor shall not be smaller than the required grounding electrode conductor specified in Table 250.66 but shall not be required to be larger than the largest ungrounded service-entrance conductor(s). In addition, for sets of ungrounded service-entrance conductors larger than 1100 kcmil copper or 1750 kcmil aluminum, the grounded conductor shall not be smaller than 12 1⁄2 percent of the circular mil area of the largest set of service-entrance ungrounded conductor(s).

Exam Questions:

74. If the size of phase conductors are increased from an existing service, the size of the equipment grounding conductor_____ proportionately to the circular mil area of the phase conductors.

A. Must parallel
B. Remains the same
C. Must also increase
D. No listed answer

75. Instrument transformers are required to be grounded where the primary windings are connected to circuits of _____ volts or more to ground.

A. 240
B. 50
C. 300
D. 100

76. The case of a meter on the dead-front of a panel with no exposed live parts _____ to be connected to the equipment grounding conductor.

A. Is required
B. Is not required
C. No such requirement
D. Is suggested, but optional

77. Yokes listed as _____shall be permitted in conjunction with the supporting screws to establish equipment bonding between the device yoke.

A. Grounded
B. Isolated
C. Self-grounding
D. Grounding

78. If you were to install sets of ungrounded service-entrance conductors larger than 1100 kcmil copper, you would be required to size the grounded conductor no less than _____ percent of the service conductors.

A. 25
B. 12 ½
C. 15
D. 18

79. Article 250.174 deals with the cases of Instruments, meters, and relays operating at _____ Volts or Less.

A. 50
B. 600
C. 300
D. 1000

80. The case of an instrument not located in the switchgear of an industrial facility with exposed metal parts is required to be connected to the equipment grounding conductor if operating at over _____ volts to ground.

A. 50
B. 1000
C. 600
D. 300

81. The grounding electrode conductor _____be required to be larger than the largest ungrounded service-entrance conductor.

A. Shall not
B. Shall
C. Must
D. Is to

(NEW): 250.186 Ground-Fault Circuit Conductor Brought to Service Equipment. (A)(2) Parallel Conductors in Two or More Raceways or Overhead Conductors. If the ungrounded service-entrance conductors are installed in parallel in two or more raceways or as overhead parallel conductors, the grounded conductors shall also be installed in parallel. The size of the grounded conductor in each raceway or overhead shall be based on the total circular mil area of the parallel ungrounded conductors in the raceway or overhead, as indicated in 250.186(A)(1), but not smaller than 1/0 AWG.

(NEW): 250.186 Ground-Fault Circuit Conductor Brought to Service Equipment. (A)(3) & (4) Delta-Connected Service. The grounded conductor of a 3-phase, 3-wire delta service shall have an ampacity not less than that of the ungrounded conductors. Impedance Grounded Neutral Systems. Impedance grounded neutral systems shall be installed in accordance with 250.187.

(NEW): 250.186 Ground-Fault Circuit Conductor Brought to Service Equipment. (B) Systems without a Grounded Conductor at the Service Point. Where an ac system operating at greater than 1000 volts is grounded at any point and is not provided with a grounded conductor at the service point, a supply-side bonding jumper shall be installed and routed with the ungrounded conductors to each service disconnecting means and shall be connected to each disconnecting means equipment grounding conductor terminal or bus. The supply-side bonding jumper shall be installed in accordance with 250.186(B)(1) through (B)(3).

Exception: Where two or more service disconnecting means are located in a single assembly listed for use as service equipment, it shall be permitted to connect the supply-side bonding jumper to the assembly common equipment grounding terminal or bus.

(NEW): 250.186 Ground-Fault Circuit Conductor Brought to Service Equipment. (B) (1) Sizing for a Single Raceway or Overhead Conductor. The supply-side bonding jumper shall not be smaller than the required grounding electrode conductor specified in Table 250.66 but shall not be required to be larger than the largest ungrounded service-entrance conductor(s). In addition, for sets of ungrounded service-entrance conductors larger than 1100 kcmil copper or 1750 kcmil aluminum, the supply-side bonding jumper shall not be smaller than 121⁄2 percent of the circular mil area of the largest set of service-entrance ungrounded conductor(s).

(NEW): 250.186 Ground-Fault Circuit Conductor Brought to Service Equipment. (B) (2) Parallel Conductors in Two or More Raceways or Overhead Conductors. If the ungrounded service-entrance conductors are installed in parallel in two or more raceways or overhead conductors, the supply-side bonding jumper shall also be installed in parallel. The size of the supply-side bonding jumper in each raceway or overhead shall be based on the total circular mil area of the parallel ungrounded conductors in the raceway or overhead, as indicated in 250.186(A)(1), but not smaller than 1/0 AWG.

(REVISED): 250.188 Grounding of Systems Supplying Portable or Mobile Equipment. (D) Ground-Fault Detection and Relaying. Ground-fault detection and relaying shall be provided to automatically de-energize any component of a system over 1000 volts that has developed a ground fault. The continuity of the equipment grounding conductor shall be continuously monitored so as to automatically de-energize the circuit of the system over 1000 volts to the portable or mobile equipment upon loss of continuity of the equipment grounding conductor.

Exam Questions:

82. What is the minimum size supply-side bonding jumper allowed by the 2014 code for systems operating over 1000 volts.

A. 1/0
B. 2/0
C. 3/0
D. 4/0

83. What is the minimum size grounded conductor allowed by the 2014 code for systems operating over 1000 volts.

A. 3/0
B. 2/0
C. 1/0
D. 4/0

84. For systems operating at over 1000 volts, the grounded conductor of a 3-phase, 3-wire_____ system is required to have the same ampacity as the ungrounded conductors.

A. Grounded
B. Wye
C. Delta
D. Ungrounded

85. The 2014 code lists _____ provisions for systems operating over 1000 volts that require a supply-side bonding jumper.

A. 3
B. 2
C. 4
D. 5

86. For systeVms over 1000 volts with ground fault detectors, the continuity of the _____ shall be continuously monitored.

A. Grounding conductor
B. Grounded conductor
C. Equipment grounding conductor
D. Bond jumper

87. If installing 3 parallel runs of 2000 kcmil overhead with an operating voltage of 4160, the 2014 code requires the _____ to also be paralleled.

A. Grounding conductor
B. Grounded conductor
C. Equipment grounding conductor
D. Bond

88. The supply-side bonding jumper _____be required to be larger than the largest ungrounded service-entrance conductor.

A. Shall
B. Shall not
C. Must
D. Is to

89. On parallel systems operating over 1000 volts, the size of the supply-side bonding jumper shall be based on the total _____ of the parallel ungrounded conductors.

A. Length
B. Circular mil area
C. Total diameter
D. All listed answers

(NEW): 250.194 Grounding and Bonding of Fences and Other Metal Structures. Metallic fences enclosing, and other metal structures in or surrounding, a substation with exposed electrical conductors and equipment shall be grounded and bonded to limit step, touch, and transfer voltages.

(NEW): 250.194 Grounding and Bonding of Fences and Other Metal Structures. (A) Metal Fences. Where metal fences are located within 5 m (16 ft) of the exposed electrical conductors or equipment, the fence shall be bonded to the grounding electrode system with wire-type bonding jumpers as follows:

(1) Bonding jumpers shall be installed at each fence corner and at maximum 50 m (160 ft) intervals along the fence.

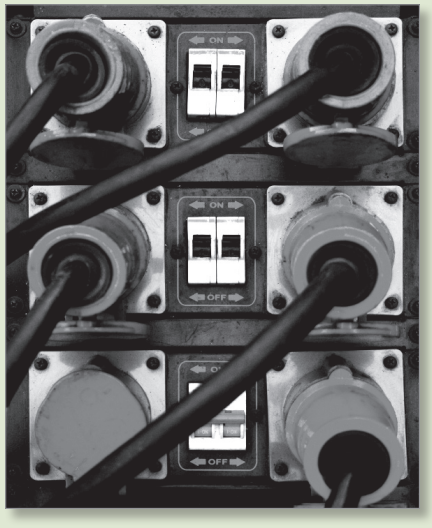
(2) Where bare overhead conductors cross the fence, bonding jumpers shall be installed on each side of the crossing.

(3) Gates shall be bonded to the gate support post, and each gate support post shall be bonded to the grounding electrode system.

(4) Any gate or other opening in the fence shall be bonded across the opening by a buried bonding jumper.

(5) The grounding grid or grounding electrode systems shall be extended to cover the swing of all gates.

(6) The barbed wire strands above the fence shall be bonded to the grounding electrode system. Alternate designs performed under engineering supervision shall be permitted for grounding or bonding of metal fences.



(NEW): 250.194 Grounding and Bonding of Fences and Other Metal Structures. (B) Metal Structures. All exposed conductive metal structures, including guy wires within 2.5 m (8 ft) vertically or 5 m (16 ft) horizontally of exposed conductors or equipment and subject to contact by persons, shall be bonded to the grounding electrode systems in the area.

(REVISED): 285.1 Scope. This article covers general requirements, installation requirements, and connection requirements for surge-protective devices (SPDs) permanently installed on premises wiring systems of 1000 volts or less.

(REVISED): 285.4 Number Required. Where used at a point on a circuit, the SPD shall be connected to each ungrounded conductor.

(NEW): 285.13 Type 4 and Other Component Type SPDs. Type 4 component assemblies and other component type SPDs shall only be installed by the equipment manufacturer.

(REVISED): 285.25 Type 3 SPDs. Type 3 SPDs shall be permitted to be installed on the load side of branch-circuit overcurrent protection up to the equipment served. If included in the manufacturer's instructions, the Type 3 SPD connection shall be a minimum 10 m (30 ft) of conductor distance from the service or separately derived system disconnect.

(REVISED): 300.2 Limitations. (C) Conductors of Different Systems. (1) 1000 Volts, Nominal, or Less. Conductors of ac and dc circuits, rated 1000 volts, nominal, or less, shall be permitted to occupy the same equipment wiring enclosure, cable, or raceway. All conductors shall have an insulation rating equal to at least the maximum circuit voltage applied to any conductor within the enclosure, cable, or raceway. Secondary wiring to electric-discharge lamps of 1000 volts or less, if insulated for the secondary voltage involved, shall be permitted to occupy the same luminaire, sign, or outline lighting enclosure as the branch-circuit conductors.

(REVISED): 300.5 Underground Installations. (C) Underground Cables and Conductors under Buildings. Underground cable and conductors installed under a building shall be in a raceway.

Exam Questions:

90. If bare overhead conductors cross the fence of a substation within the specified distance, _____ are required to be installed on each side of the crossing.

A. Insulators
B. Warning signs
C. Caution signs
D. Bonding jumpers

91. The secondary wiring to electric-discharge lamps of 1000 volts or less, and insulated for the secondary voltage involved, _____be permitted to occupy the same luminaire.

A. No such provision
B. Shall not
C. Must
D. Shall

92. All exposed conductive metal structures within _____ horizontally of exposed conductors operating at over 1000 volts subject to contact by people is required to be bonded to the grounding electrode system.

A. 8 ft.
B. 16 ft.
C. 12 ft.
D. 10 ft.

93. Article 285 covers _____.

A. Surge-protective devices
B. Surge-arrestor devices
C. Standard-protective devices
D. Surge-personnel devices

94. A type _____can be installed on the load side of branch-circuit overcurrent protection up to the equipment served.

A. 2 SPD
B. 4 SPD
C. 1 SPD
D. 3 SPD

95. The metal fence surrounding a substation is required to be bonded to limit _____.

A. Step voltages
B. Transfer voltages
C. Touch voltages
D. All listed answers

96. A type 4 SPD can only be installed by the _____.

A. Equipment manufacturer
B. Electrician
C. Maintenance personnel
D. Qualified individual

97. In most cases, conductors run under a building are required to be in _____.

A. A vault
B. Concrete
C. A raceway
D. All listed answers

(REVISED): 300.5 Underground Installations. (D)(4) Enclosure or Raceway Damage. Where the enclosure or raceway is subject to physical damage, the conductors shall be installed in rigid metal conduit, intermediate metal conduit, RTRC-XW, Schedule 80 PVC conduit, or equivalent.

300.22 Wiring in Ducts Not Used for Air Handling, Fabricated Ducts for Environmental Air, and Other Spaces for Environmental Air (Plenums). (C)(1)

Informational Notes

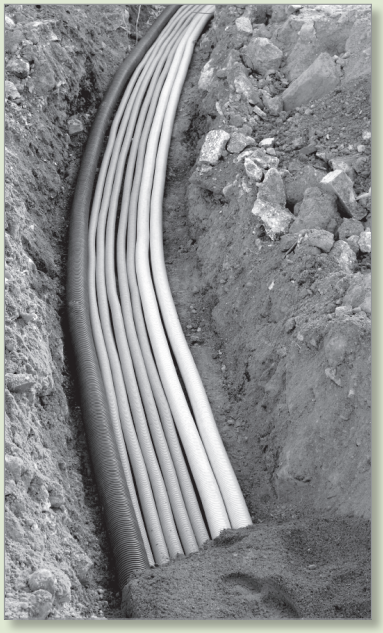
(NEW): Informational Note: One method to determine low smoke and heat release properties is that the nonmetallic cable ties and other nonmetallic cable accessories exhibit a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with ANSI/UL 2043-2008, Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.

(NEW): 300.38 Raceways in Wet Locations Above Grade. Where raceways are installed in wet locations above grade, the interior of these raceways shall be considered to be a wet location. Insulated conductors and cables installed in raceways in wet locations above grade shall comply with 310.10(C).

(NEW): 300.45 Warning Signs. Warning signs shall be conspicuously posted at points of access to conductors in all conduit systems and cable systems. The warning sign(s) shall be legible and permanent and shall carry the following wording:

DANGER—HIGH VOLTAGE—KEEP OUT

(NEW): 300.50 Underground Installations. (A)(2) Industrial Establishments. In industrial establishments, where conditions of maintenance and supervision ensure that only qualified persons service the installed cable, non-shielded single-conductor cables with insulation types up to 2000 volts that are listed for direct burial shall be permitted to be directly buried.



(REVISED): 310.10 Uses Permitted. (H)(5)(6) Conductors in Parallel. Equipment Bonding Conductors. Where parallel equipment bonding conductors are used, they shall be sized in accordance with 250.122. Sectioned equipment bonding conductors smaller than 1/0 AWG shall be permitted in multi-conductor cables, provided that the combined circular mil area of the sectioned equipment bonding conductors in each cable complies with 250.122.

(6) Bonding Jumpers. Where parallel equipment bonding jumpers or supply-side bonding jumpers are installed in raceways, they shall be sized and installed in accordance with 250.102.

(REVISED): 310.15 Ampacities for Conductors Rated 0–2000 Volts. (B)(7) 120/240-Volt, Single-Phase Dwelling Services and Feeders. For one-family dwellings and the individual dwelling units of two-family and multifamily dwellings, service and feeder conductors supplied by a single-phase, 120/240-volt system shall be permitted be sized in accordance with 310.15(B)(7)(1) through (4).

(1) For a service rated 100 through 400 A, the service conductors supplying the entire load associated with a one-family dwelling, or the service conductors supplying the entire load associated with an individual dwelling unit in a two-family or multifamily dwelling, shall be permitted to have an ampacity not less than 83 percent of the service rating.

(2) For a feeder rated 100 through 400 A, the feeder conductors supplying the entire load associated with a one family dwelling, or the feeder conductors supplying the entire load associated with an individual dwelling, unit in a two-family or multifamily dwelling, shall be permitted to have an ampacity not less than 83 percent of the feeder rating.

(3) In no case shall a feeder for an individual dwelling unit be required to have an ampacity greater than that specified in 310.15(B)(7)(1) or (2).

(4) Grounded conductors shall be permitted to be sized smaller than the ungrounded conductors, provided that the requirements of 220.61 and 230.42 for service conductors or the requirements of 215.2 and 220.61 for feeder conductors are met.

Exam Questions:

98. Non-shielded single-conductor cables with insulation types of up to _____volts are allowed in industrial establishments where qualified persons service the installed cable.

A. 2000
B. 1000
C. 600
D. 10,000

99. What is the maximum allowable heat release rate for nonmetallic cable ties according to ANSI standards?

A. 75 kW
B. 100 W
C. 50 kW
D. 100 kW

100. A conductor warning sign is required by the 2014 code to read:

A. HIGH VOLTAGE—KEEP OUT—DANGER
B. HIGH VOLTAGE—DANGER—KEEP OUT
C. DANGER—HIGH VOLTAGE—KEEP OUT
D. No such requirement

101. True or False, the 2014 code allows paralleling equipment bonding conductors only if smaller than 1/0 AWG.

A. False
B. True

102. Parallel equipment bonding conductors are sized using _____

A. 250.122 (D)
B. 250.105
C. 250.66
D. 250.122

103. Raceways that are installed in wet locations above grade are considered to have their interior classified as a _____.

A. Damp location
B. Dry location
C. Wet location
D. Classified location

104. Nonmetallic cable ties should have an average optical density of _____or less.

A. 0.12
B. 0.15
C. 0.25
D. 0.50

105. If conduit may be subject to physical damage when run underground, type _____ is required to be used.

A. All listed answers
B. Rigid metal conduit
C. RTRC-XW
D. Intermediate metal conduit

(REVISED): 314.15 Damp or Wet Locations. In damp or wet locations, boxes, conduit bodies, and fittings shall be placed or equipped so as to prevent moisture from entering or accumulating within the box, conduit body, or fitting. Boxes, conduit bodies, and fittings installed in wet locations shall be listed for use in wet locations. Approved drainage openings not larger than 6 mm (1⁄4 in.) shall be permitted to be installed in the field in boxes or conduit bodies listed for use in damp or wet locations. For installation of listed drain fittings, larger openings are permitted to be installed in the field in accordance with manufacturer's instructions.

(REVISED): 314.16 Number of Conductors in Outlet, Device, and Junction Boxes, and Conduit Bodies (B)(2) Clamp Fill. Where one or more internal cable clamps, whether factory or field supplied, are present in the box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest conductor present in the box. No allowance shall be required for a cable connector with its clamping mechanism outside the box. A clamp assembly that incorporates a cable termination for the cable conductors shall be listed and marked for use with specific nonmetallic boxes. Conductors that originate within the clamp assembly shall be included in conductor fill calculations covered in 314.16(B)(1) as though they entered from outside the box. The clamp assembly shall not require a fill allowance, but the volume of the portion of the assembly that remains within the box after installation shall be excluded from the box volume as marked in 314.16(A)(2).

(REVISED): 314.25 Covers and Canopies. In completed installations, each box shall have a cover, faceplate, lampholder, or luminaire canopy, except where the installation complies with 410.24(B). Screws used for the purpose of attaching covers, or other equipment, to the box shall be either machine screws matching the thread gauge or size that is integral to the box or shall be in accordance with the manufacturer's instructions.

(REVISED): 314.25 Covers and Canopies. (C) Flexible Cord Pendants. Covers of outlet boxes and conduit bodies having holes through which flexible cord pendants pass shall be provided with identified bushings or shall have smooth, well-rounded surfaces on which the cords may bear. So-called hard rubber or composition bushings shall not be used.

(REVISED): 314.27 Outlet Boxes. (A)(2) Boxes at Luminaire or Lampholder Outlets. (2) Ceiling Outlets. At every outlet used exclusively for lighting, the box shall be designed or installed so that a luminaire or lampholder may be attached. Boxes shall be required to support a luminaire weighing a minimum of 23 kg (50 lb). A luminaire that weighs more than 23 kg (50 lb) shall be supported independently of the outlet box, unless the outlet box is listed and marked on the interior of the box to indicate the maximum weight the box shall be permitted to support.

(REVISED): 314.28 Pull and Junction Boxes and Conduit Bodies. (A)(3) Minimum Size. (3) Smaller Dimensions. Listed boxes or listed conduit bodies of dimensions less than those required in 314.28(A)(1) and (A)(2) shall be permitted for installations of combinations of conductors that are less than the maximum conduit or tubing fill (of conduits or tubing being used) permitted by Table 1 of Chapter 9. Listed conduit bodies of dimensions less than those required in 314.28(A)(2), and having a radius of the curve to The centerline not less than that indicated in Table 2 of

Chapter 9 for one-shot and full-shoe benders, shall be permitted for installations of combinations of conductors permitted by Table 1 of Chapter 9. These conduit bodies shall be marked to show they have been specifically evaluated in accordance with this provision. Where the permitted combinations of conductors for which the box or conduit body has been listed are less than the maximum conduit or tubing fill permitted by Table 1 of Chapter 9, the box or conduit body shall be permanently marked with the maximum number and maximum size of conductors permitted.

Exam Questions:

106. True or False, conduit bodies smaller than what is specified in 314.28(A)(1) and (A)(2) are not allowed to be used.

A. False
B. True

107. A _____ that incorporates a cable termination for cable conductors is required to be listed and marked for use with specific nonmetallic boxes.

A. Clamp rating
B. Clamp assembly
C. Termination lug
D. Equipment terminal

108. Where is a box required to be marked with its maximum weight rating?

A. Nail or screw side
B. Outside
C. Inside
D. All listed answers

109. Holes through which flexible cord pendants pass is required to have _____.

A. Rated
B. Identified bushings
C. Listed
D. Integral

110. A smaller conduit body than what is listed in 314.28(A)(1) and (A)(2) is required to be ____to show they have been specifically evaluated in accordance with this provision.

A. Listed
B. Marked
C. Rated
D. Manufactured

111. If one or more internal cable clamps are in a box, a single volume allowance can be made based on the _____ conductor present in the box.

A. Grounded
B. Smallest
C. Largest
D. Grounding

REVISED): 320.23 In Accessible Attics. (A) Cables Run Across the Top of Floor Joists. Where run across the top of floor joists, or within 2.1 m (7 ft) of the floor or floor joists across the face of rafters or studding, the cable shall be protected by guard strips that are at least as high as the cable. Where this space is not accessible by permanent stairs or ladders, protection shall only be required within 1.8 m (6 ft) of the nearest edge of the scuttle hole or attic entrance.

(REVISED): 324.41 Floor Coverings. Floor-mounted Type FCC cable, cable connectors, and insulating ends shall be covered with carpet squares not larger than 1.0 m (39.37 in.) square. Carpet squares that are adhered to the floor shall be attached with release-type adhesives.

(REVISED): 330.30 Securing and Supporting. Type MC (B) Securing. Unless otherwise provided, cables shall be secured at intervals not exceeding 1.8 m (6 ft). Cables containing four or fewer conductors sized no larger than 10 AWG shall be secured within 300 mm (12 in.) of every box, cabinet, fitting, or other cable termination. In vertical installations, listed cables with ungrounded conductors 250 kcmil and larger shall be permitted to be secured at intervals not exceeding 3 m (10 ft).

(NEW): 330.30 Securing and Supporting. (D)(3) Unsupported Cables. Type MC of the interlocked armor type in lengths not exceeding 900 mm (3 ft) from the last point where it is securely fastened and is used to connect equipment where flexibility is necessary to minimize the transmission of vibration from equipment or to provide flexibility for equipment that requires movement after installation.

338.10 Uses Permitted. (B)(4)(b) Branch Circuits or Feeders.

(NEW): Exception: Single-conductor Type USE and multi-rated USE conductors shall not be subject to the ampacity limitations of Part II of Article 340.

Exam Questions:

112. USE conductors are not subject to the ampacity limitations of Part _____of Article 340.

A. III
B. II
C. IV
D. V

113. If a cable is run across the top of floor joists, or across the face of rafters or studding, the cable is required to be protected by _____.

A. Planking
B. Guard rails
C. Guard strips
D. Blocking

114. What is the maximum size carpet squares that can be used to cover type FCC cable?

A. 39.73″ square
B. 38.37″ square
C. 39.37″ square
D. 37.97″ square

115. Interlocked armor type MC cable is allowed to be supported within _____ of a motor termination enclosure.

A. 36″
B. 24″
C. 18″
D. 48″

(REVISED): 344.30 Securing and Supporting. (A) Securely Fastened. RMC shall be secured in accordance with one of the following:

(1) RMC shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other conduit termination.

(2) Fastening shall be permitted to be increased to a distance of 1.5 m (5 ft) where structural members do not readily permit fastening within 900 mm (3 ft).

(3) Where approved, conduit shall not be required to be securely fastened within 900 mm (3 ft) of the service head for above-the-roof termination of a mast.

(NEW): 344.100 Construction. RMC shall be made of one of the following:

(1) Steel (ferrous), with or without protective coatings
(2) Aluminum (nonferrous)
(3) Red brass
(4) Stainless steel

348.30 Securing and Supporting (FMC). (A) Securely Fastened.

(REVISED): Exception No. 4: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to a luminaire(s) or other equipment. For the purposes

of this exception, listed flexible metal conduit fittings shall be permitted as a means of support.

(REVISED): 350.42 Couplings and Connectors. Only fittings listed for use with LFMC shall be used. Angle connectors shall not be concealed. Straight LFMC fittings shall be permitted for direct burial where marked.

(REVISED): 352.24 Bends (PVC) — How Made. Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with identified bending equipment. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.

(REVISED): 354.2 Definition. Nonmetallic Underground Conduit with Conductors

(NUCC). A factory assembly of conductors or cables inside a nonmetallic, smooth wall raceway with a circular cross section.

(REVISED): 355.2 Definition. Reinforced Thermosetting Resin Conduit (RTRC). A rigid nonmetallic raceway of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables.

Exam Questions:

116. The radius of the curve to the centerline of PVC pipe bends shall not be less than shown in Table _____, Chapter 9.

A. 3
B. 2
C. 1
D. 7

117. Type _____ is a rigid nonmetallic raceway with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables.

A. RNC
B. NUCC
C. RTRC
D. ENT

118. RMC can be made of _____.

A. Stainless steel
B. All listed answers
C. Red brass
D. Steel

119. Straight _____ fittings are allowed to be used for direct burial if marked.

A. NMC
B. MC
C. All listed answers
D. LFMC

120. LFMC angle connectors _____be concealed.

A. May
B. Can
C. Shall
D. Shall not

[See Page 35 to fill out the Answer Sheet]

ANSWER SHEET – 2014 NEC CODE CHANGE (VIRGINIA)

First Name: _____ Last Name: _____ Date: _____

Address: _____ City: _____ State: _____ ZIP: _____

License #: _____ Phone: _____ Email: _____

**** See instructions on the inside cover page to submit your exams and pay for your course**

V.2

1.	A B C D	28.	A B C D	55.	A B C D	82.	A B C D
2.	A B C D	29.	A B C D	56.	A B C D	83.	A B C D
3.	A B C D	30.	A B C D	57.	A B C D	84.	A B C D
4.	A B C D	31.	A B C D	58.	A B C D	85.	A B C D
5.	A B C D	32.	A B C D	59.	A B C D	86.	A B C D
6.	A B C D	33.	A B C D	60.	A B C D	87.	A B C D
7.	A B C D	34.	A B C D	61.	A B C D	88.	A B C D
8.	A B C D	35.	A B C D	62.	A B C D	89.	A B C D
9.	A B C D	36.	A B C D	63.	A B C D	90.	A B C D
10.	A B C D	37.	A B C D	64.	A B C D	91.	A B C D
11.	A B C D	38.	A B C D	65.	A B C D	92.	A B C D
12.	A B C D	39.	A B C D	66.	A B C D	93.	A B C D
13.	A B C D	40.	A B C D	67.	A B C D	94.	A B C D
14.	A B C D	41.	A B C D	68.	A B C D	95.	A B C D
15.	A B C D	42.	A B C D	69.	A B C D	96.	A B C D
16.	A B C D	43.	A B C D	70.	A B C D	97.	A B C D
17.	A B C D	44.	A B C D	71.	A B C D	98.	A B C D
18.	A B C D	45.	A B C D	72.	A B C D	99.	A B C D
19.	A B C D	46.	A B C D	73.	A B C D	100.	A B C D
20.	A B C D	47.	A B C D	74.	A B C D	101.	A B C D
21.	A B C D	48.	A B C D	75.	A B C D	102.	A B C D
22.	A B C D	49.	A B C D	76.	A B C D	103.	A B C D
23.	A B C D	50.	A B C D	77.	A B C D	104.	A B C D
24.	A B C D	51.	A B C D	78.	A B C D	105.	A B C D
25.	A B C D	52.	A B C D	79.	A B C D	106.	A B C D
26.	A B C D	53.	A B C D	80.	A B C D	107.	A B C D
27.	A B C D	54.	A B C D	81.	A B C D	108.	A B C D

109. Ⓐ Ⓑ Ⓒ Ⓓ
110. Ⓐ Ⓑ Ⓒ Ⓓ
111. Ⓐ Ⓑ Ⓒ Ⓓ
112. Ⓐ Ⓑ Ⓒ Ⓓ
113. Ⓐ Ⓑ Ⓒ Ⓓ
114. Ⓐ Ⓑ Ⓒ Ⓓ
115. Ⓐ Ⓑ Ⓒ Ⓓ
116. Ⓐ Ⓑ Ⓒ Ⓓ
117. Ⓐ Ⓑ Ⓒ Ⓓ
118. Ⓐ Ⓑ Ⓒ Ⓓ
119. Ⓐ Ⓑ Ⓒ Ⓓ
120. Ⓐ Ⓑ Ⓒ Ⓓ