Instructions: **Fee $90**

1. Print these pages.
2. Circle the correct answers and transfer them to the answer sheet on last pages.
3. Page down to the last page for the verification forms and mailing instructions.
4. Use the provided information and your 2023 NEC code book (optional).
5. 240 questions are listed in a straight order in mini sections format throughout the complete quiz.

Course: 2023 NEC 240 Quiz

This course is valid for these credentials:

	Cred Code	Credit Hours
Registered/Beginner Electrician	BE	8.0
Commercial Electrical Inspector	CEI	8.0
Industrial Journeyman Electrician	IJE	8.0
Journeyman Electrician	JE	8.0
Master Electrician	ME	8.0
Residential Journeyman Electrician	RJE	8.0
Residential Master Electrician	RME	8.0
UDC-Electrical Inspector	UEI	8.0

2023 NEC 240 Quiz

Covered. This Code covers the installation and removal of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables for the following: (1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings (2) Yards, lots, parking lots, carnivals, and industrial substations (3) Installations of conductors and equipment that connect to the supply of electricity (4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center (5) Installations supplying shore power to ships and watercraft in marinas and boatyards, including monitoring of leakage current (6) Installations used to export electric power from vehicles to premises wiring or for bidirectional current flow

90.6 Formal Interpretations. To promote uniformity of interpretation and application of this Code, formal interpretation procedures have been established and are found in the NFPA Regulations Governing Committee Projects.

Article 100 Scope. This article contains only those definitions essential to the application of this Code. It is not intended to include commonly defined general terms or commonly defined technical terms from related codes and standards. In general, only those terms that are used in two or more articles are defined in Article 100. Definitions are also found in XXX.2 sections of other articles. Part I of this article contains definitions intended to apply wherever the terms are used throughout this Code. Part II contains definitions applicable to installations and equipment operating at over 1000 volts, nominal. Part III contains definitions applicable to Hazardous (Classified) Locations.

Simple Apparatus. An electrical component or combination of components of simple

construction with well-defined electrical parameters that does not generate more than 1.5 volts, 100 mA, and 25 mW, or a passive component that does not dissipate more than 1.3 watts and is compatible with the intrinsic safety of the circuit in which it is used. Informational Note No. 1: The following apparatus are examples of simple apparatus: (1) Passive components; for example, switches, instrument connectors, plugs and sockets, junction boxes, resistance temperature devices, and simple semiconductor devices such as LEDs (2) Sources of stored energy consisting of single components in simple circuits with well-defined parameters; for example, capacitors or inductors, whose values are considered when determining the overall safety of the system (3) Sources of generated energy; for example, thermocouples and photocells, that do not generate more than 1.5 volts, 100 mA, and 25 mW Informational Note No. 2: For further information, refer to ANSI/UL 913-2013, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations; and ANSI/UL 60079-11-2013, Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety “i.”

Spray Area. Any fully enclosed, partly enclosed, or unenclosed area in which dangerous quantities of flammable or combustible vapors, mists, residues, dusts, or deposits are present due to the operation of spray processes, including (1) any area in the direct path of a spray application process; (2) the interior of a spray booth, spray room, or limited finishing workstation, as herein defined; (3) the interior of any exhaust plenum, eliminator section, or scrubber section; (4) the interior of any exhaust duct or exhaust stack leading from a spray application process; (5) the interior of any air recirculation path up to and including recirculation particulate filters; (6) any solvent concentrator (pollution abatement) unit or solvent recovery (distillation) unit; and (7) the inside of a membrane enclosure. The following are not part of the spray area: (1) fresh air make-up units; (2) air supply ducts and air supply plenums; (3) recirculation air supply ducts downstream of recirculation particulate filters; and (4) exhaust ducts from solvent concentrator (pollution abatement) units. Informational Note: Unenclosed spray areas are locations outside of buildings or are localized operations within a larger room or space. Such are normally provided with some local vapor extraction/ventilation system. In automated operations, the area limits are the maximum area in the direct path of spray operations. In manual operations, the area limits are the maximum area of spray when aimed at 90 degrees to the application surface.

Spray Booth. A power-ventilated enclosure for a spray application operation or process that confines and limits the escape of the material being sprayed, including vapors, mists, dusts, and residues that are produced by the spraying operation and conducts or directs these materials to an exhaust system. Informational Note: A spray booth is an enclosure or insert within a larger room used for spray/coating/dipping applications. A spray booth can be fully enclosed or have open front or face and can include separate conveyor entrance and exit. The spray booth is provided with a dedicated ventilation exhaust with supply air from the larger room or from a dedicated air supply.

Spray Room. A power-ventilated fully enclosed room used exclusively for open spraying of flammable or combustible materials.

Type of Protection “n”. Type of protection where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur. Informational Note: See ANSI/UL 60079-15-2013, Explosive Atmospheres — Part 15: Equipment Protection by Type of Protection “n”.

Unclassified Locations. Locations determined to be neither Class I, Division 1; Class I, Division 2; Zone 0; Zone 1; Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; Zone 20; Zone 21; Zone 22; nor any combination thereof.

Unenclosed Spray Area. Any spray area that is not confined by a limited finishing workstation, spray booth, or spray room, as herein defined.
Ventilated. Provided with a means to permit circulation of air sufficient to remove an excess of heat, fumes, or vapors.
Volatile Flammable Liquid. A flammable liquid having a flash point below 38°C (100°F), or a flammable liquid whose temperature is above its flash point, or a Class II combustible liquid that has a vapor pressure not exceeding 276 kPa (40 psia) at 38°C (100°F) and whose temperature is above its flash point.

1. What does the 2023 code cover?
    A. Installations supplying shore power to ships and watercraft in marinas a and boatyards, including monitoring of leakage current
    B. Yards, lots, parking lots, carnivals, and industrial substations
    C. Installations used to export electric power from vehicles to premises wiring or for bidirectional current flow
    D. All listed answers
2. What is the letter designator where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur?
    A. i
    B. e
    C. p
    D. n
3. What does part III of Article 100 contain definitions applicable to?
    A. Hazardous (Classified) Locations
    B. Installations and equipment operating under 1000 volts
    C. Installations and equipment operating under 600 volts
    D. Installations and equipment operating at over 1000 volts
4. What does the code consider a component that does not dissipate more than 1.3 watts and is compatible with the intrinsic safety of the circuit in which it is used?
    A. Simple apparatus
    B. Passive component
    C. Passive apparatus
    D. Simple component
5. Where can formal code interpretation procedures for the electrical code be found?
    A. Committee Projects and regulations
    B. Code Making Panel 17
    C. NFPA Regulations Governing Committee Projects
    D. Code Making Panel 13
6. What does the code list as examples of passive components?
    A. LED’s
    B. Resistance temperature devices
    C. switches
    D. All listed answers
7. What does part II of Article 100 contain definitions applicable to?
    A. Installations and equipment operating in hazardous locations
    B. Installations and equipment operating under 1000 volts

C. Installations and equipment operating under 600 volts
D. Installations and equipment operating at over 1000 volts

8. In general, what does the code consider any fully enclosed, partly enclosed, or unenclosed area in which dangerous quantities of flammable or combustible vapors, mists, residues, dusts, or deposits are present due to the operation of spray processes?
A. Spray booth
B. Spray Area
C. Spray room
D. All listed answers

9. What is any spray area that is not confined by a limited finishing workstation, spray booth, or spray room?
A. Unenclosed spray area
B. Spray area
C. Spray room
D. All listed answers

10. What is a power-ventilated fully enclosed room used exclusively for open spraying of flammable or combustible materials?
A. Unenclosed spray area
B. Spray area
C. Spray room
D. All listed answers

11. What is the maximum voltage of an electrical component or combination of components to be considered a simple apparatus?
A. 1.2 volts
B. 1.4 volts
C. 1.5 volts
D. 1 volt

12. What best defines a power-ventilated enclosure for a spray application operation or process that confines and limits the escape of the material being sprayed, including vapors, mists, dusts, and residues that are produced by the spraying operation and conducts or directs these materials to an exhaust system?
A. Spray booth
B. Spray area
C. Spray room
D. All listed answers

13. In general, what does the code consider a flammable liquid having a flash point below 100°F?
A. Classified volatile liquid
B. Flammable volatile liquid
C. Volatile flammable liquid
D. All listed answers

14. What best describes an area provided with a means to permit circulation of air sufficient to remove an excess of heat, fumes, or vapors?
A. Air circulated
B. Ventilated
C. Exhaust fan
D. Whole house fan

110.3(A) Examination. In judging equipment, considerations such as the following shall be evaluated: (1) Suitability for installation and use in conformity with this Code Informational Note No. 1: Equipment may be new, reconditioned, refurbished, or remanufactured. Informational Note No. 2: Suitability of equipment use may be identified by a description marked on or provided with a product to identify the suitability of the product for a specific purpose, environment, or application. Special conditions of use or other limitations and other pertinent information may be marked on the equipment, included in the product instructions, or included in the appropriate listing and labeling information. Suitability of equipment may be evidenced by listing or labeling. (2) Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided (3) Wire-bending and connection space (4) Electrical insulation (5) Heating effects under normal conditions of use and also under abnormal conditions likely to arise in service (6) Arcing effects (7) Classification by type, size, voltage, current capacity, and specific use (8) Other factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment

110.5 Conductors. Conductors used to carry current shall be of copper, aluminum, or copper-clad aluminum unless otherwise provided in this Code. Where the conductor material is not specified, the sizes given in this Code shall apply to copper conductors. Where other materials are used, the size shall be changed accordingly.

110.12(C) Cables and Conductors. Cables and conductors installed exposed on the surfaces of ceilings and sidewalls shall be supported by the building structure in such a manner that the cables and conductors will not be damaged by normal building use. Such cables and conductors shall be secured by hardware including straps, staples, cable ties, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4 and 300.11. Nonmetallic cable ties and other nonmetallic cable accessories used to secure and support cables in other spaces used for environmental air (plenums) shall be listed as having low smoke and heat release properties. Informational Note No. 1: Accepted industry practices are described in ANSI/ NECA/FOA 301-2009, Standard for Installing and Testing Fiber Optic Cables, and other ANSI-approved installation standards. Informational Note No. 2: See 4.3.11.2.6.5 and 4.3.11.5.5.6 of NFPA 90A-2018, Standard for the Installation of Air-Conditioning and Ventilating Systems, for discrete combustible components installed in accordance with 300.22(C). Informational Note No. 3: Paint, plaster, cleaners, abrasives, corrosive residues, or other contaminants may result in an undetermined alteration of optical fiber cable properties.

110.14 Electrical Connections. Because of different characteristics of dissimilar metals, devices such as pressure terminal or pressure splicing connectors and soldering lugs shall be identified for the material of the conductor and shall be properly installed and used. Conductors of dissimilar metals shall not be intermixed in a terminal or splicing connector where physical contact occurs between dissimilar conductors (such as copper and aluminum or aluminum and copper-clad aluminum), unless the device is identified for the purpose and conditions of use. Materials such as solder, fluxes, inhibitors, and compounds, where employed, shall be suitable for the use and shall be of a type that will not adversely affect the conductors, installation, or equipment. Connectors and terminals for conductors more finely stranded than Class B and Class C stranding as shown in Chapter 9, Table 10, shall be identified for the specific conductor class or classes.

15. When using dissimilar metals or devices, how are the pressure terminal or pressure splicing connectors and soldering lugs required to be identified?
    A. Identified for the location of the lugs
    B. Identified for the material of the conductor
    C. Identified for the temperature of the assembly
    D. Identified for the alloy of the splicing connectors
16. If a conductor material is not specified in the code, what type of material are you required to size conductors with?
    A. Copper-clad aluminum
    B. Aluminum
    C. Copper
    D. Silver -clad copper
17. What is the first listed consideration that should be given when judging and evaluating electrical equipment?
    A. Suitability
    B. Arcing effects
    C. Electrical insulation
    D. Mechanical strength and durability
18. What can be used to support fiber optic cables installed exposed on the surfaces of ceilings?
    A. Straps
    B. Staples
    C. Cable ties
    D. All listed answers

110.14(D) Terminal Connection Torque. Tightening torque values for terminal connections shall be as indicated on equipment or in installation instructions provided by the manufacturer. An approved means shall be used to achieve the indicated torque value. Informational Note No. 1: Examples of approved means of achieving the indicated torque values include torque tools or devices such as shear bolts or breakaway-style devices with visual indicators that demonstrate that the proper torque has been applied. Informational Note No. 2: The equipment manufacturer can be contacted if numeric torque values are not indicated on the equipment or if the installation instructions are not available. Informative Annex I of UL Standard 486A-486B, Standard for Safety-Wire Connectors, provides torque values in the absence of manufacturer's recommendations. Informational Note No. 3: Additional information for torquing threaded connections and terminations can be found in Section 8.11 of NFPA 70B-2019, Recommended Practice for Electrical Equipment Maintenance.

110.16(B) Service Equipment. In other than dwelling units, in addition to the requirements in 110.16(A), a permanent label shall be field or factory applied to service equipment rated 1200 amps or more. The label shall meet the requirements of 110.21(B) and contain the following information: (1) Nominal system voltage (2) Available fault current at the service overcurrent protective devices (3)The clearing time of service overcurrent protective devices based on the available fault current at the service equipment (4) The date the label was applied Exception: Service equipment labeling shall not be required if an arc flash label is applied in accordance with acceptable industry practice. Informational Note No. 1: NFPA 70E-2018, Standard for Electrical Safety in the Workplace, provides guidance, such as determining severity of potential exposure, planning safe work practices, arc flash labeling, and selecting

personal protective equipment. Informational Note No. 2: ANSI Z535.4-2011, Product Safety Signs and Labels, provides guidelines for the design of safety signs and labels for application to products. Informational Note No. 3: Acceptable industry practices for equipment labeling are described in NFPA 70E-2018, Standard for Electrical Safety in the Workplace. This standard provides specific criteria for developing arc-flash labels for equipment that provides nominal system voltage, incident energy levels, arc-flash boundaries, minimum required levels of personal protective equipment, and so forth.

110.21(A)(2) Reconditioned Equipment. Reconditioned equipment shall be marked with the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the electrical equipment can be identified, along with the date of the reconditioning. Reconditioned equipment shall be identified as “reconditioned” and the original listing mark removed. Approval of the reconditioned equipment shall not be based solely on the equipment’s original listing. Exception: In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the equipment, the markings indicated in 110.21(A)(2) shall not be required for equipment that is reconditioned by the owner or operator as part of a regular equipment maintenance program. Informational Note No. 1: Industry standards are available for application of reconditioned and refurbished equipment. Informational Note No. 2: The term reconditioned may be interchangeable with the terms rebuilt, refurbished, or remanufactured. Informational Note No. 3: The original listing mark may include the mark of the certifying body and not the entire equipment label.

110.22(A) General. Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. In other than one- or two-family dwellings, the marking shall include the identification of the circuit source that supplies the disconnecting means. The marking shall be of sufficient durability to withstand the environment involved.

110.24(A) Field Marking. Service equipment at other than dwelling units shall be legibly marked in the field with the available fault current. The field marking(s) shall include the date the fault-current calculation was performed and be of sufficient durability to withstand the environment involved. The calculation shall be documented and made available to those authorized to design, install, inspect, maintain, or operate the system. Informational Note No. 1: The available fault-current marking(s) addressed in 110.24 is related to required shortcircuit current and interrupting ratings of equipment. NFPA 70E-2018, Standard for Electrical Safety in the Workplace, provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment. Informational Note No. 2: Values of available fault current for use in determining appropriate minimum shortcircuit current and interrupting ratings of service equipment are available from electric utilities in published or other forms.

110.24(B) Modifications. When modifications to the electrical installation occur that affect the available fault current at the service, the available fault current shall be verified or recalculated as necessary to ensure the service equipment ratings are sufficient for the available fault current at the line terminals of the equipment. The required field marking(s) in 110.24(A) shall be adjusted to reflect the new level of available fault current. Exception: The field marking requirements in 110.24(A) and 110.24(B) shall not be required in industrial installations where conditions of maintenance and supervision ensure that only qualified persons service the equipment.

19. Where could you find torque values in the absence of manufacturer’s recommendations?

A. Informative Annex K of UL Standard 486b-486c
B. Informative Annex J of the 2023 code
C. Informative Annex I of UL Standard 486A-486B
D. Informative Annex N of the 2023 code

20. Where should the tightening torque values for terminal connections be located?
A. The installation instructions
B. On the equipment
C. Paper work from the manufacturer
D. All listed answers

21. In general, how are disconnects required to be legibly marked?
A. With its location
B. With its current
C. With its wattage rating
D. With its purpose

22. What publication has standards for electrical safety in the workplace?
A. 2023 NEC
B. NFPA 70E-2018
C. ANSI Z535.4-2011
D. Informative Annex I of UL Standard 486A-486B

23. How is reconditioned electrical equipment required to be identified?
A. Remanufactured or reconditioned
B. Rebuilt
C. Refurbished
D. All listed answers

24. What is service equipment at other than dwelling units required to be legibly marked in the field with?
A. Available fault current
B. Available voltage
C. Instantaneous short circuit current
D. Maximum load recommendations

25. What is required to be field or factory applied to service equipment rated 1200 amps or more?
A. A warning label
B. A permanent label
C. Clearing instructions
D. All listed answers

26. When can the field marking requirements in 110.24(A) and 110.24(B) be ignored?
A. In multifamily dwellings
B. In single family dwellings
C. In industrial installations where conditions of maintenance and supervision ensure that only qualified persons service the equipment
D. In commercial production facilities

110.26(A) Working Space. Working space for equipment operating at 1000 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized shall comply with the dimensions of 110.26(A)(1), (A) (2), (A)(3), and (A)(4) or as required or permitted elsewhere in this Code. Informational Note: NFPA 70E-2018, Standard for Electrical Safety in the Workplace, provides guidance, such as determining

severity of potential exposure, planning safe work practices including establishing an electrically safe work condition, arc flash labeling, and selecting personal protective equipment.

110.26(A)(3) Height of Working Space. The work space shall be clear and extend from the grade, floor, or platform to a height of 2.0 m (6½ ft) or the height of the equipment, whichever is greater. Within the height requirements of this section, other equipment or support structures, such as concrete pads, associated with the electrical installation and located above or below the electrical equipment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the electrical equipment. Exception No. 1: On battery systems mounted on open racks, the top clearance shall comply with 480.10(D). Exception No. 2: In existing dwelling units, service equipment or panelboards that do not exceed 200 amperes shall be permitted in spaces where the height of the working space is less than 2.0 m (6½ ft). Exception No. 3: Meters that are installed in meter sockets shall be permitted to extend beyond the other equipment. The meter socket shall be required to follow the rules of this section.

110.26(C)(2) Large Equipment. For large equipment that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to and egress from the required working space not less than 610 mm (24 in.) wide and 2.0 m (6½ ft) high at each end of the working space. This requirement shall apply to either of the following conditions: (1) For equipment rated 1200 amperes or more and over 1.8 m (6 ft) wide (2) For service disconnecting means installed in accordance with 230.71 where the combined ampere rating is 1200 amperes or more and over 1.8 m (6 ft) wide. Open equipment doors shall not impede the entry to or egress from the working space. A single entrance to and egress from the required working space shall be permitted where either of the conditions in 110.26(C)(2) (a) or (C)(2)(b) is met. (a) Unobstructed Egress. Where the location permits a continuous and unobstructed way of egress travel, a single entrance to the working space shall be permitted. (b) Extra Working Space. Where the depth of the working space is twice that required by 110.26(A)(1), a single entrance shall be permitted. It shall be located such that the distance from the equipment to the nearest edge of the entrance is not less than the minimum clear distance specified in Table 110.26(A)(1) for equipment operating at that voltage and in that condition.

110.26(C)(3) Personnel Doors. Where equipment rated 800 amperes or more that contains overcurrent devices, switching devices, or control devices is installed and there is a personnel door(s) intended for entrance to and egress from the working space less than 7.6 m (25 ft) from the nearest edge of the working space, the door(s) shall open in the direction of egress and be equipped with listed panic hardware or listed fire exit hardware. Informational Note: For information on panic hardware, see UL 305, Standard For Safety For Panic Hardware. For fire exit hardware, see UL 305, Standard For Panic Hardware, and UL 10C, Standard for Safety for Positive Pressure Fire Tests of Door Assemblies.

110.26(D) Illumination. Illumination shall be provided for all working spaces about service equipment, switchboards, switchgear, panelboards, or motor control centers installed indoors. Control by automatic means shall not be permitted to control all illumination within the working space. Additional lighting outlets shall not be required where the work space is illuminated by an adjacent light source or as permitted by 210.70(A)(1), Exception No. 1, for switched receptacles.

110.26(E)(2) Outdoor. Outdoor installations shall comply with 110.26(E)(2)(a) through (E)(2)(c). (a) Installation Requirements. Outdoor electrical equipment shall be the following: (1) Installed in identified enclosures (2) Protected from accidental contact by unauthorized

personnel or by vehicular traffic (3) Protected from accidental spillage or leakage from piping systems (b) Work Space. 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. (c) 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: Structural overhangs or roof extensions shall be permitted in this zone.

27. In general, how wide is the door required to be from the required working space for large equipment that contains overcurrent devices, switching devices, or control devices?
    A. 24 inches
    B. 30 inches
    C. 20 inches
    D. 36 inches
28. What section applies to the top clearance requirements for battery systems mounted on open racks?
    A. 420.30 (D)
    B. 110.26(C)(3)
    C. 410.24(A)
    D. 480.10(D)
29. Where can you find information on panic hardware for personnel doors?
    A. UL 305
    B. UL 10C
    C. UL 30C
    D. UL 315
30. What section of the 2023 code addresses the working space for equipment operating at 1000 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized?
    A. 110.24(A)
    B. 110.26(C)(3)
    C. 110.26(A)
    D. 110.30
31. What is allowed to be in the dedicated equipment space with regards to outdoor electrical installations?
    A. Sprinkler lines less than 4”
    B. HVAC duct work
    C. Structural overhangs or roof extensions
    D. Sprinkler lines less than 1”
32. In general, what is the minimum working height required for equipment operating at 1000 volts, nominal, or less to ground?
    A. 6½ ft
    B. 6 ft
    C. 5½ ft
    D. 8 ft
33. What section requires illumination to be provided for all working spaces about service equipment, switchboards, switchgear, panelboards, or motor
control centers installed indoors?

A. 410.24(A)
B. 480.10(D)
C. 110.26(C)(3)
D. 110.26(D)

Part III. Over 1000 Volts, Nominal 110.30 General. Conductors and equipment used on circuits over 1000 volts, nominal, shall comply with Part I of this article and with 110.30 through 110.41, which supplement or modify Part I. In no case shall this part apply to equipment on the supply side of the service point.
110.31(A)(4) Locks. Doors shall be equipped with locks, and doors shall be kept locked, with access allowed only to qualified persons. Personnel doors shall open in the direction of egress and be equipped with listed panic hardware or listed fire exit hardware.
110.31(A)(5) Transformers. Where a transformer is installed in a vault as required by Article 450, the vault shall be constructed in accordance with the requirements of Part III of Article 450. Informational Note No. 1: For additional information, see ANSI/ASTM E119-2018a, Method for Fire Tests of Building Construction and Materials, and NFPA 80-2019, Standard for Fire Doors and Other Opening Protectives. Informational Note No. 2: A typical 3-hour construction is 150 mm (6 in.) thick reinforced concrete.
110.32 Work Space About Equipment. Sufficient space shall be provided and maintained about electrical equipment to permit ready and safe operation and maintenance of such equipment. Where energized parts are exposed, the minimum clear work space shall be not less than 2.0 m (6½ ft) high (measured vertically from the floor or platform) and the width of the equipment or 914 mm (3 ft) wide (measured parallel to the equipment), whichever is greater. The depth shall be as required in 110.34(A). In all cases, the work space shall permit at least a 90-degree opening of doors or hinged panels. Within the height requirements of this section, other equipment that is associated with the electrical installation and is located above or below the electrical equipment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the electrical equipment. Working space required by this section shall not be used for storage. When normally enclosed live parts are exposed for inspection or servicing, the working space, if in a passageway or general open space, shall be suitably guarded.
110.33(A)(3) Personnel Doors. Where there are personnel doors intended for entrance to and egress from the working space less than 7.6 m (25 ft) from the nearest edge of the working space, the doors shall open in the direction of egress and be equipped with listed panic hardware or listed fire exit hardware.
110.70 General. Electrical enclosures intended for personnel entry and specifically fabricated for this purpose shall be of sufficient size to provide safe work space about electrical equipment with live parts that is likely to require examination, adjustment, servicing, or maintenance while energized. Such enclosures shall have sufficient size to permit ready installation or withdrawal of the conductors employed without damage to the conductors or to their insulation. They shall comply with this part. Exception: Where electrical enclosures covered by Part V of this article are part of an industrial wiring system operating under conditions of maintenance and supervision that ensure that only qualified persons monitor and supervise the system, they shall be permitted to be designed and installed in accordance with appropriate engineering practice. If required by the authority having jurisdiction, design documentation shall be provided.
200.3 Connection to Grounded System. Grounded conductors of premises wiring systems shall be electrically connected to the supply system grounded conductor to ensure a

common, continuous grounded system. For the purpose of this section, electrically connected shall mean making a direct electrical connection capable of carrying current, as distinguished from induced currents. Exception: Listed interactive inverters identified for use in distributed resource generation systems such as photovoltaic and fuel cell power systems shall be permitted to be connected to premises wiring without a grounded conductor if the connected premises wiring or utility system includes a grounded conductor.
200.6(A) Sizes 6 AWG or Smaller. An insulated grounded conductor of 6 AWG or smaller shall be identified by one of the following means: (1) The insulated conductor shall have a continuous white outer finish. (2) The insulated conductor shall have a continuous gray outer finish. (3) The insulated conductor shall have three continuous white or gray stripes along the conductor's entire length on other than green insulation. (4) Insulated conductors that have their outer covering finished to show a white or gray color but have colored tracer threads in the braid identifying the source of manufacture are acceptable means of identification. (5) A single-conductor, sunlight-resistant, outdoor-rated cable used as a solidly grounded onductor in photovoltaic power systems, as permitted by 690.41, shall be identified at the time of installation by markings at terminations in accordance with 200.6(A)(1) through (A)(4). (6) The grounded conductor of a mineral-insulated, metal-sheathed cable (Type MI) shall be identified at the time of installation by distinctive marking at its terminations. (7) Fixture wire shall comply with the requirements for grounded conductor identification as specified in 402.8. (8) For aerial cable, the identification shall comply with one of the methods in 200.6(A)(1) through (A)(5), or by means of a ridge located on the exterior of the cable so as to identify it.

34. Which way are doors required to open that are intended for entrance to and egress within 25 ft from the nearest edge of the working space with regards to conductors and equipment used on circuits over 1000 volts?
    A. There are no requirements for door openings at 25 ft
    B. Direction of entrance
    C. Direction of the break room
    D. Direction of egress
35. Grounded conductors of premises wiring systems are required to be electrically connected to the supply system grounded conductor for what purpose?
    A. To ensure a common, continuous grounded system
    B. To ensure an intersystem bond
    C. To ensure a common, continuous ground loop system
    D. All listed answers
36. What part of Article 450 is the construction of a transformer vault required to comply with?
    A. Part I
    B. Part II
    C. Part III
    D. Part V
37. What part of Article 110 are conductors and equipment used on circuits over 1000 volts nominal required to comply with?
    A. Part II
    B. Part I
    C. Part III
    D. Part IV

38. What are electrical room doors with conductors and equipment used on circuits over 1000 volts nominal required to have?
    A. Windows
    B. Locks
    C. Signage
    D. All listed answers
39. In general, how wide is the clear work space for energized parts that are exposed with regards to conductors and equipment used on circuits over 1000 volts required to be?
    A. 30 inches
    B. 4 ft
    C. 6 1⁄2 ft
    D. 3 ft
40. How is an insulated grounded conductor of 6 AWG or smaller required to be identified?
    A. The insulated conductor shall have three continuous white or gray stripes along the conductor's entire length on other than green insulation
    B. The insulated conductor shall have a continuous white outer finish
    C. The insulated conductor shall have a continuous gray outer finish
    D. All listed answers
41. In general, what is the required clear work space height for energized parts that are exposed when measured vertically from the floor or platform with regards to conductors and equipment used on circuits over 1000 volts?
    A. 7 ft
    B. 6 1⁄2 ft
    C. 7 1⁄2 ft
    D. 80 inches
42. What part of Article 110 covers manholes and other electrical enclosures intended for personnel entry?
    A. Part V
    B. Part II
    C. Part I
    D. Part IV
43. What would require qualified individuals to actually enter a manhole or other electrical enclosure where live parts or cables may be energized?
    A. For maintenance
    B. For adjustment
    C. For servicing
    D. All listed answers

200.6(E) Grounded Conductors of Multiconductor Cables. The insulated grounded conductor(s) in a multiconductor cable shall be identified by a continuous white or gray outer finish or by three continuous white or gray stripes on other than green insulation along its entire length. For conductors that are 4 AWG or larger in cables, identification of the grounded conductor shall be permitted to comply with 200.6(B). For multiconductor flat cable with conductors that are 4 AWG or larger, an external ridge shall be permitted to identify the grounded conductor. Exception No. 1: Conductors within multiconductor cables shall be permitted to be re-identified at their terminations at the time of installation by a distinctive

white or gray marking or other equally effective means. Exception No. 2: The grounded conductor of a multiconductor varnished-cloth-insulated cable shall be permitted to be identified at its terminations at the time of installation by a distinctive white marking or other equally effective means. Informational Note: The color gray may have been used in the past as an ungrounded conductor. Care should be taken when working on existing systems.

200.9 Means of Identification of Terminals. In devices or utilization equipment with polarized connections, identification of terminals to which a grounded conductor is to be connected shall be substantially white or silver in color. The identification of other terminals shall be of a readily distinguishable different color. Exception: Where the conditions of maintenance and supervision ensure that only qualified persons service the installations, terminals for grounded conductors shall be permitted to be permanently identified at the time of installation by a distinctive white marking or other equally effective means.

200.10(B) Receptacles, Plugs, and Connectors. Receptacles, polarized attachment plugs, and cord connectors for plugs and polarized plugs shall have the terminal intended for connection to the grounded conductor identified as follows: (1) Identification shall be by a metal or metal coating that is substantially white or silver in color or by the word “white” or the letter “W” located adjacent to the identified terminal. (2) If the terminal is not visible, the conductor entrance hole for the connection shall be colored white or marked with the word “white” or the letter “W.”

210.6(C) 277 Volts to Ground. Circuits exceeding 120 volts, nominal, between conductors but not exceeding 277 volts, nominal, to ground shall be permitted to supply cord-and-plug-connected or permanently connected utilization equipment, or the following types of listed luminaires: (1) Electric-discharge luminaires with integral ballasts (2) LED luminaires with LED drivers between the branch circuit and the lampholders (3) Incandescent or LED luminaires, equipped with medium-base or smaller screw shell lampholders, where the lampholders are supplied at 120 volts or less from the output of a stepdown autotransformer, LED driver, or other type of power supply that is an integral component of the luminaire Informational Note: See 410.90 for requirements regarding the connection of screw shell lampholders to grounded conductors. (4) Luminaires equipped with mogul-base screw shell lampholders (5) Luminaires equipped with lampholders, other than the screw shell type, when used within their voltage ratings of their lampholders (6) Luminaires without lampholders Informational Note: Luminaires with nonserviceable LEDs are examples of luminaires without lampholders. (7) Auxiliary equipment of electric-discharge or LED-type lamps Informational Note: See 410.137 for auxiliary equipment limitations. (8) Luminaires converted with listed retrofit kits incorporating integral LED light sources or accepting LED lamps that also conforms with 210.6(C)(1), (C)(2), (C)(3), (C)(4), or (C)(5)

210.8 Ground-Fault Circuit-Interrupter Protection for Personnel. Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F). The ground-fault circuit interrupter shall be installed in a readily accessible location. Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders. Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances. Informational Note No. 3: See 555.9 for GFCI requirements for boat hoists. Informational Note No. 4: Additional GFCI requirements for specific circuits and equipment are contained in Chapters 4, 5, and 6. For the purposes of this section, when determining the distance from receptacles the distance shall be measured as the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or the shortest path without passing through a window.

210.8(A) Dwelling Units. All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit interrupter protection for personnel. (1) Bathrooms (2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use (3) Outdoors. Exception to (3): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable. (4) Crawl spaces — at or below grade level (5) Basements Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection. Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems. Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G). (6) Kitchens — where the receptacles are installed to serve the countertop surfaces (7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink (8) Boathouses (9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall (10) Laundry areas Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided. (11) Indoor damp and wet locations

44. In general, what color are the terminals required to be where the grounded conductor is terminated in devices or utilization equipment?
    A. Substantially gray
    B. Substantially gold and chrome
    C. Substantially white or silver
    D. Substantially white and silver
45. What color may have been used in the past as an ungrounded conductor?
    A. White
    B. Gray
    C. Green
    D. All listed answers
46. With what letter designator does the terminal intended for connection to the grounded conductor need to be when using a polarized attachment plug?
    A. S
    B. GC
    C. G
    D. W
47. How are the insulated grounded conductor(s) in a multiconductor cable required to be identified?
    A. By three continuous white or gray stripes on other than green insulation along its entire length
    B. By a continuous white outer finish
    C. By a continuous gray outer finish
    D. All listed answers

48. What section of the 2023 code lists the requirements regarding the connection of screw shell lampholders to grounded conductors?
    A. 410.90
    B. 420.80
    C. 210.60
    D. 412.90
49. What section of this code has the GFCI requirements for appliances?
    A. 555.9
    B. 215.9
    C. 422.5(A)
    D. 210.8(D)
50. What section of the 2023 code has information regarding ground-fault circuit-interrupter protection for personnel on feeders?
    A. 220.52(C)
    B. 422.5(A)
    C. 555.9
    D. 215.9
51. What does the exception to 210.8(A)(3) pertain to?
    A. Electric snow-melting equipment
    B. Boathouses
    C. Crawl spaces
    D. Ceiling fans
52. What section of this code has the GFCI requirements for boat hoists?
    A. 215.9
    B. 555.9
    C. 422.5(A)
    D. 220.52(C)
53. In what type of location is a ground-fault circuit interrupter required to be installed?
    A. An open location
    B. Accessible location
    C. Readily accessible location
    D. All listed answers

210.8(B) Other Than Dwelling Units. All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel. (1) Bathrooms (2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking (3) Rooftops Exception: Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop. (4) Outdoors Exception No. 1 to (3) and (4): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable. Exception No. 2 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with

GFCI protection. (5) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection. Exception No. 2 to (5): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21. (6) Indoor damp and wet locations (7) Locker rooms with associated showering facilities (8) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms (9) Crawl spaces — at or below grade level (10) Unfinished areas of basements Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided. (11) Laundry areas (12) Bathtubs and shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

210.8(D) Specific Appliances. Unless GFCI protection is provided in accordance with 422.5(B)(3) through (B)(5), the outlets supplying the appliances specified in 422.5(A)shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2). Where the appliance is a vending machine as specified in 422.5(A)(5) and GFCI protection is not provided in accordance with 422.5(B)(3) or (B)(4), branch circuits supplying vending machines shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2).

210.8(E) Equipment Requiring Servicing. GFCI protection shall be provided for the receptacles required by 210.63.

210.8(F) Outdoor Outlets. All outdoor outlets for dwellings, other than those covered in 210.8(A)(3), Exception to (3), that are supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, shall have ground-fault circuit-interrupter protection for personnel. Exception: Ground-fault circuit-interrupter protection shall not be required on lighting outlets other than those covered in 210.8(C).

210.11(C)(3) Bathroom Branch Circuits. In addition to the number of branch circuits required by other parts of this section, one or more 120-volt, 20-ampere branch circuit shall be provided to supply bathroom(s) receptacle outlet(s) required by 210.52(D) and any countertop and similar work surface receptacle outlets. Such circuits shall have no other outlets. Exception: Where the 20-ampere circuit supplies a single bathroom, outlets for other equipment within the same bathroom shall be permitted to be supplied in accordance with 210.23(A)(1) and (A)(2).

210.12(C) Guest Rooms, Guest Suites, and Patient Sleeping Rooms in Nursing Homes and Limited-Care Facilities. All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets and devices installed in guest rooms and guest suites of hotels and motels and patient sleeping rooms in nursing homes and limited-care facilities shall be protected by any of the means described in 210.12(A)(1) through (6).

54. How many dedicated 20-amp circuits are required to supply a single bathroom?
    A. 1
    B. 2
    C. 3
    D. None
55. What section of the code has GFCI requirements for equipment requiring servicing?

A. 210.8(E)
B. 215.9
C. 555.9
D. 210.8(D)

56. What section should be referenced to determine if ground-fault circuit-interrupter protection is required for lighting outlets?
A. 210.12(C)
B. 210.8(D)
C. 210.8(C)
D. 210.18(C)

57. What section of the code has GFCI requirements for specific appliances?
A. 215.9
B. 210.8(D)
C. 555.9
D. 210.8(E)

58. In other than dwelling units, what is the minimum distance from the outside edge of a bathtub or shower stall that a receptacle is required to have ground-fault circuit-interrupter protection for personnel?
A. 7 ft
B. 8 ft
C. 5 ft
D. 6 ft

210.12(D) Branch Circuit Extensions or Modifications — Dwelling Units, Dormitory Units, and Guest Rooms and Guest Suites. Where branch circuit wiring for any of the areas specified in 210.12(A), (B), or (C) is modified, replaced, or extended, the branch circuit shall be protected by one of the following: (1) By any of the means described in 210.12(A)(1) through (A)(6) (2) A listed outlet branch-circuit-type AFCI located at the first receptacle outlet of the existing branch circuit Exception: AFCI protection shall not be required where the extension of the existing branch circuit conductors is not more than 1.8 m (6 ft) and does not include any additional outlets or devices, other than splicing devices. This measurement shall not include the conductors inside an enclosure, cabinet, or junction box.

210.15 Reconditioned Equipment. The following shall not be reconditioned: (1) Equipment that provides ground-fault circuit interrupter protection for personnel (2) Equipment that provides arc-fault circuit-interrupter protection (3) Equipment that provides ground-fault protection of equipment

210.25(B) Common Area Branch Circuits. Branch circuits installed for lighting, central alarm, signal, communications, or other purposes for public or common areas of a two-family dwelling, a multifamily dwelling, or a multi-occupancy building shall not be supplied from equipment that supplies an individual dwelling unit or tenant space. Informational Note: Examples of public or common areas include, but are not limited to, lobbies, corridors, stairways, laundry rooms, roofs, elevators, washrooms, store rooms, driveways (parking), and mechanical rooms.

210.52 Dwelling Unit Receptacle Outlets. This section provides requirements for 125-volt, 15- and 20-ampere receptacle outlets. The receptacles required by this section shall be in addition to any receptacle that is as follows: (1) Part of a luminaire or appliance, or (2) Controlled by a listed wall-mounted control device in accordance with 210.70(A)(1),

Exception No. 1, or (3) Located within cabinets or cupboards, or (4) Located more than 1.7 m (5½ ft) above the floor

210.52(C) Countertops and Work Surfaces. In kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units, receptacle outlets for countertop and work surfaces that are 300 mm (12 in.) or wider shall be installed in accordance with 210.52(C)(1) through (C)(3) and shall not be considered as the receptacle outlets required by 210.52(A). For the purposes of this section, where using multioutlet assemblies, each 300 mm (12 in.) of multi-outlet assembly containing two or more receptacles installed in individual or continuous lengths shall be considered to be one receptacle outlet.

210.52(C)(3) Receptacle Outlet Location. Receptacle outlets shall be located in one or more of the following: (1) On or above countertop or work surfaces: On or above, but not more than 500 mm (20 in.) above, the countertop or work surface. (2) In countertop or work surfaces: Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces. (3) Below countertop or works surfaces: Not more than 300 mm (12 in.) below the countertop or work surface. Receptacles installed below a countertop or work surface shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond its support base. Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or range tops as covered in 210.52(C)(1), Exception, or appliances occupying assigned spaces shall not be considered as these required outlets. Informational Note No. 1: See 406.5(E) and 406.5(G) for installation of receptacles in countertops and 406.5(F) and 406.5(G) for installation of receptacles in work surfaces. See 380.10 for installation of multioutlet assemblies. Informational Note No. 2: See Annex J and ANSI/ICC A117.1-2009, Standard on Accessible and Usable Buildings and Facilities.

210.52(G) Basements, Garages, and Accessory Buildings. For one- and two-family dwellings, and multifamily dwellings, at least one receptacle outlet shall be installed in the areas specified in 210.52(G)(1) through (G)(3). These receptacles shall be in addition to receptacles required for specific equipment.

210.52(G)(1) Garages. In each attached garage and in each detached garage with electric power, at least one receptacle outlet shall be installed in each vehicle bay and not more than 1.7 m (5½ ft) above the floor. Exception: Garage spaces not attached to an individual dwelling unit of a multifamily dwelling shall not require a receptacle outlet in each vehicle bay.

210.60 Guest Rooms, Guest Suites, Dormitory Units, and Similar Occupancies.

210.60(B) Receptacle Placement. The total number of receptacle outlets shall not be less than required in 210.52(A). These receptacle outlets shall be permitted to be located conveniently for permanent furniture layout. At least two receptacle outlets shall be readily accessible. Where receptacles are installed behind the bed, the receptacle shall be located to prevent the bed from contacting any attachment plug that may be installed or the receptacle shall be provided with a suitable guard.

59. What section should be referenced for the installation of multioutlet assemblies?
    A. 406.5(G)
    B. 406.5(E)
    C. 380.10
    D. All listed answers
60. What type of equipment is NOT allowed to be reconditioned?
    A. Equipment that provides ground-fault circuit-interrupter protection for personnel

B. Equipment that provides ground-fault protection of equipment
C. Equipment that provides arc-fault circuit-interrupter protection
D. All listed answers

61. What section of the code provides requirements for 125-volt, 15- and 20-ampere receptacle outlets?
A. 210.52
B. 210.52(C)
C. 210.15
D. 210.12(C)

62. What does the code consider a public or common area?
A. Mechanical rooms
B. Laundry rooms
C. Store rooms
D. All listed answers

63. What is the maximum distance above the floor that a garage receptacle outlet is required to be installed?
A. 5 1/2 ft
B. 6 ft
C. 6 ft 7 inches
D. 48 inches

64. How many receptacle outlets are required to be installed in the areas specified in 210.52(G)(1) through (G)(3) with regards to one- and two-family dwellings, and multifamily dwellings?
A. One
B. Two
C. Three
D. Four

65. Where receptacles are installed behind a bed, the receptacle(s) shall be located to prevent the bed from contacting any _____ that may be installed or the receptacle shall be provided with a suitable guard.
A. Equipment
B. Wall plate
C. Attachment plug
D. All listed answers

66. AFCI protection is not required where the extension of existing branch circuit conductors is not more than _____ and does not include any additional outlets or devices, other than splicing devices.
A. 8 ft
B. 7 ft
C. 6 ft
D. 10 ft

67. In general, how many receptacle outlets are required to be installed in a single-family dwelling 2-car attached garage?
A. 1
B. 2
C. 3
D. 4

210.63 Equipment Requiring Servicing. A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location within 7.5 m (25 ft) of the equipment as specified in 210.63(A) and (B).
210.63(A) Heating, Air-Conditioning, and Refrigeration Equipment. The required receptacle outlet shall be located on the same level as the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment's branch-circuit disconnecting means. Exception: A receptacle outlet shall not be required at one- and two-family dwellings for the service of evaporative coolers.
210.63(B) Other Electrical Equipment. In other than one- and two-family dwellings, a receptacle outlet shall be located as specified in 210.63(B)(1) and (B)(2). **210.63(B)(1) Indoor Service Equipment.** The required receptacle outlet shall be located within the same room or area as the service equipment.
210.63(B)(2) Indoor Equipment Requiring Dedicated Equipment Spaces. Where equipment, other than service equipment, requires dedicated equipment space as specified in 110.26(E), the required receptacle outlet shall be located within the same room or area as the electrical equipment and shall not be connected to the load side of the equipment's branch-circuit disconnecting means.
210.65(B) Receptacle Outlets Required. The total number of receptacle outlets, including floor outlets and receptacle outlets in fixed furniture, shall not be less than as determined in (1) and (2).
210.65(B)(1) Receptacle Outlets in Fixed Walls. The required number of receptacle outlets shall be determined in accordance with 210.52(A)(1) through (A)(4). These receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner.
210.65(B)(2) Floor Outlets. A meeting room with any floor dimension that is 3.7 m (12 ft) or greater in any direction and that has a floor area of at least 20 m2 (215 ft2) shall have at least one floor receptacle outlet, or at least one floor outlet to serve receptacle(s), located at a distance not less than 1.8 m (6 ft) from any fixed wall for each 20 m2 (215 ft2) or major portion of floor space.
Informational Note No. 1: See 314.27(B) for floor boxes used for receptacles located in the floor. Informational Note No. 2: See Article 518 for assembly occupancies designed for 100 or more persons.
210.70(A)(1) Habitable Rooms. At least one lighting outlet controlled by a listed all mounted control device shall be installed in every habitable room, kitchen, and bathroom. The wallmounted control device shall be located near an entrance to the room on a wall. Exception No. 1: In other than kitchens and bathrooms, one or more receptacles controlled by a listed wallmounted control device shall be permitted in lieu of lighting outlets. Exception No. 2: Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to listed wall-mounted control devices or (2) located at a customary wall switch location and equipped with a manual override that will allow the sensor to function as a wall switch.
210.70(A)(2) Additional Locations. Additional lighting outlets shall be installed in accordance with the following: (1) At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in hallways, stairways, attached garages, and detached garages with electric power. (2) For dwelling units, attached garages, and detached garages with electric power, at least one lighting outlet controlled by a listed wall-mounted control device shall be installed to provide illumination on the exterior side of outdoor entrances or exits with grade-level access. A vehicle door in a garage shall not be considered

as an outdoor entrance or exit. (3) Where one or more lighting outlet(s) are installed for interior stairways, there shall be a listed wall-mounted control device at each floor level and landing level that includes an entryway to control the lighting outlet(s) where the stairway between floor levels has six risers or more. Exception to (A)(2)(1), (A)(2)(2), and (A)(2)(3): In hallways, in stairways, and at outdoor entrances, remote, central, or automatic control of lighting shall be permitted. (4) Lighting outlets controlled in accordance with 210.70(A)(2)(3) shall not be controlled by use of listed wallmounted control devices unless they provide the full range of dimming control at each location.

68. What section of the code has information regarding floor boxes used for receptacles located in the floor?
    A. 314.27(B)
    B. 518
    C. 210.63(B)
    D. 210.70(A)(2)
69. What section of the code addresses indoor equipment requiring dedicated equipment spaces with regards to receptacles?
    A. 210.65(B)
    B. 210.63(B)(2)
    C. 210.63(B)
    D. 210.70(A)(2)
70. Within how many feet of equipment requiring servicing is a 125-volt, single-phase, 15- or 20-ampererated receptacle outlet required to be installed?
    A. 20 ft
    B. 7.5 ft
    C. 25 ft
    D. 10 ft
71. What article should be referenced for assembly occupancies designed for 100 or more persons?
    A. 210.70(A)(2)
    B. 314.27(B)
    C. 210.63(B)
    D. 518
72. Where is the receptacle required by 210.63(B)(1) required to be located?
    A. Within 5 feet of the equipment
    B. Within 10 feet of the equipment
    C. The same room or area as the service equipment
    D. 210.63(B)(1) has no receptacle requirements
73. In general, at least _____ lighting outlet(s) controlled by a listed wall-mounted control device is required to be installed in every habitable room, kitchen, and bathroom.
    A. One
    B. Two
    C. None
    D. Three
74. Who can determine the location for receptacle outlets located in fixed walls?
    A. Building owner
    B. Installer
    C. Designer

D. All listed answers

75. How many lighting outlets controlled by a listed wall mounted control device are required to be installed in hallways, stairways, attached garages, and detached garages with electric pow er?

A. One
B. Two
C. None
D. Three

210.70(B) Guest Rooms or Guest Suites. In hotels, motels, or similar occupancies, guest rooms or guest suites shall have at least one lighting outlet controlled by a listed wall-mounted control device installed in every habitable room and bathroom. Exception No. 1: In other than bathrooms and kitchens where provided, one or more receptacles controlled by a listed wall-mounted control device shall be permitted in lieu of lighting outlets. Exception No. 2: Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to listed wall-mounted control devices or (2) located at a customary wall switch location and equipped with a manual override that allows the sensor to function as a wall switch.

210.70(C) All Occupancies. For attics and underfloor spaces, utility rooms, and basements, at least one lighting outlet containing a switch

220.12 Lighting Load for Non-Dwelling Occupancies. 220.12(A) General. A unit load of not less than that specified in Table 220.12 for non-dwelling occupancies and the floor area determined in 220.11 shall be used to calculate the minimum lighting load. Motors rated less than 1⁄8 HP and connected to a lighting circuit shall be considered general lighting load. Informational Note: The unit values of Table 220.12 are based on minimum load conditions and 100 percent power factor and may not provide sufficient capacity for the installation contemplated

220.12(B) Energy Code. 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 using the unit 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. Automatic means to take action to reduce the connected load shall be permitted. (3) The demand factors specified in 220.42 are not applied to the general lighting load. (4) The continuous load multiplier of 125 percent shall be applied.

220.14(J) Dwelling Units. In one-family, two-family, and multifamily dwellings, the minimum unit load shall be not less than 33 voltamperes/m2 (3 volt-amperes/ft2). The lighting and receptacle outlets specified in 220.14(J)(1), (J)(2), and (J)(3) are included in the minimum unit load. No additional load calculations shall be required for such outlets. The minimum lighting load shall be determined using the minimum unit load and the floor area as determined in 220.11 for dwelling occupancies. Motors rated less than 1⁄8 hp and connected to a lighting circuit shall be considered part of the minimum lighting load. (1) All general-use receptacle outlets of 20-ampere rating or less, including receptacles connected to the circuits in 210.11(C)(3) and 210.11(C)(4) (2) The receptacle outlets specified in 210.52(E) and (G) (3) The lighting outlets specified in 210.70

220.14(M) Hotel and Motel Occupancies. In guest rooms or guest suites of hotels and motels, the lighting and receptacle outlets specified in 220.14(M) (1), (M)(2), and (M)(3) are

included in the minimum unit load in Table 220.12. No additional load calculations shall be required for such outlets. The minimum lighting load shall be determined using the minimum unit load and the floor area as determined in 220.11 for hotel and motel occupancies. (1) All general-use receptacle outlets of 20-ampere rating or less, including receptacles connected to the circuits in 210.11(C)(3) and 210.11(C)(4) (2) The receptacle outlets specified in 210.52(E)(3) (3) The lighting outlets specified in 210.70 or controlled by a wall switch or listed wall-mounted control device shall be installed where these spaces are used for storage or contain equipment requiring servicing. A point of control shall be at each entry that permits access to the attic and underfloor space, utility room, or basement. Where a lighting outlet is installed for equipment requiring service, the lighting outlet shall be installed at or near the equipment.

215.2(B)(3) Supervised Installations. For supervised installations, feeder conductor sizing shall be permitted to be determined by qualified persons under engineering supervision in accordance with 310.14(B) or 311.60(B). Supervised installations are defined as those portions of a facility where all of the following conditions are met: (1) Conditions of design and installation are provided under engineering supervision. (2) Qualified persons with documented training and experience in over 1000-volt systems provide maintenance, monitoring, and servicing of the system.

215.10 Ground-Fault Protection of Equipment. Each feeder disconnect rated 1000 amperes 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 groundfault protection of equipment in accordance with 230.95. Informational Note: For buildings that contain health care occupancies, see 517.17. Exception No. 1: This section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards. Exception No. 2: This section shall not apply if ground-fault protection of equipment is provided on the supply side of the feeder and on the load side of any transformer supplying the feeder. Exception No. 3: If temporary feeder conductors are used to connect a generator to a facility for repair, maintenance, or emergencies, ground-fault protection of equipment shall not be required. Temporary feeders without ground-fault protection shall be permitted for the time period necessary but shall not exceed 90 days.

220.11 Floor Area. The floor area for each floor shall be calculated from the outside dimensions of the building, dwelling unit, or other area involved. For dwelling units, the calculated floor area shall not include open porches, garages, or unused or unfinished spaces not adaptable for future use.

220.53 Appliance Load — Dwelling Unit(s). It shall be permissible to apply a demand factor of 75 percent to the nameplate rating load of four or more appliances rated 1⁄4 hp or greater, or 500 watts or greater, that are fastened in place, and that are served by the same feeder or service in a one-family, two-family, or multifamily dwelling. This demand factor shall not apply to: (1) Household electric cooking equipment that is fastened in place (2) Clothes dryers (3) Space heating equipment (4) Air-conditioning equipment

76. If a lighting outlet is installed for equipment requiring service, where is the lighting outlet required to be installed?

A. On the same level of the equipment
B. At the equipment
C. Near the equipment
D. All listed answers

77. How many conditions must be met to meet the definition of supervised installations?
    A. One
    B. Two
    C. None
    D. Three
78. How is the floor area for each floor required to be calculated?
    A. From the outside dimensions of the building, dwelling unit, or other area involved
    B. From the inside dimensions of the building, dwelling unit, or other area involved
    C. The sum of all open floor space
    D. The sum of all free floor space of the building, dwelling unit, or other area involved
79. What section of the code addresses the lighting outlet required for guest rooms or guest suites?
    A. 210.70(A)(1)
    B. 210.70(C)
    C. 210.70(A)(2)
    D. 210.70(B)
80. Motors rated less than _____ and connected to a lighting circuit shall be considered a general lighting load.
    A. 3/4 HP
    B. 1/4 HP
    C. 1/8 HP
    D. 1 HP
81. It shall be permissible to apply a demand factor of _____ percent to the nameplate rating load of four or more appliances rated 1⁄4 hp or greater, or 500 watts or greater, that are fastened in place, and that are served by the same feeder or service in a one-family, two-family, or multifamily dwelling.
    A. 60
    B. 75
    C. 100
    D. 125
82. The minimum lighting load is required to be determined using the minimum unit load and the floor area as determined in _____ for dwelling occupancies.
    A. 220.14(M)
    B. 220.14(B)
    C. 220.12(A)
    D. 220.11
83. With regards to guest rooms or guest suites of hotels and motels, the lighting and receptacle outlets specified in 220.14(M)(1), (M)(2), and (M)(3) are included in the minimum unit load of what table(s)?
    A. Table 220.12
    B. Table 220.52
    C. Table 220.16
    D. All listed answers
84. What section of this code addresses the lighting load requirements with regards to the energy code?

A. 220.12(A)
B. 220.14(J)
C. 220.12(B)
D. 220.14(M)

220.60 Noncoincident Loads. Where it is unlikely that two or more noncoincident loads will be in use simultaneously, it shall be permissible to use only the largest load(s) that will be used at one time for calculating the total load of a feeder or service. Where a motor is part of the noncoincident load and is not the largest of the noncoincident loads, 125 percent of the motor load shall be used in the calculation if it is the largest motor.
225.4 Conductor Covering. Where within 3.0 m (10 ft) of any building or structure other than supporting poles or towers, open individual (aerial) overhead conductors shall be insulated for the nominal voltage. The insulation of conductors in cables or raceways, except Type MI cable, shall be of thermoset or thermoplastic type and, in wet locations, shall comply with 310.10(C). The insulation of conductors for festoon lighting shall be of the thermoset or thermoplastic type.
225.15 Supports over Buildings. Outside branch-circuit and feeder conductors passing over a building shall be securely supported.
225.19 Clearances from Buildings for Conductors of Not over 1000 Volts, Nominal. Overhead spans of open conductors and open multiconductor cables shall comply with 225.19(A), (B), (C), and (D).
225.30(B) Common Supply Equipment. Where feeder conductors originate in the same panelboard, switchboard, or other distribution equipment, and each feeder terminates in a single disconnecting means, not more than six feeders shall be permitted. Where more than one feeder is installed in accordance with this section, all feeder disconnects supplying the building or structure shall be grouped in the same location, and the requirements of 225.33 shall not apply. Each disconnect shall be marked to indicate the load served.
230.46 Spliced and Tapped Conductors. Service-entrance conductors shall be permitted to be spliced or tapped in accordance with 110.14, 300.5(E), 300.13, and 300.15. Power distribution blocks, pressure connectors, and devices for splices and taps shall be listed. Power distribution blocks installed on service conductors shall be marked “suitable for use on the line side of the service equipment” or equivalent. Effective January 1, 2023, pressure connectors and devices for splices and taps installed on service conductors shall be marked “suitable for use on the line side of the service equipment” or equivalent.
230.62(C) Barriers. Barriers shall be placed in service equipment such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations.
230.66 Marking. 230.66(A) General. Service equipment rated at 1000 volts or less shall be marked to identify it as being suitable for use as service equipment. All service equipment shall be listed or field evaluated.
230.66(B) Meter Sockets. Meter sockets shall not be considered service equipment but shall be listed and rated for the voltage and current rating of the service. Exception: Meter sockets supplied by and under the exclusive control of an electric utility shall not be required to be listed.
230.67 Surge Protection. 230.67(A) Surge-Protective Device. All services supplying dwelling units shall be provided with a surge-protective device (SPD).
230.67(B) Location. The SPD shall be an integral part of the service equipment or shall be located immediately adjacent thereto. Exception: The SPD shall not be required to be located

in the service equipment as required in (B) if located at each next level distribution equipment downstream toward the load.
230.67(C) Type. (New) The SPD shall be a Type 1 or Type 2 SPD.
230.67(D) Replacement. Where service equipment is replaced, all of the requirements of this section shall apply.
Part VI. Service Equipment — Disconnecting Means (Revised) 230.70 General. Means shall be provided to disconnect all ungrounded conductors in a building or other structure from the service conductors.
230.71(B) Two to Six Service Disconnecting Means. Two to six service disconnects shall be permitted for each service permitted by 230.2 or for each set of service entrance conductors permitted by 230.40, Exception No. 1, 3, 4, or 5. The two to six service disconnecting means shall be permitted to consist of a combination of any of the following:
(1) Separate enclosures with a main service disconnecting means in each enclosure
(2) Panelboards with a main service disconnecting means in each panelboard enclosure
(3) Switchboard(s) where there is only one service disconnect in each separate vertical section where there are barriers separating each vertical section (4) Service disconnects in switchgear or metering centers where each disconnect is located in a separate compartment Informational Note No. 1: Metering centers are addressed in UL 67, Standard for Panelboards. Informational Note No. 2: Examples of separate enclosures with a main service disconnecting means in each enclosure include but are not limited to motor control centers, fused disconnects, circuit breaker enclosures, and transfer switches that are suitable for use as service equipment.

85. What type of insulation are conductors used for festoon lighting required to have?
A. The thermoset or thermoplastic type
B. Mineral insulated type
C. PE (Polyethylene) type
D. PVC (Polyvinyl Chloride) type
86. If a motor is part of the noncoincident load and is not the largest of the noncoincident loads, what percent of the motor load shall be used in the calculation if it is the largest motor?
A. 100%
B. 60%
C. 125%
D. 75%
87. How are outside branch-circuit and feeder conductors passing over a building required to be supported?
A. With rubber insulation pads
B. Securely
C. With independent supports
D. With a multi wire listed assembly
88. Within how many feet of any building or structure, other than supporting poles or towers, are open individual (aerial) overhead conductors required to
be insulated for the nominal voltage?
A. 5 ft
B. 7 ft
C. 10 ft
D. 3 ft

89. If feeder conductors originate in the same panelboard, switchboard, or other distribution equipment, and each feeder terminates in a single disconnecting
means, how many feeders are permitted?

A. More than six feeders shall be permitted
B. Not more than one feeder shall be permitted
C. Not more than four feeders shall be permitted
D. Not more than six feeders shall be permitted

90. How many provisions of Article 225 are clearances from buildings regarding overhead spans of open conductors and open multiconductor cables not over
1000 volts nominal required to comply with?

A. One
B. Four
C. Two
D. Three

91. Effective September 1, _____ , pressure connectors and devices for splices and taps installed on service conductors shall be marked “suitable for use on the line side of the service equipment” or equivalent.

A. 2023
B. 2017
C. 2019
D. 2026

92. What is an example of a separate enclosure with a main service disconnecting means in the enclosure?

A. Motor control centers
B. Fused disconnects
C. Circuit breaker enclosures
D. All listed answers

93. What are required to be placed in service equipment such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing
load terminations?

A. Isolators
B. Insulators
C. Barriers
D. All listed answers

94. If service equipment is replaced, all of the requirements of what section are required to apply?

A. 230.67(C)
B. 230.67(D)
C. 230.67
D. 230.70

95. What are meter sockets supplied by and under the exclusive control of an electric utility NOT required to be?

A. Identified
B. Rated
C. Listed
D. All listed answers

96. What are all services supplying dwelling units required to be provided with?

A. A surge-protective device (SPD)
B. An arc fault circuit interrupter (AFCI)
C. A Ground fault circuit interrupter (GFCI)
D. All listed answers

97. If an SPD is not an integral part of the service equipment, where is it required to be located?
A. It needs to be located on the load side of the main service breaker
B. It needs to be located in the first disconnect
C. It needs to be located in line with the feeders
D. It shall be located immediately adjacent thereto

98. What UL addresses metering centers?
A. 76
B. 24
C. 67
D. 34

99. What is service equipment rated at 1000 volts or less required to be marked with to identify it as being suitable for?
A. AFCI protected
B. Use as service equipment
C. Rated for hazardous environments
D. Suitable for personnel protection

100. What type of SPD is allowed to protect dwelling units?
A. SPD's are not required to be part of service equipment for dwellings
B. Type 3 or Type 4
C. Fast acting
D. Type 1 or Type 2

230.85 Emergency Disconnects. For one- and two-family dwelling units, all service conductors shall terminate in disconnecting means having a short-circuit current rating equal to or greater than the available fault current, installed in a readily accessible outdoor location. If more than one disconnect is provided, they shall be grouped. Each disconnect shall be one of the following: (1) Service disconnects marked as follows: EMERGENCY DISCONNECT, SERVICE DISCONNECT (2) Meter disconnects installed per 230.82(3) and marked as follows: EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT (3) Other listed disconnect switches or circuit breakers on the supply side of each service disconnect that are suitable for use as service equipment and marked as follows: EMERGENCY DISCONNECT, NOT SERVICE EQUIPMENT

240.21(B) Feeder Taps. Conductors shall be permitted to be tapped, without overcurrent protection at the tap, to a feeder as specified in 240.21(B)(1) through (B)(5). The tap shall be permitted at any point on the load side of the feeder overcurrent protective device. Section 240.4(B) shall not be permitted for tap conductors.

240.24(A) Accessibility. Circuit breakers and switches containing fuses shall be readily accessible and installed so that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 2.0 m (6 ft 7 in.) above the floor or working platform, unless one of the following applies: (1) For busways, as provided in 368.17(C). (2) For supplementary overcurrent protection, as described in 240.10. (3) For overcurrent devices, as described in 225.40 and 230.92. (4) For overcurrent devices adjacent to utilization equipment that they supply, access shall be permitted to be by portable

means. Exception: The use of a tool shall be permitted to access overcurrent devices located within listed industrial control panels or similar enclosures.
240.62 Reconditioned Equipment. Low-voltage fuseholders and low-voltage nonrenewable fuses shall not be permitted to be reconditioned.
240.67(C) Performance Testing. The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer's instructions. A written record of this testing shall be made and shall be available to the authority having jurisdiction. Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.
240.87(C) Performance Testing. The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer's instructions. A written record of this testing shall be made and shall be available to the authority having jurisdiction. Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.
240.88 Reconditioned Equipment. Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed.
240.88(A) Circuit Breakers. The use of reconditioned circuit breakers shall comply with (1) through (3): (1) Molded-case circuit breakers shall not be permitted to be reconditioned. (2) Low- and medium-voltage power circuit breakers shall be permitted to be reconditioned. (3) High-voltage circuit breakers shall be permitted to be reconditioned.
240.88(B) Components. The use of reconditioned trip units, protective relays, and current transformers shall comply with (1) and (2): (1) Low-voltage power circuit breaker electronic trip units shall not be permitted to be reconditioned. (2) Electromechanical protective relays and current transformers shall be permitted to be reconditioned.

101. When are arc energy reduction protection systems required to be performance tested by primary current injection testing or other approved methods?
A. During start up and system testing
B. When first assembled
C. At the factory before shipping
D. When first installed on site
102. On what side of the feeder overcurrent protective device are taps permitted?
A. Load side
B. Line side
C. Service lateral side
D. Non-fused side
103. According to the code, what are low-voltage fuse holders and low-voltage nonrenewable fuses not permitted to be?
A. Reconditioned
B. Manufactured
C. Field installed
D. All listed answers

104. What is the maximum height from grade that the center of a grip pertaining to the operating handle for circuit breakers and switches containing fuses can be installed?

A. 5 ft 6 inches
B. 6 ft
C. 6 ft 7 inches
D. 6 ft 6 inches

105. Who is the performance testing written record required to be made available to?

A. The general contractor
B. The authority having jurisdiction
C. The owner's insurer
D. The bond company

106. How many provisions are the use of reconditioned circuit breakers required to comply with?

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

107. For one- and two-family dwelling units, all service conductors shall terminate in disconnecting means having a short-circuit current rating equal to or _____ the available fault current, installed in a readily accessible outdoor location.

A. Rated for
B. Less than
C. Listed for
D. Greater than

108. How many provisions are the use of reconditioned trip units, protective relays, and current transformers required to comply with?

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

109. What is reconditioned equipment required to be listed as?

A. Re-manufactured
B. Reconditioned
C. Fast acting arc reduction
D. New equipment

240.102 Reconditioned Equipment. Medium-voltage fuseholders and medium-voltage nonrenewable fuses shall not be permitted to be reconditioned.

ARTICLE 242 Overvoltage Protection Part I. General 242.1 Scope. This article provides the general requirements, installation requirements, and connection requirements for overvoltage protection and overvoltage protective devices. Part II covers surge-protective devices (SPDs) permanently installed on premises wiring systems of not more than 1000 volts, nominal, while Part III covers surge arresters permanently installed on premises wiring systems over 1000 volts, nominal. Informational Note: Article 242 combines and replaces Articles 280 and 285 in NFPA 70-2017.

242.6 Uses Not Permitted. An SPD device shall not be installed in the following: (1) Circuits over 1000 volts (2) On ungrounded systems, impedance grounded systems, or corner

grounded delta systems unless listed specifically for use on these systems (3) Where the rating of the SPD is less than the maximum continuous phase-to-ground voltage at the power frequency available at the point of application
242.8 Listing. An SPD shall be a listed device.
242.10 Short-Circuit Current Rating. The SPD shall be marked with a short-circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating. This marking requirement shall not apply to receptacles.
242.12 Type 1 SPDs. Type 1 SPDs shall be installed in accordance with 242.12(A) and (B).
242.12(A) Installation. Type 1 SPDs shall be permitted to be connected in accordance with one of the following: (1) To the supply side of the service disconnect as permitted in 230.82(4) (2) As specified in 242.14
242.12(B) At the Service. When installed at services, Type 1 SPDs shall be connected to one of the following: (1) Grounded service conductor (2) Grounding electrode conductor (3) Grounding electrode for the service (4) Equipment grounding terminal in the service equipment
242.14 Type 2 SPDs. Type 2 SPDs shall be installed in accordance with 242.14(A) through (C).
242.14(A) Service-Supplied Building or Structure. Type 2 SPDs shall be connected anywhere on the load side of a service disconnect overcurrent device required in 230.91 unless installed in accordance with 230.82(8).
242.14(B) Feeder-Supplied Building or Structure. Type 2 SPDs shall be connected at the building or structure anywhere on the load side of the first overcurrent device at the building or structure.
242.14(C) Separately Derived System. The SPD shall be connected on the load side of the first overcurrent device in a separately derived system.
242.16 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.
242.18 Type 4 and other Component Type SPDs. Type 4 component assemblies and other component type SPDs shall only be installed by the equipment manufacturer.
242.20 Number Required. Where used at a point on a circuit, the SPD shall be connected to each ungrounded conductor.
242.22 Location. SPDs shall be permitted to be located indoors or outdoors and shall be made inaccessible to unqualified persons unless listed for installation in accessible locations.

110. What is an SPD required to be?
    A. Listed
    B. Rated
    C. Fast acting
    D. All listed answers
111. According to the code, what are medium-voltage fuse holders and medium-voltage nonrenewable fuses not permitted to be?
    A. Reconditioned
    B. Manufactured
    C. Field installed
    D. All listed answers
112. Where can an SPD NOT be installed?

A. All listed answers
B. Where the rating of the SPD is less than the maximum continuous phase-to-ground voltage at the power frequency available at the point of application
C. Circuits over 1000 volts
D. On ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems

113. What article provides the general requirements, installation requirements, and connection requirements for overvoltage protection and overvoltage protective devices?
A. Article 242
B. Article 240
C. Article 230
D. Article 250

114. Section 230.82(4) allows a type 1 SPD to be connected to what?
A. To the supply side of the service disconnect
B. To the load side of the service disconnect
C. To the service disconnect grounded conductor
D. Equipment grounding terminal in the service equipment

115. An SPD is required to be marked with a short-circuit current rating and shall not be installed at a point on the system where the available fault current is _____ of that rating.
A. In excess
B. Equal
C. Less
D. Outside

116. Where is a type 1 SPD required to be connected when installed at services?
A. All listed answers
B. Grounding electrode for the service
C. Grounded service conductor
D. Grounding electrode conductor

117. What are type 1 SPDs required to be installed in accordance with?
A. 242.12(A) and (B)
B. 242.10
C. 242.14
D. 242.16(C) and (D)

118. With regards to service-supplied buildings or structures, where are type 2 SPDs required to be connected according to 230.91?
A. Anywhere on the load side of a service disconnect overcurrent device
B. Anywhere on the line side of a service disconnect overcurrent device
C. Only on the line side of a service disconnect overcurrent device
D. Anywhere on the service laterals

119. Where are type 2 SPDs required to be connected with regards to feeder-supplied buildings or structures?
A. On the load side of the first overcurrent device at the building or structure
B. On the line side of the first overcurrent device at the building or structure
C. Only on the line side of a service disconnect overcurrent device
D. Anywhere on the service laterals

120. How many installation provisions is a type 2 SPD required to comply with?
A. 3

B. 2
C. 4
D. 5

121. Where are type 3 SPDs allowed to be installed?
A. The load side of branch-circuit overcurrent protection up to the equipment served
B. The line side of branch-circuit overcurrent protection up to the equipment served
C. Within 10 feet of the service disconnect
D. Within 30 feet of the service disconnect

122. Where are SPDs required to be connected when used at a point on a circuit?
A. Each ungrounded conductor
B. Each grounded conductor
C. Each equipment grounding conductor
D. All listed answers

123. Where are type 2 SPDs required to be connected in a separately derived system?
A. On the load side of the first overcurrent device
B. On the line side of the first overcurrent device
C. Before the main service disconnect
D. Anywhere on the service laterals

124. SPDs are permitted to be located indoors or outdoors and shall be made inaccessible to unqualified persons unless listed for installation in _____.
A. Accessible locations
B. Service panels
C. Service disconnects
D. All listed answers

125. Who is required to install type 4 and other component type SPDs?
A. The equipment manufacturer
B. The authority having jurisdiction
C. The qualified individual
D. Supervising engineer

242.24 Routing of Connections. The conductors used to connect the SPD to the line or bus and to ground shall not be any longer than necessary and shall avoid unnecessary bends.
242.26 Connection. Where an SPD device is installed, it shall comply with 242.12, 242.14, 242.16, 242.28. and 242.30.
242.28 Conductor Size. Line and grounding conductors shall not be smaller than 14 AWG copper or 12 AWG aluminum.
242.30 Connection Between Conductors. An SPD shall be permitted to be connected between any two conductors — ungrounded conductor(s), grounded conductor, equipment grounding conductor, or grounding electrode conductor. The grounded conductor and the equipment grounding conductor shall be interconnected only by the normal operation of the SPD during a surge.
242.32 Grounding Electrode Conductor Connections and Enclosures. Except as indicated in this article, SPD grounding connections shall be made as specified in Article 250, Part III. Grounding electrode conductors installed in metal enclosures shall comply with 250.64(E).
Part III. Surge Arresters, Over 1000 Volts 242.40 Uses Not Permitted. A surge arrester shall not be installed where the rating of the surge arrester is less than the maximum

continuous phase-to-ground voltage at the power frequency available at the point of application.
242.42 Surge Arrester Selection. The surge arresters shall comply with 242.42(A) and (B).
242.42(A) Rating. The rating of a surge arrester shall be equal to or greater than the maximum continuous operating voltage available at the point of application.
242.42(A)(1) Solidly Grounded Systems. The maximum continuous operating voltage shall be the phase-to-ground voltage of the system.
242.42(A)(2) Impedance or Ungrounded System. The maximum continuous operating voltage shall be the phase-to-phase voltage of the system.
242.42(B) Silicon Carbide Types. The rating of a silicon carbide-type surge arrester shall be not less than 125 percent of the rating specified in 242.42(A). Informational Note No. 1: For further information on surge arresters, see IEEE C62.11-2012, Standard for Metal-Oxide Surge Arresters for Alternating-Current Power Circuits (>1 kV), and IEEE C62.22-2009, Guide for the Application of Metal-Oxide Surge Arresters for Alternating-Current Systems. Informational Note No. 2: The selection of a properly rated metal oxide arrester is based on considerations of maximum continuous operating voltage and the magnitude and duration of over voltages at the arrester location as affected by phase-to-ground faults, system grounding techniques, switching surges, and other causes. See the manufacturer's application rules for selection of the specific arrester to be used at a particular location.
242.44 Number Required. Where used at a point on a circuit, a surge arrester shall be connected to each ungrounded conductor. A single installation of such surge arresters shall be permitted to protect a number of interconnected circuits if no circuit is exposed to surges while disconnected from the surge arresters.
242.46 Location. Surge arresters shall be permitted to be located indoors or outdoors. Surge arresters shall be made inaccessible to unqualified persons unless listed for installation in accessible locations.
242.48 Routing of Surge Arrester Equipment Grounding Conductors. The conductor used to connect the surge arrester to line, bus, or equipment and to an equipment grounding conductor or grounding electrode connection point as provided in 242.50 shall not be any longer than necessary and shall avoid unnecessary bends.
242.50 Connection. The arrester shall be connected to one of the following: (1) Grounded service conductor (2) Grounding electrode conductor (3) Grounding electrode for the service (4) Equipment grounding terminal in the service equipment
242.52 Surge-Arrester Conductors. The conductor between the surge arrester and the line, and the surge arrester and the grounding connection, shall not be smaller than 6 AWG copper or aluminum.

126. What conductor(s) is an SPD allowed to be connected to?
    A. Grounded conductor(s)
    B. Ungrounded conductor(s)
    C. Grounding electrode conductor(s)
    D. All listed answers
127. What is the smallest copper conductor that can be used when connecting to an SPD?
    A. 14 AWG
    B. 12 AWG
    C. 16 AWG
    D. 10 AWG

128. When installing an SPD, what part of Article 250 are grounding electrode conductors installed in metal enclosures required to comply with?
A. 250.66
B. 250.64(E)
C. 250.122
D. 250.52
129. What are conductors used to connect SPDs to the line or bus and to ground required to avoid?
A. Ground bushings
B. Pulling compound
C. Compression fittings
D. Unnecessary bends
130. How many provisions is surge arrester selection on systems over 1000 volts required to comply with?
A. 3
B. 2
C. 5
D. 4
131. What is required to comply with 242.12, 242.14, 242.16, 242.28 and 242.30?
A. Compression fittings
B. SPDs
C. Cable tray
D. Equipment grounding conductors
132. What part of Article 250 are SPD grounding connections required to comply with?
A. III
B. II
C. I
D. IV
133. What part of Article 242 deals with surge arrestors on circuits over 1000 volts?
A. V
B. II
C. III
D. IV
134. Surge arresters are permitted to be located indoors or outdoors and shall be made inaccessible to unqualified persons unless listed for installation in _____.
A. Service panels
B. Accessible locations
C. Service disconnects
D. All listed answers
135. When selecting an SPD, how is the maximum continuous operating voltage determined with regards to a solidly grounded system?
A. By determining the conductor maximum voltage
B. By measuring the phase-to-phase voltage
C. By determining the equipment voltage
D. By measuring the phase-to-ground voltage
136. The rating of a surge arrester is required to be equal to or greater than the maximum continuous operating _____ available at the point of application.
A. Voltage

B. Current
C. Power
D. Resistance

137. A silicon carbide-type surge arrester is required to be not less than what percentage of the ratings in 242.42(A)?
A. 25%
B. 100%
C. 125%
D. 150%

138. When selecting an SPD, how is the maximum continuous operating voltage determined with regards to an impedance or ungrounded system?
A. By measuring the phase-to-ground voltage
B. By measuring the phase-to-phase voltage
C. By determining the equipment voltage
D. By determining the conductor maximum voltage

139. When used, what conductor(s) can a surge arrestor be connected to?
A. Grounding electrode for the service
B. Grounded service conductor
C. Grounding electrode conductor
D. All listed answers

140. What is a surge arrester required to be connected to when used at a point on a circuit?
A. Each equipment grounded conductor
B. Each grounded conductor
C. Each ungrounded conductor
D. All listed answers

141. What are conductors used to connect surge arresters to line, bus, or equipment and to an equipment grounding conductor or grounding electrode connection required to avoid?
A. Unnecessary bends
B. Pulling compound
C. Compression fittings
D. Ground bushings

142. What is the smallest allowable conductor permitted between a surge arrester and the line, and a surge arrester and the grounding connection?
A. 10 AWG
B. 8 AWG
C. 4 AWG
D. 6 AWG

242.54 Interconnections. The surge arrester protecting a transformer that supplies a secondary distribution system shall be interconnected as specified in 242.54(A), (B), or (C).
242.54(B)(1) Ungrounded or Unigrounded Primary System. For ungrounded or unigrounded primary systems, the spark gap for a listed device shall have a 60-Hz breakdown voltage of at least twice the primary circuit voltage but not necessarily more than 10 kV, and there shall be at least one other ground on the grounded conductor of the secondary that is not less than 6.0 m (20 ft) distant from the surge-arrester grounding electrode.

242.54(B)(2) Multi-grounded Neutral Primary System. For multi-grounded neutral primary systems, the spark gap or listed device shall have a 60-Hz breakdown of not more than 3 kV, and there shall be at least one other ground on the grounded conductor of the secondary that is not less than 6.0 m (20 ft) distant from the surge-arrester grounding electrode.
242.54(C) By Special Permission. An interconnection of the surge-arrester ground and the secondary neutral conductor, other than as provided in 242.54(A) or (B), shall be permitted to be made only by special permission.
242.56 Grounding Electrode Conductor Connections and Enclosures. Except as indicated in this article, surge-arrester grounding electrode conductor connections shall be made as specified in Article 250, Parts III and X. Grounding electrode conductors installed in metal enclosures shall comply with 250.64(E).
250.25 Grounding Systems Permitted to Be Connected on the Supply Side of the Disconnect. The grounding of systems connected on the supply side of the service disconnect, as permitted in 230.82, that are in enclosures separate from the service equipment enclosure shall comply with 250.25(A) or (B).
250.25(A) Grounded System. If the utility supply system is grounded, the grounding of systems permitted to be connected on the supply side of the service disconnect and are installed in one or more separate enclosures from the service equipment enclosure shall comply with the requirements of 250.24(A) through (D).
250.25(B) Ungrounded Systems. If the utility supply system is ungrounded, the grounding of systems permitted to be connected on the supply side of the service disconnect and are installed in one or more separate enclosures from the service equipment enclosure shall comply with the requirements of 250.24(E).
250.53(C) Bonding Jumper. The bonding jumper(s) used to connect the grounding electrodes together to form the grounding electrode system shall be installed in accordance with 250.64(A), (B), and (E), shall be sized in accordance with 250.66, and shall be connected in the manner specified in 250.70. Rebar shall not be used as a conductor to interconnect the electrodes of grounding electrode systems.
250.64(A) Aluminum or Copper-Clad Aluminum Conductors. Grounding electrode conductors of bare, covered, or insulated aluminum or copper-clad aluminum shall comply with the following: (1) Bare or covered conductors without an extruded polymeric covering shall not be installed where subject to corrosive conditions or be installed in direct contact with concrete. (2) Terminations made within outdoor enclosures that are listed and identified for the environment shall be permitted within 450 mm (18 in.) of the bottom of the enclosure. (3) Aluminum or copper-clad aluminum conductors external to buildings or equipment enclosures shall not be terminated within 450 mm (18 in.) of the earth.
250.64(B)(2) Exposed to Physical Damage. A 6 AWG or larger copper or aluminum grounding electrode conductor exposed to physical damage shall be protected in rigid metal conduit (RMC), intermediate metal conduit (IMC), Schedule 80 rigid polyvinyl chloride conduit (PVC), reinforced thermosetting resin conduit Type XW (RTRC-XW), electrical metallic tubing (EMT), or cable armor.
250.98 Bonding Loosely Jointed Metal Raceways. Expansion, expansion-deflection, or deflection fittings and telescoping sections of metal raceways shall be made electrically continuous by equipment bonding jumpers or other means.

143. A surge arrester protecting a transformer that supplies a secondary distribution system is required to be interconnected as specified in what listed article(s)?

A. 242.54(A), (B), or (C)

B. 242.52
C. 250.53(C)
D. 250.104(D)(1), (D)(2), and (D)(3)

144. For ungrounded or unigrounded primary systems, the spark gap for a listed device is required to have a 60-Hz breakdown voltage of at least twice the primary circuit voltage but not necessarily more than _____ kV.
A. 5
B. 10
C. 3
D. 60

145. For multi grounded neutral primary systems, the spark gap or listed device shall have a _____ breakdown of not more than 3 kV.
A. 75-Hz
B. 50-Hz
C. 60-Hz
D. 120-Hz

146. An interconnection of the surge-arrester ground and the secondary neutral conductor, other than as provided in 242.54(A) or (B), shall be permitted to be made only by _____ .
A. The qualified individual
B. The authority having jurisdiction
C. The building official
D. Special permission

147. What part(s) of Article 250 are surge-arrester grounding electrode conductor connections required to be made?
A. Part IV and VII
B. Part II and V
C. Part III and X
D. Part I and II

148. What section pertains to grounding systems permitted to be connected on the supply side of a service disconnect?
A. 250.25(A)
B. 250.26
C. 250.53(C)
D. 250.64(A)

149. How many requirements must be met if the utility supply system is grounded, the grounding of systems permitted to be connected on the supply side of the service disconnect and are installed in one or more separate enclosures from the service equipment enclosure?
A. 5
B. 2
C. 3
D. 4

150. If the utility supply system is ungrounded, the grounding of systems permitted to be connected on the supply side of the service disconnect and are installed in one or more separate enclosures from the service equipment enclosure shall comply with the requirements of what listed section?
A. 250.24(E)
B. 250.52(C)
C. 250.42(E)

D. 250.66

151. What cannot be used as a conductor to interconnect the electrodes of grounding electrode systems?

A. Aluminum conductors
B. Copper conductors
C. Rebar
D. All listed answers

152. How many provisions are grounding electrode conductors of bare, covered, or insulated aluminum or copper-clad aluminum required to comply with?

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

153. What size copper or aluminum grounding electrode conductor exposed to physical damage is required to be protected by using RMC, IMC, Schedule 80 PVC, Type XW, RTRC-XW, EMT, or cable armor?

A. 6 AWG or larger
B. 8 AWG or smaller
C. 10 AWG or smaller
D. 8 AWG or larger

154. How are expansion, expansion-deflection, or deflection fittings and telescoping sections of metal raceways required to be made electrically continuous?

A. By the use of equipment grounding conductors
B. By using equipment bonding jumpers
C. With the use of ground screws
D. With the use of ground clips

250.104(D)(1) Metal Water Piping System(s). The grounded conductor of each separately derived system shall be bonded to the nearest available point of the metal water piping system(s) in the area served by each separately derived system. This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. Each bonding jumper shall be sized in accordance with Table 250.102(C)(1) based on the largest ungrounded conductor of the separately derived system except that it shall not be required to be larger than 3/0 copper or 250 kcmil aluminum or copper-clad aluminum.

Part VI. Equipment Grounding and Equipment Grounding Conductors 250.109 Metal Enclosures. Metal enclosures shall be permitted to be used to connect bonding jumpers or equipment grounding conductors, or both, together to become a part of an effective ground-fault current path. Metal covers and metal fittings attached to these metal enclosures shall be considered as being connected to bonding jumpers or equipment grounding conductors, or both.

250.120(B) Aluminum and Copper-Clad Aluminum Conductors. Equipment grounding conductors of bare, covered, or insulated aluminum or copper-clad aluminum shall comply with the following: (1) Unless part of a suitable Chapter 3 cable wiring method, bare or covered conductors shall not be installed where subject to corrosive conditions or be installed in direct contact with concrete, masonry, or the earth. (2) Terminations made within outdoor enclosures that are listed and identified for the environment shall be permitted

within 450 mm (18 in.) of the bottom of the enclosure. (3) Aluminum or copper-clad aluminum conductors external to buildings or enclosures shall not be terminated within 450 mm (18 in.) of the earth, unless terminated within a listed wire connector system.

250.102(C) Equipment Grounding Conductors Smaller than 6 AWG.

Where not routed with circuit conductors as permitted in 250.130(C) and 250.134(A) Exception No. 2, equipment grounding conductors smaller than 6 AWG shall be protected from physical damage by an identified raceway or cable armor unless installed within hollow spaces of the framing members of buildings or structures and where not subject to physical damage.

250.121 Restricted Use of Equipment Grounding Conductors. 250.121(A) Grounding Electrode Conductor. An equipment grounding conductor shall not be used as a grounding electrode conductor. 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.

250.121(B) Metal Frame of Building or Structure. The structural metal frame of a building or structure shall not be used as an equipment grounding conductor.

250.122 Size of Equipment Grounding Conductors. 250.122(A) General.

Copper, aluminum, or copper-clad aluminum equipment grounding conductors of the wire type shall not be smaller than shown in Table 250.122. The equipment grounding conductor shall not be required to be larger than the circuit conductors supplying the equipment. If a cable tray, a raceway, or a cable armor or sheath is used as the equipment grounding conductor, as provided in 250.118 and 250.134(1), it shall comply with 250.4(A)(5) or (B)(4). Equipment grounding conductors shall be permitted to be sectioned within a multiconductor cable, provided the combined circular mil area complies with Table 250.122.

250.122(B) Increased in Size. If ungrounded conductors are increased in size for any reason other than as required in 310.15(B) or 310.15(C), wire-type equipment grounding conductors, if installed, shall be increased in size proportionately to the increase in circular mil area of the ungrounded conductors. Exception: Equipment grounding conductors shall be permitted to be sized by a qualified person to provide an effective ground fault current path in accordance with 250.4(A)(5) or (B)(4).

250.122(C) Multiple Circuits. A single equipment grounding conductor shall be permitted to be installed for multiple circuits that are installed in the same raceway, cable, trench, or cable tray. It shall be sized from Table 250.122 for the largest overcurrent device protecting circuit conductors in the raceway, cable, trench, or cable tray. Equipment grounding conductors installed in cable trays shall meet the minimum requirements of 392.10(B)(1)(c).

155. How many provisions are equipment grounding conductors of bare, covered, or insulated aluminum or copper-clad aluminum required to comply with?

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

156. What part of Article 250 pertains to equipment grounding and equipment grounding conductors?

A. VII
B. V

C. VI
D. IV

157. An equipment grounding conductor _____ be used as a grounding electrode conductor.
A. May
B. Shall
C. Can
D. Shall not

158. Who can size an equipment grounding conductor to provide an effective ground fault current path in accordance with 250.4(A)(5)or (B)(4)?
A. Qualified person
B. The AHJ
C. The construction management company
D. All listed answers

159. Equipment grounding conductors installed in cable trays are required to meet the minimum requirements of what listed section?
A. 250.66
B. 250.122
C. 392.10(B)(1)(c)
D. 250.102

160. What table is used to size an equipment grounding conductor?
A. 250.66
B. 250.122
C. 250. 52(C)
D. 250.102(B)

250.136 Equipment Secured to Grounded Metal Supports. Electrical equipment secured to and in electrical contact with a metal rack or structure provided for its support shall be permitted to be considered as being connected to an equipment grounding conductor if the metal rack or structure is connected to an equipment grounding conductor by one of the means indicated in 250.134.

300.4(G) Fittings. Where raceways contain 4 AWG or larger insulated circuit conductors, and these conductors enter a cabinet, a box, an enclosure, or a raceway, the conductors shall be protected in accordance with any of the following: (1) An identified fitting providing a smoothly rounded insulating surface (2) A listed metal fitting that has smoothly rounded edges (3) Separation from the fitting or raceway using an identified insulating material that is securely fastened in place (4) Threaded hubs or bosses that are an integral part of a cabinet, box, enclosure, or raceway providing a smoothly rounded or flared entry for conductors

300.7 Raceways Exposed to Different Temperatures. 300.7(A) Sealing. Where portions of a raceway or sleeve are known to be subjected to different temperatures, and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway or sleeve shall be sealed to prevent the circulation of warm air to a colder section of the raceway or sleeve. Sealants shall be identified for use with cable insulation, conductor insulation, a bare conductor, a shield, or other components. An explosionproof seal shall not be required for this purpose.

300.25 Exit Enclosures (Stair Towers). Where an exit enclosure is required to be separated from the building, only electrical wiring methods serving equipment permitted by the authority having jurisdiction in the exit enclosure shall be installed within the exit enclosure.

Informational Note: For more information, refer to NFPA 101-2018, Life Safety Code, 7.1.3.2.1(10)(b).
300.45 Danger Signs. Danger signs shall be conspicuously posted at points of access to conductors in all raceway systems and cable systems. The sign(s) shall meet the requirements in 110.21(B), shall be readily visible, and shall state the following: DANGER—HIGH VOLTAGE—KEEP OUT
310.3 Conductors. 310.3(A) Minimum Size of Conductors. The minimum size of conductors for voltage ratings up to and including 2000 volts shall be 14 AWG copper or 12 AWG aluminum or copper-clad aluminum, except as permitted elsewhere in this Code.
310.3(C) Stranded Conductors. Where installed in raceways, conductors 8 AWG and larger shall be stranded, unless specifically permitted or required elsewhere in this Code to be solid.
310.8(A) Required Information. All conductors and cables shall be marked to indicate the following information, using the applicable method described in 310.8(B): (1) The maximum rated voltage. (2) The proper type letter or letters for the type of wire or cable as specified elsewhere in this Code. (3) The manufacturer's name, trademark, or other distinctive marking by which the organization responsible for the product can be readily identified. (4) The AWG size or circular mil area. Informational Note: See Chapter 9, Table 8, Conductor Properties, for conductor area expressed in SI units for conductor sizes specified in AWG or circular mil area. (5) Cable assemblies where the neutral conductor is smaller than the ungrounded conductors shall be so marked.
310.8(B) Method of Marking. 310.8(B)(1) Surface Marking. The following conductors and cables shall be durably marked on the surface: (1) Single-conductor and multiconductor thermoset and thermoplastic-insulated wire and cable (2) Nonmetallic-sheathed cable (3) Service-entrance cable (4) Underground feeder and branch-circuit cable (5) Tray cable (6) Irrigation cable (7) Power-limited tray cable (8) Instrumentation tray cable
310.12(A) Services. For a service rated 100 amperes through 400 amperes, 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. If no adjustment or correction factors are required, Table 310.12 shall be permitted to be applied.

161. How many different options are listed to protect 4 AWG or larger insulated circuit conductors that enter a cabinet, a box, an enclosure, or a raceway?
    A. 4
    B. 2
    C. 3
    D. 1
162. What section lists how to connect an equipment grounding conductor to a metal rack or structure?
    A. 250.134
    B. 250.122
    C. 250.66
    D. 250.102
163. What publication is listed for more information regarding Exit Enclosures (Stair Towers)?
    A. Building Code-2018, Electrical Safety installation
    B. NFPA 70e-2018, Electrical Safety Code

C. NFPA 101-2018, Life Safety Code
D. 2018 Federal ADA, electrical installations

164. If a raceway or sleeve is subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, what is required to be done with the raceway or sleeve?
A. You are required to wrap the raceway or sleeve with an approved thermal wrap
B. You are required to heat trace the raceway or sleeve
C. You are required to use a sealant in the raceway or sleeve
D. All listed answers

165. In general, what is the required minimum size copper clad aluminum conductor that can be used for voltage ratings up to and including 2000 volts?
A. 14 AWG
B. 12 AWG
C. 16 AWG
D. 18 AWG

166. What wording is a danger sign meeting the requirements of 110.21(B) required to have?
A. DANGER—HIGH VOLTAGE
B. DANGER—HIGH VOLTAGE—KEEP OUT
C. KEEP OUT—DANGER—HIGH VOLTAGE
D. DANGER—KEEP OUT—HIGH VOLTAGE

167. In general, where installed in raceways, conductors 8 AWG and larger shall be _____.
A. Copper clad
B. Compact copper
C. Self-lubricating
D. Stranded

168. In general, what table can be used to size the service conductors for a 200-amp single-phase panel installed in a single-family dwelling?
A. Table 310.15(B)(2)
B. Table 315.12
C. Table 310.15
D. Table 310.12

169. What cable is NOT listed as required to be durably marked with the required information?
A. Medium voltage cable
B. Irrigation cable
C. Power-limited tray cable
D. Tray cable

170. What is the name of Table 8 in Chapter 9?
A. PLFA Direct-Current Power Source Limitations
B. Radius of Conduit and Tubing Bends
C. Conductor Stranding
D. Conductor Properties

310.12(B) Feeders. For a feeder rated 100 amperes through 400 amperes, 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. If no adjustment or correction factors are required, Table 310.12 shall be permitted to be applied.
310.12(C) Feeder Ampacities. In no case shall a feeder for an individual dwelling unit be required to have an ampacity greater than that specified in 310.12(A) or (B).
310.12(D) Grounded Conductors. Grounded conductors shall be permitted to be sized smaller than the ungrounded conductors, if 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. Where correction or adjustment factors are required by 310.15(B) or (C), they shall be permitted to be applied to the ampacity associated with the temperature rating of the conductor. Informational Note No. 1: The service or feeder ratings addressed by this section are based on the standard ampere ratings for fuses and inverse time circuit breakers from 240.6(A). Informational Note No. 2: See Example D7 in Annex D.
310.15 Ampacity Tables. 310.15(A) General. Ampacities for conductors rated 0 volts to 2000 volts shall be as specified in the Ampacity Table 310.16 through Table 310.21, as modified by 310.15(A) through (F) and 310.12. Under engineering supervision, ampacities of sizes not shown in ampacity tables for conductors meeting the general wiring requirements shall be permitted to be determined by interpolation of the adjacent conductors based on the conductor's area. The temperature correction and adjustment factors shall be permitted to be applied to the ampacity for the temperature rating of the conductor, if the corrected and adjusted ampacity does not exceed the ampacity for the temperature rating of the termination in accordance with the provisions of 110.14(C). Informational Note No. 1: Table 310.16 through Table 310.19 are application tables for use in determining conductor sizes on loads calculated in accordance with Part II, Part III, Part IV, or Part V of Article 220. Ampacities result from consideration of one or more of the following: (1) Temperature compatibility with connected equipment, especially the connection points. (2) Coordination with circuit and system overcurrent protection. (3) Compliance with the requirements of product listings or certifications. See 110.3(B). (4) Preservation of the safety benefits of established industry practices and standardized procedures. Informational Note No. 2: For conductor area see Chapter 9, Table 8, Conductor Properties. Interpolation is based on the conductor area and not the conductor overall area. Informational Note No. 3: For the ampacities of flexible cords and cables, see 400.5. For the ampacities of fixture wires, see 402.5. Informational Note No. 4: For explanation of type letters used in tables and for recognized sizes of conductors for the various conductor insulations, see Table 310.4(A) and Table 310.4(B). For installation requirements, see 310.1 through 310.14 and the various articles of this Code. For flexible cords, see Table 400.4, Table 400.5(A)(1), and Table 400.5(A)(2).
310.15(B)(2) Rooftop. For raceways or cables exposed to direct sunlight on or above rooftops where the distance above the roof to the bottom of the raceway or cable is less than 23 mm (7⁄8 in.), a temperature adder of 33°C (60°F) shall be added to the outdoor temperature to determine the applicable ambient temperature for application of the correction factors in Table 310.15(B)(1) or Table 310.15(B)(2). Exception: Type XHHW-2 insulated conductors shall not be subject to this ampacity adjustment. Informational Note: One source for the ambient temperatures in various locations is the ASHRAE Handbook — Fundamentals.

171. In general, what table can be used to size the feeder conductors for a 200-amp single-phase panel installed in a single-family dwelling?
A. Table 310.15

B. Table 315.12
C. Table 310.12
D. Table 310.15(B)(2)

172. The ampacity specified in 310.12(A) or (B) for a feeder will never have to be larger with regards to what type of dwelling?
A. Commercial units
B. Multi-family dwelling unit
C. Zone 3 dwelling unit
D. Individual dwelling unit

173. What example in Annex D is referenced for 310.12(D) grounded conductors?
A. D7
B. D2
C. D8
D. D5

174. Table 310.16 through Table 310.19 are application tables for use in determining conductor sizes on loads calculated in accordance with Part II, Part III, Part IV, or Part V of what listed article?
A. Article 310
B. Article 220
C. Article 240
D. Article 250

175. Where do you find the ampacities for fixture wires?
A. 400.5
B. 405.2
C. 402.5
D. 310.4(B)

176. What is interpolation based on?
A. The conductor diameter
B. The conductor overall area
C. The conductor length
D. The conductor area

177. What insulation type is exempt from the ampacity adjustment required by 310.15(B)(2)?
A. THWN
B. THHN
C. XHHW-2
D. THW-2

310.15(C) Adjustment Factors. 310.15(C)(1) More than Three Current-Carrying Conductors. The ampacity of each conductor shall be reduced as shown in Table 310.15(C)(1) where the number of currentcarrying conductors in a raceway or cable exceeds three, or where single conductors or multiconductor cables not installed in raceways are installed without maintaining spacing for a continuous length longer than 600 mm (24 in.). Each current-carrying conductor of a paralleled set of conductors shall be counted as a current-carrying conductor. Where conductors of different systems, as provided in 300.3, are installed in a common raceway or cable, the adjustment factors shown in Table 310.15(C)(1) shall apply only to the number of power and lighting conductors (Articles 210, 215, 220, and 230). Informational Note No. 1: See Annex B for adjustment factors for more than three current-carrying conductors in a raceway or cable with load diversity.

Informational Note No. 2: See 366.23 for adjustment factors for conductors and ampacity for bare copper and aluminum bars in auxiliary gutters and 376.22(B) for adjustment factors for conductors in metal wireways. (a) Where conductors are installed in cable trays, the provisions of 392.80 shall apply. (b) Adjustment factors shall not apply to conductors in raceways having a length not exceeding 600 mm (24 in.). (c) Adjustment factors shall not apply to underground conductors entering or leaving an outdoor trench if those conductors have physical protection in the form of rigid metal conduit, intermediate metal conduit, rigid polyvinyl chloride conduit (PVC), or reinforced thermosetting resin conduit (RTRC) having a length not exceeding 3.05 m (10 ft), and if the number of conductors does not exceed four. (d) Adjustment factors shall not apply to Type AC cable or to Type MC cable under the following conditions: (1) The cables do not have an overall outer jacket. (2) Each cable has not more than three current-carrying conductors. (3) The conductors are 12 AWG copper. (4) Not more than 20 current-carrying conductors are installed without maintaining spacing, are stacked, or are supported on “bridle rings.” Exception to (4): If cables meeting the requirements in 310.15(C)(1)(d)(1) through (C)(1)(d)(3) with more than 20 current-carrying conductors are installed longer than 600 mm (24 in.) without maintaining spacing, are stacked, or are supported on bridle rings, a 60 percent adjustment factor shall be applied.

310.15(C)(2) Raceway Spacing. Spacing between raceways shall be maintained.

310.15(D) Bare or Covered Conductors. Where bare or covered conductors are installed with insulated conductors, the temperature rating of the bare or covered conductor shall be equal to the lowest temperature rating of the insulated conductors for the purpose of determining ampacity.

310.15(F) Grounding or Bonding Conductor. A grounding or bonding conductor shall not be counted when applying the provisions of 310.15(C)(1).

310.16 Ampacities of Insulated Conductors in Raceway, Cable, or Earth (Directly Buried). The ampacities shall be as specified in Table 310.16 where all of the following conditions apply: (1) Conductors are rated 0 volts through 2000 volts. (2) Conductors are rated 60°C (140°F), 75°C (167°F), or 90°C (194°F). (3) Wiring is installed in a 30°C (86°F) ambient temperature. (4) There are not more than three current-carrying conductors.

310.17 Ampacities of Single-Insulated Conductors in Free Air. The ampacities shall be as specified in Table 310.17 where all of the following conditions apply: (1) Conductors are rated 0 volts through 2000 volts. (2) Conductors are rated 60°C (140°F), 75°C (167°F), or 90°C (194°F). (3) Wiring is installed in a 30°C (86°F) ambient temperature.

310.18 Ampacities of Insulated Conductors in Raceway or Cable. The ampacities shall be as specified in Table 310.18 where all of the following conditions apply: (1) Conductors are rated 0 volts through 2000 volts. (2) Conductors are rated 150°C (302°F), 200°C (392°F), or 250°C (482°F). (3) Wiring is installed in a 40°C (104°F) ambient temperature.
(4) There are not more than three current-carrying conductors.

310.19 Ampacities of Single-Insulated Conductors in Free Air. The ampacities shall be as specified in Table 310.19 where all of the following conditions apply: (1) Conductors are rated 0 volts through 2000 volts. (2) Conductors are rated up to 250°C (482°F). (3) Wiring is installed in a 40°C (104°F) ambient temperature.

310.20 Ampacities of Conductors Supported on a Messenger. The ampacities shall be as specified in Table 310.20 where all of the following conditions apply: (1) Conductors are rated 0 volts through 2000 volts. (2) Conductors are rated 75°C (167°F) or 90°C (194°F). (3) Wiring is installed in a 40°C (104°F) ambient temperature. (4) There are not more than three single-insulated conductors. **310.21 Ampacities of Bare or Covered Conductors in Free Air.**

The ampacities shall be as specified in Table 310.21 where all of the following conditions apply: (1) Wind velocity is 610 mm/sec (2 ft/sec). (2) Conductors are 80°C (176°F) total conductor temperature. (3) Wiring is installed in a 40°C (104°F) ambient temperature.

178. What table is used to determine the ampacities of bare or covered conductors in free air if all of the listed conditions apply?
A. Table 310.21
B. Table 310.17
C. Table 310.20
D. Table 310.18

179. Where do you find adjustment factors for conductors and ampacity for bare copper and aluminum bars in auxiliary gutters?
A. 376.22(B)
B. 366.23
C. 230.10
D. 220.20

180. What does Table 310.15(C)(1) cover?
A. Multi cable conductors in free air
B. More than four current-carrying conductors
C. Two current carrying conductors
D. More than three current-carrying conductors

181. If conductors are installed in cable trays, the provisions of what listed section are required to apply?
A. 366.23
B. 310.15(C)(1)(d)(1)
C. 392.80
D. 376.22(B)

182. What annex in the code has adjustment factors for more than three current-carrying conductors in a raceway or cable with load diversity?
A. B
B. C
C. D
D. E

183. If bare or covered conductors are installed with insulated conductors, the temperature rating of the bare or covered conductor is required to be equal to the lowest temperature rating of the insulated conductors for what purpose?
A. To determine voltage
B. To determine ampacity
C. To determine voltage drop
D. To determine equipment power requirements

184. What table is used to determine the ampacities of single-insulated conductors in free air if all of the listed conditions apply?
A. Table 310.18
B. Table 310.17
C. Table 310.21
D. Table 310.19

185. When applying the provisions of 310.15(C)(1), what must be done with the grounding or bonding conductor?

A. The grounding or bonding conductor is allowed to be decreased
B. The grounding or bonding conductor shall be counted
C. The grounding or bonding conductor is required to be increased
D. The grounding or bonding conductor shall not be counted

186. What table is used to determine the ampacities of insulated conductors in a raceway or cable if all of the listed conditions apply?

A. Table 310.18
B. Table 310.17
C. Table 310.21
D. Table 310.19

187. What table is used to determine the ampacities of conductors supported on a messenger if all of the listed conditions apply?

A. Table 310.17
B. Table 310.20
C. Table 310.21
D. Table 310.18

ARTICLE 311 Medium Voltage Conductors and Cable Part I. General 311.1 Scope. This article covers the use, installation, construction specifications, and ampacities for Type MV medium voltage conductors and cable.

Electrical Ducts. Electrical conduits, or other raceways round in cross section, that are suitable for use underground or embedded in concrete.

Medium Voltage Cable, Type MV.
A single or multiconductor solid dielectric insulated cable rated 2001 volts up to and including 35,000 volts, nominal.

Thermal Resistivity. As used in this Code, the heat transfer capability through a substance by conduction. Informational Note: Thermal resistivity is the reciprocal of thermal conductivity and is designated Rho, which is expressed in the units °C-cm/W.

Part II. Construction Specifications 311.10 Constructions and Applications. Type MV cables shall comply with the applicable provisions in 311.10(A) through (C).

311.10(A) Conductor Application and Insulation. Conductor application and insulation shall comply with Table 311.10(A).

311.12(B) Conductor Material. Conductors shall be of aluminum, copper-clad aluminum, or copper unless otherwise specified.

311.12(C) Stranded Conductors. Where installed in raceways, conductors not specifically permitted or required elsewhere in this Code to be solid shall be stranded.

312.1 Scope. This article covers the installation and construction specifications of cabinets, cutout boxes, and meter socket enclosures. It does not apply to equipment operating at over 1000 volts, except as specifically referenced elsewhere in the Code.

312.8(B)(1) Identification. The power monitoring or energy management equipment shall be identified as a field installable accessory as part of the listed equipment or is a listed kit evaluated for field installation in switch or overcurrent device enclosures.

312.8(B)(3) Conductors. Conductors used exclusively for control or instrumentation circuits shall comply with either 312.8(B)(3)(a) or (B)(3)(b). (a) Conductors shall comply with 725.49. (b) Conductors smaller than 18 AWG, but not smaller than 22 AWG for a single conductor and 26 AWG for a multiconductor cable, shall be permitted to be used where the conductors and cable assemblies meet all of the following conditions: (1) Are enclosed within raceways or routed along one or more walls of the enclosure and secured at intervals that do not

exceed 250 mm (10 in.) (2) Are secured within 250 mm (10 in.) of terminations (3) Are secured to prevent contact with current carrying components within the enclosure (4) Are rated for the system voltage and not less than 600 volts (5) Have a minimum insulation temperature rating of 90°C.

314.16(B)(5) Equipment Grounding Conductor Fill. Where up to four equipment grounding conductors or equipment bonding jumpers enter a box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest equipment grounding conductor or equipment bonding jumper entering the box. A 1⁄4 volume allowance shall be made for each additional equipment grounding conductor or equipment bonding jumper that enters the box, based on the largest equipment grounding conductor or equipment bonding conductor.

314.17(B) Boxes and Conduit Bodies. The installation of the conductors in boxes and conduit bodies shall comply with 314.17(B)(1) through (B)(4).

314.17(B)(2) Conductors Entering Through Cable Clamps. Where cable assemblies with nonmetallic sheathes are used, the sheath shall extend not less than 6 mm (1⁄4 in.) inside the box and beyond any cable clamp. Except as provided in 300.15(C), the wiring method shall be secured to the box or conduit body. Exception: Where nonmetallic-sheathed cable is used with single gang nonmetallic boxes not larger than a nominal size 57 mm × 100 mm (2 1⁄4 in. × 4 in.) mounted in walls or ceilings, and where the cable is fastened within 200 mm (8 in.) of the box measured along the sheath and where the sheath extends through a cable knockout not less than 6 mm (1⁄4 in.), securing the cable to the box shall not be required. Multiple cable entries shall be permitted in a single cable knockout opening.

188. How far past any cable clamp inside a box is the nonmetallic sheath required to extend when using cable assemblies?

A. 1/4 inch
B. 3/4 inch
C. 5/8 inch
D. 1/2 inch

189. What does the code list as the required material from which medium voltage conductors are to be made from?

A. All listed answers
B. Copper-clad aluminum
C. Copper
D. Aluminum

190. What is the maximum listed voltage for medium voltage (MV) cable?

A. 35,000 volts
B. 2000 volts
C. 15,000 volts
D. 1001 volts

191. What table is medium voltage cable conductor application and insulation required to comply with?

A. Table 311.10(A)
B. Table 311.10(B)
C. Table 311.10(C)
D. Table 311.10(D)

192. In general, if medium voltage conductors are installed in a raceway, what type of conductor is required?

A. Stranded
B. Solid
C. Compact
D. All listed answers

193. How many provisions are conductors used exclusively for control or instrumentation circuits required to comply with?
A. 1
B. 2
C. 3
D. 5

194. What best defines electrical conduits, or other raceways round in cross section, that are suitable for use underground or embedded in concrete?
A. Electrical ducts
B. Duct bank
C. Conduit ducts
D. All listed answers

195. What section is the installation of the conductors in boxes and conduit bodies required to comply with?
A. 314.17(B)(1) through (B)(4)
B. 317.47(B)(1) through (B)(4)
C. 330.80(C)
D. 317.80(C)

196. Where is power monitoring or energy management equipment listed as being acceptable for installation?
A. In switch or overcurrent device enclosures
B. At the utility switch yard
C. In a control room where qualified individuals can directly monitor the equipment
D. Next to or adjacent to the switch or overcurrent device enclosure

197. What listed term best defines the heat transfer capability through a substance by conduction?
A. Thermal resistivity
B. Thermal conductivity
C. Conduction resistivity
D. Thermal conduction

198. What table can be used to determine a single volume allowance for up to four equipment grounding conductors or equipment bonding jumpers that enter a box?
A. 314.16(B)
B. 312.8(B)(3)
C. 314.17(B)(1)
D. 330.80(C)

199. What is the scope of Article 311?
A. Article 311 covers the use, installation, construction specifications, and ampacities for Type MV medium voltage conductors and cable
B. Article 311 covers the use, installation, construction specifications, and ampacities for Type HV high voltage conductors and cable
C. Article 311 covers the use, installation, construction specifications, and ampacities for Type LV low voltage conductors and cable

D. Article 311 covers the use, installation, construction specifications, and ampacities for 600 volt conductors and cable

314.17(B)(4) Temperature Limitation. Nonmetallic boxes and conduit bodies shall be suitable for the lowest temperature-rated conductor entering the box or conduit body.
314.29 Boxes, Conduit Bodies, and Handhole Enclosures to Be Accessible.
Boxes, conduit bodies, and handhole enclosures shall be installed so that wiring contained in them can be rendered accessible in accordance with 314.29(A) and (B).
314.29(A) In Buildings and Other Structures.
Boxes and conduit bodies shall be installed so the contained wiring can be accessed without removing any part of the building or structure.
314.29(B) Underground. Underground boxes and handhole enclosures shall be installed so they are accessible without excavating sidewalks, paving, earth, or other substance that is to be used to establish the finished grade. Exception: Listed boxes and handhole enclosures shall be permitted where covered by gravel, light aggregate, or noncohesive granulated soil if their location is effectively identified and accessible for excavation.
330.80(C) Thermal Insulation. Where more than two Type MC cables containing two or more current-carrying conductors in each cable are installed in contact with thermal insulation, caulk, or sealing foam without maintaining spacing between cables, the ampacity of each conductor shall be adjusted in accordance with Table 310.15(C)(1).
Part III. Construction Specifications 330.104 Conductors. AWG copper, nickel, or nickel-coated copper and 12 AWG aluminum or copper-clad aluminum. For control and signal conductors minimum conductor sizes shall be 18 AWG copper, nickel, or nickel-coated copper, 14 AWG copper-clad aluminum, and 12 AWG aluminum.
330.130 Hazardous (Classified) Locations. Where required to be marked MC-HL, the cable shall be listed and shall have a gas/vapor tight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, and a separate equipment grounding conductor.
334.30 Securing and Supporting. Nonmetallic-sheathed cable shall be supported and secured by staples, cable ties listed and identified for securement and support, or straps, hangers, or similar fittings designed and installed so as not to damage the cable, at intervals not exceeding 1.4 m (4½ ft) and within 300 mm (12 in.) of every cable entry into enclosures such as outlet boxes, junction boxes, cabinets, or fittings. The cable length between the cable entry and the closest cable support shall not exceed 450 mm (18 in.). Flat cables shall not be stapled on edge.
334.104 Conductors. The 600-volt insulated power conductors shall be sizes 14 AWG through 2 AWG copper conductors or sizes 12 AWG through 2 AWG aluminum or copper-clad aluminum conductors. Control and signaling conductors shall be no smaller than 18 AWG copper.
336.1 Scope. This article covers the use, installation, and construction specifications for power and control tray cable, Type TC.
336.104 Conductors. For ungrounded, grounded, and equipment grounding conductors, the conductor sizes shall be 14 AWG through 1000 kcmil copper, nickel, or nickel-coated copper and 12 AWG through 1000 kcmil aluminum or copper-clad aluminum. Insulation types shall be one of the types listed in Table 310.4(A) or Table 310.4(B) that is suitable for branch circuit and feeder circuits or one that is identified for such use. For control and signal conductors, the minimum conductor sizes shall be 18 AWG copper, nickel, or nickel-coated copper, 14 AWG copper-clad aluminum, and 12 AWG aluminum.

336.130 Hazardous (Classified) Location Cable. Cable listed and marked Type TC-ER-HL shall comply with the following: (1) The overall nonmetallic jacket shall be suitable for the environment. (2) The overall cable construction shall be essentially circular in cross-section. (3) The overall nonmetallic jacket shall be continuous and gas/vapor tight. (4) For construction greater than 25.4 mm (1 in.) in diameter, the following shall apply: a. The equipment grounding conductor shall be bare. b. A metallic shield shall be included over all conductors under the outer jacket. For ungrounded, grounded, and equipment grounding conductors, the minimum conductor sizes shall be 14.

200. If more than two MC cables containing two or more current-carrying conductors in each cable are installed in contact with thermal insulation, caulk, or sealing foam without maintaining spacing between the cables, what table is required to be used to adjust the ampacity of each conductor?
A. 312.8(B)(3)
B. 314.16(B)
C. Table 310.15(C)(1)
D. 314.17(B)(1)

201. Where should nonmetallic-sheathed cable NEVER be stapled?
A. On hangars spaced every 4 1/2 feet
B. Within 12 inches of a box
C. Every 4 1/2 feet
D. On edge

202. Nonmetallic boxes and conduit bodies are required to be suitable for the lowest _____ conductor entering the box or conduit body.
A. Voltage-rated
B. Current-rated
C. Temperature-rated
D. Power-rated

203. What is the smallest control and signaling conductor permitted in the construction of nonmetallic-sheathed cable?
A. 14 AWG copper
B. 16 AWG copper
C. 12 AWG copper
D. 18 AWG copper

204. What is the minimum size copper conductor that MC cable can have for an equipment grounding conductor?
A. 12 AWG
B. 16 AWG
C. 14 AWG
D. 18 AWG

205. What is tray cable with a TC-ER-HL marking required to contain?
A. An overall cable construction that is essentially circular in cross-section
B. An overall nonmetallic jacket that is suitable for the environment
C. An overall nonmetallic jacket that is continuous and gas/vapor tight
D. All listed answers

206. What is not permitted to be removed to access the wire located inside boxes and conduit bodies when installed in a building?
A. Any conduit cover

B. Any part of the building or structure
C. Any box cover
D. Any gutter cover

207. What is MC cable marked with MC-HL required to exhibit?
A. A separate equipment grounding conductor
B. A gas/vapor tight continuous corrugated metallic sheath
C. An overall jacket of suitable polymeric material
D. All listed answers

208. What are the different sizes in which aluminum tray cable can be purchased for the use with ungrounded, grounded, and equipment grounding conductors?
A. 12 AWG through 1000 kcmil
B. 14 AWG through 1000 kcmil
C. 16 AWG through 1000 kcmil
D. Aluminum tray cable is not permitted

ARTICLE 337 Type P Cable Part I. General 337.1 Scope. This article covers the use, installation, and construction specifications for up through 2000-volt Type P cable (armored and unarmored).
337.2 Definition. The definition in this section shall apply within this article and throughout the Code.
Type P. Cable A factory assembly of one or more insulated flexible tinned copper conductors, with associated equipment grounding conductor(s), with or without a braided metallic armor and with an overall nonmetallic jacket.
337.31 Single Conductors. Where single-conductor cables are used, the installation shall comply with 300.20.
Part III. Construction Specifications 337.104 Conductors. Conductors shall be of tinned copper. Conductors shall employ flexible stranding. The minimum conductor size shall be 18 AWG.
337.108 Equipment Grounding Conductor. An equipment grounding conductor complying with 250.122 shall be provided within the cable.
338.1 Scope. This article covers the use, installation, and construction specifications of service-entrance cable.
Service-Entrance Conductor Assembly. Multiple single-insulated conductors twisted together without an overall covering, other than an optional binder intended only to keep the conductors together.
338.10(B)(4) Installation Methods for Branch Circuits and Feeders. Informational Note No. 1: See 310.14(A)(3) for temperature limitation of conductors. Informational Note No. 2: For the installation of main power feeder conductors in dwelling units refer to 310.12.
(a) Interior Installations. (1) In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Part II of Article 334, excluding 334.80. (2) Where more than two Type SE cables containing two or more current-carrying conductors in each cable are installed in contact with thermal insulation, caulk, or sealing foam without maintaining spacing between cables, the ampacity of each conductor shall be adjusted in accordance with Table 310.15(C)(1). (3) For Type SE cable with ungrounded conductor sizes 10 AWG and smaller, where installed in contact with thermal insulation, the ampacity shall be in accordance with 60°C (140°F) conductor temperature rating. The maximum conductor temperature rating shall be permitted to be used for ampacity adjustment and correction purposes, if the final ampacity does not exceed that

for a 60°C (140°F) rated conductor. (b) Exterior Installations. (1) In addition to the provisions of this article, service-entrance cable used for feeders or branch circuits, where installed as exterior wiring, shall be installed in accordance with Part I of Article 225. The cable shall be supported in accordance with 334.30. (2) Type USE cable installed as underground feeder and branch circuit cable shall comply with Part II of Article 340.

Part III. Construction Specifications 338.100 Construction. 338.100(A) Assemblies. Cabled assemblies of multiple single-conductor Type USE conductors shall be permitted for direct burial. All conductors shall be insulated. Informational Note: The term “cabled” refers to a manufacturing process of twisting single conductors together and may also be referred to as “plexed.”

342.10(E) Severe Physical Damage. IMC shall be permitted to be installed where subject to severe physical damage.

342.14 Dissimilar Metals. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. Stainless steel and aluminum fittings and enclosures shall be permitted to be used with galvanized steel IMC where not subject to severe corrosive influences.

Stainless steel IMC shall only be used with the following: (1) Stainless steel fittings (2) Stainless steel boxes and enclosures (3) Steel (galvanized, painted, powder or PVC coated, and so forth) boxes and enclosures when not subject to severe corrosive influences (4) Stainless steel, nonmetallic, or approved accessories.

209. What article do you need to follow when installing single conductor type P cable?
    A. 300.20
    B. 310.20
    C. 320.10
    D. 315.16(B)

210. What part of Article 334 is SE service-entrance cable used for interior wiring required to comply with?
    A. Part IV
    B. Part III
    C. Part II
    D. Part V

211. Where is IMC usually installed?
    A. Above a T bar ceiling
    B. With service equipment
    C. At lumber mills
    D. Where subject to severe physical damage

212. What is a service-entrance conductor assembly?
    A. Multiple conductor assembly with single-insulated conductors twisted together without an overall covering, other than an optional binder intended only to keep the conductors together
    B. Multiple single-insulated conductors twisted together without an overall covering, other than an optional binder intended only to keep the conductors together
    C. Multiple single-insulated conductors twisted together with an overall covering, other than an optional binder intended only to keep the conductors together
    D. Multiple conductor assembly with single-insulated conductors twisted together with an overall covering, other than an optional binder intended

only to keep the conductors together

213. What is type P cable?

A. A factory assembly of one or more insulated flexible tinned copper conductors, with associated equipment grounding conductor(s)

B. A field assembly of one or more insulated flexible tinned copper conductors, with associated equipment grounding conductor(s), with or without a braided metallic armor and with an overall nonmetallic jacket

C. A factory assembly of one or more insulated flexible tinned copper conductors, with associated equipment grounding conductor(s), with or without a braided metallic armor and with an overall nonmetallic jacket

D. A factory assembly of tinned copper conductors, with associated equipment grounding conductor(s), with or without a braided metallic armor and without an overall nonmetallic jacket

214. What can happen when dissimilar metals are in contact with each other?

A. Stray currents

B. Galvanic action

C. Copper loss

D. Hysteresis

215. What term is often used to describe a manufacturing process of twisting single conductors together?

A. Twisty

B. Vexed

C. Plexed

D. Comingled

216. What article is the equipment grounding conductor in Type P cable required to comply with?

A. 250.122

B. 250.66

C. 250.52(C)

D. 250.102(D)

344.10(E) Severe Physical Damage. RMC shall be permitted to be installed where subject to severe physical damage.

344.14 Dissimilar Metals. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. Stainless steel and aluminum fittings and enclosures shall be permitted to be used with galvanized steel RMC, and galvanized steel fittings and enclosures shall be permitted to be used with aluminum RMC where not subject to severe corrosive influences. Stainless steel rigid conduit shall only be used with the following: (1) Stainless steel fittings (2) Stainless steel boxes and enclosures (3) Steel (galvanized, painted, powder or PVC coated, and so forth) boxes and enclosures when not subject to severe corrosive influences (4) Stainless steel, nonmetallic, or approved accessories

Part II. Installation 356.10 Uses Permitted. LFNC shall be permitted to be used in exposed or concealed locations for the following purposes: (1) Where flexibility is required for installation, operation, or maintenance. (2) Where protection of the contained conductors is required from vapors, machine oils, liquids, or solids. (3) For outdoor locations where listed and marked as suitable for the purpose. (4) For direct burial where listed and marked for the purpose. (5) Type LFNC shall be permitted to be installed in lengths longer than 1.8 m (6 ft)

where secured in accordance with 356.30. (6) Type LFNC-B as a listed manufactured prewired assembly, metric designator 16 through 27 (trade size 1⁄2 through 1) conduit. (7) For encasement in concrete where listed for direct burial and installed in compliance with 356.42. (8) Conductors or cables rated at a temperature rating of LFNC conduit shall be permitted to be installed in LFNC, provided the conductors or cables are not operated at a temperature higher than the listed temperature rating of the LFNC.

358.10(E) Physical Damage. Steel and stainless steel EMT shall be permitted to be installed where subject to physical damage.

358.14 Dissimilar Metals. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. Stainless steel and aluminum fittings and enclosures shall be permitted to be used with galvanized steel EMT, and galvanized steel fittings and enclosures shall be permitted to be used with aluminum EMT where not subject to severe corrosive influences. Stainless steel EMT shall only be used with the following: (1) Stainless steel fittings (2) Stainless steel boxes and enclosures (3) Steel (galvanized, painted, powder or PVC coated, and so forth) boxes and enclosures when not subject to severe corrosive influences (4) Stainless steel, nonmetallic, or approved accessories

370.20(B) Termination. Approved terminating means shall be used for connections to cablebus conductors. Informational Note No. 1: See 110.14(C) for conductor temperature limitations due to termination provisions for installations up to and including 2000 volts. Informational Note No. 2: See 110.40 for conductor temperature limitations due to termination provisions for installations 2001 volts to 35,000 volts.

370.80 Ampacity of Conductors. The ampacity of conductors in cablebus shall be in accordance with 310.17 and 310.19 for installations up to and including 2000 volts, or with Table 311.60(C)(69) and Table 311.60(C)(70) for installations 2001 volts to 35,000 volts.

217. Where is EMT usually installed?
- A. Where subject to severe physical damage
- B. Where subject to severe corrosion
- C. Where subject to physical damage
- D. Where subject to severe environments

218. What listed circumstance can galvanized steel rigid metal conduit be connected to aluminum rigid metal conduit?
- A. With the use of no lox
- B. If subject to severe corrosive influences
- C. With the use of copper coat
- D. If not subject to severe corrosive influences

219. What table(s) are the ampacity of conductors in cablebus required to comply with for installations up to and including 2000 volts?
- A. 311.60(C)(69)
- B. 310.17 and 310.19
- C. 311.60(C)(70)
- D. 404.14(A) and (B)

220. What is stainless steel EMT only allowed to be used with?
- A. Stainless steel boxes and enclosures
- B. Steel (galvanized, painted, powder or PVC coated, and so forth) boxes and enclosures when not subject to severe corrosive influences
- C. Stainless steel fittings

D. All listed answers

221. What section is the securing of LFNC in lengths longer than 6 ft required to comply with?
A. 344.14
B. 356.42
C. 356.30
D. 358.10(E)

222. What section are the termination provisions located for cable bus conductor temperature limitations for installations 2001 volts to 35,000 volts?
A. 370.80
B. 110.14(C)
C. 110.40
D. 404.14(B)

374.6 Listing Requirements. Cellular metal floor raceways shall be listed.

404.14(B) Alternating-Current or Direct-Current General-Use Snap Switch. This form of switch shall be permitted on either ac or dc circuits and used only for controlling the following: (1) Resistive loads not exceeding the ampere rating of the switch at the voltage applied. (2) Inductive loads not exceeding 50 percent of the ampere rating of the switch at the applied voltage. Switches rated in horsepower are suitable for controlling motor loads within their rating at the voltage applied. (3) Tungsten-filament lamp loads not exceeding the ampere rating of the switch at the applied voltage if T-rated. (4) Electronic ballasts, self-ballasted lamps, compact fluorescent lamps, and LED lamp loads with their associated drivers, not exceeding the ampere rating of the switch at the voltage applied.

404.14(C) CO/ALR Snap Switches. Snap switches directly connected to aluminum conductors and rated 20 amperes or less shall be marked CO/ALR.

404.14(D) Alternating-Current General-Use Snap Switches Rated for 347 Volts. This form of switch shall not be rated less than 15 amperes at a voltage of 347 volts ac, and they shall not be readily interchangeable in box mounting with switches covered in 404.14(A) and (B). These switches shall be used only for controlling any of the following: (1) Noninductive loads other than tungsten-filament lamps not exceeding the ampere and voltage ratings of the switch. (2) Inductive loads not exceeding the ampere and voltage ratings of the switch. Where particular load characteristics or limitations are specified as a condition of the listing, those restrictions shall be observed regardless of the ampere rating of the load. (3) Electronic ballasts, self-ballasted lamps, compact fluorescent lamps, and LED lamp loads with their associated drivers, not exceeding 20 amperes and not exceeding the ampere rating of the switch at the voltage applied.

404.14(E) Dimmer and Electronic Control Switches. General-use dimmer switches shall be used only to control permanently installed incandescent luminaires unless listed for the control of other loads and installed accordingly. Other electronic control switches, such as timing switches and occupancy sensors, shall be used to control permanently connected loads. They shall be marked by their manufacturer with their current and voltage ratings and used for loads that do not exceed their ampere rating at the voltage applied.

406.5(G) Receptacle Orientation. 406.5(G)(1) Countertop and Work Surfaces. Receptacles shall not be installed in a face-up position in or on countertop surfaces or work surfaces unless listed for countertop or work surface applications.

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

406.9(C) Bathtub and Shower Space. Receptacles shall not be installed within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or shower stall threshold. The identified zone is all-encompassing and shall include the space directly over the tub or shower stall. Exception: In bathrooms with less than the required zone the receptacle(s) shall be permitted to be installed
opposite the bathtub rim or shower stall threshold on the farthest wall within the room.
406.12 Tamper-Resistant Receptacles. All 15- and 20-ampere, 125- and 250-volt nonlocking-type receptacles in the areas specified in 406.12(1) through (8) shall be listed tamper-resistant receptacles. (1) Dwelling units, including attached and detached garages and accessory buildings to dwelling units, and common areas of multifamily dwellings specified in 210.52 and 550.13 (2) Guest rooms and guest suites of hotels, motels, and their common areas (3) Child care facilities (4) Preschools and education facilities (5) Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices, and outpatient facilities (6) Subset of assembly occupancies described in 518.2 to include places of awaiting transportation, gymnasiums, skating rinks, and auditoriums (7) Dormitory units (8) Assisted living facilities Informational Note No. 1: This requirement would include receptacles identified as 5-15, 5-20, 6-15, and 6-20 in ANSI/NEMA WD 6-2016, Wiring Devices — Dimensional Specifications. Informational Note No. 2: Assisted living facilities are Institutional Use Group I-1 per IBC 2015. Exception to (1), (2), (3), (4), (5), (6), (7) and (8): Receptacles in the following locations shall not be required to be tamper resistant: (1) Receptacles located more than 1.7 m (5 1⁄2 ft) above the floor (2) Receptacles that are part of a luminaire or appliance (3) A single receptacle, or a duplex receptacle for two appliances, located within the dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord-and-plug-connected in accordance with 400.10(A)(6), (A)(7), or (A)(8) (4) Nongrounding receptacles used for replacements as permitted in 406.4(D)(2)(a)

223. Where can alternating-current or direct-current general-use snap switches be used?
    A. On electronic ballasts, self-ballasted lamps, compact fluorescent lamps, and LED lamp loads with their associated drivers, not exceeding the ampere rating of the switch at the voltage applied
    B. On inductive loads not exceeding 50 percent of the ampere rating of the switch at the applied voltage
    C. On resistive loads not exceeding the ampere rating of the switch at the voltage applied
    D. All listed answers
224. What article applies to cellular metal floor raceways?
    A. 374
    B. 370
    C. 358
    D. 344
225. How are snap switches directly connected to aluminum conductors and rated 20 amperes or less required to be marked?
    A. With the maximum current limitations
    B. With polarity
    C. With the maximum power limitations
    D. CO/ALR

226. What type of loads are other electronic control switches, such as timing switches and occupancy sensors, required to be used with?

A. Inductive connected loads
B. Temporary connected loads
C. Permanently connected loads
D. Capacitive connected loads

227. What is the minimum amperage rating for an alternating-current general-use snap switch rated for 347 volts?

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

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

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

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

406.13(D) Connecting and Disconnecting. The use of single-pole separable connectors shall be performed by a qualified person and shall comply with at least one of the following conditions: (1) Connection and disconnection of connectors are only possible where the supply connectors are interlocked to the source, and it Is not possible to connect or disconnect connectors when the supply is energized. (2) Line connectors are of the listed sequential-interlocking type so that load connectors are connected in the following sequence and that disconnection is in the reverse sequence: (a) Equipment grounding conductor connection (b) Grounded circuit conductor connection, if provided (c) Ungrounded conductor connection (3) A caution notice that complies with 110.21(B) is provided on the equipment employing single-pole separable connectors, adjacent to the line connectors, indicating that connections are to be performed in the following sequence and that disconnection is in the reverse sequence: (a) Equipment grounding conductor connectors (b) Grounded circuit-conductor connectors, if provided (c) Ungrounded conductor connectors Informational Note: A single-pole locking-type separable connector is investigated in accordance with ANSI/UL 1691-2014, Single Pole Locking-Type Separable Connectors.

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

408.7 Unused Openings. Unused openings for circuit breakers and switches shall be closed using identified closures, or other approved means that provide protection substantially equivalent to the wall of the enclosure.

408.8(A) Panelboards. Panelboards shall not be permitted to be reconditioned. This shall not prevent the replacement of a panelboard within an enclosure. In the event the

replacement has not been listed for the specific enclosure and the available fault current is greater than 10,000 amperes, the completed work shall be field labeled, and any previously applied listing marks on the cabinet that pertain to the panelboard shall be removed.
408.8(B) Switchboards and Switchgear. Switchboards and switchgear, or sections of switchboards or switchgear, shall be permitted to be reconditioned. Reconditioned switchgear shall be listed or field labeled as reconditioned, and previously applied listing marks, if any, within the portions reconditioned shall be removed.
408.18(C) Connections. Each section of equipment that requires rear or side access to make field connections shall be so marked by the manufacturer on the front. Section openings requiring rear or side access shall comply with 110.26. Load terminals for field wiring shall comply with 408.18(C)(1), (C)(2), or (C)(3) as applicable.
408.18(C)(1) Equipment Grounding Conductors. Load terminals for field wiring shall be so located that it is not necessary to reach across uninsulated ungrounded bus in order to make connections.
408.18(C)(2) Grounded Circuit Conductors. Where multiple branch or feeder grounded circuit conductor load terminals for field wiring are grouped together in one location, they shall be so located that it is not necessary to reach across uninsulated ungrounded bus, whether or not energized, in order to make connections. Where only one branch or feeder set of load terminals for field wiring are grouped with its associated ungrounded load terminals, they shall be so located that it is not necessary to reach across energized uninsulated bus including other branch or feeder bus in order to make connections. Bus on the line side of service, branch, or feeder disconnects is considered energized with respect to its associated load side circuits.
410.10(D) Bathtub and Shower Areas. A luminaire installed in a bathtub or shower area shall meet all of the following requirements:
410.10(D)(1) No parts of cord-connected luminaires, chain-, cable-, or cord-suspended luminaires, lighting track, pendants, or ceiling-suspended (paddle) fans shall be located within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or shower stall threshold. This zone is all-encompassing and includes the space directly over the tub or shower stall.

228. What are single-pole separable connectors required to be marked with?
    A. Ampere ratings
    B. Manufacturer’s name
    C. Voltage ratings
    D. All listed answers
229. Who does the code require to install a single-pole separable connector?
    A. The authority having jurisdiction
    B. A qualified person
    C. The owner
    D. The construction management representative
230. What are switchboards, switchgear, and panelboards required to have their short-circuit current rating based on?
    A. The maximum power rating
    B. The instantaneous short circuit condition
    C. The available fault current
    D. The overcurrent protective device

231. What listed section describes what to do with unused openings for circuit breakers and switches?
A. 408.7
B. 408.8
C. 408.8(B)
D. 406.13(D)
232. Where is a section of switchgear required to be labeled that requires rear or side access to make field connections?
A. In the manufacturers documentation
B. On the open side of the switchgear
C. On the bus connection area
D. On the front
233. What is bus on the line side of service, branch, or feeder disconnects with respect to its associated load side circuits considered?
A. Guarded
B. Energized
C. Grounded
D. Listed
234. How far vertically from the top of a bathtub rim or shower stall threshold are pendants not allowed to be installed?
A. 6 ft
B. 8 ft
C. 3 ft
D. 5 ft

410.10(D)(2) Luminaires located within the actual outside dimension of the bathtub or shower to a height of 2.5 m (8 ft) vertically from the top of the bathtub rim or shower threshold shall be marked suitable for damp locations or marked suitable for wet locations. Luminaires located where subject to shower spray shall be marked suitable for wet locations.
410.36(A) Luminaires Supported By Outlet Boxes. Luminaires shall be permitted to be supported by outlet boxes or fittings installed as required by 314.23. The installation shall comply with the following requirements: (1) The outlet boxes or fittings shall comply with 314.27(A)(1) and 314.27(A)(2). (2) Luminaires shall be permitted to be supported in accordance with 314.27(E). (3) Outlet boxes complying with 314.27(E) shall be considered lighting outlets as required by 210.70(A), (B), and (C).
410.52 Conductor Insulation. Luminaires shall be wired with conductors having insulation suitable for the environmental conditions, current, voltage, and temperature to which the conductors will be subjected. Informational Note: For ampacity of fixture wire, maximum operating temperature, voltage limitations, minimum wire size, and other information, see Article 402.
422.5(A) General. Appliances identified in 422.5(A)(1) through (A)(7) rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase, shall be provided with Class A GFCI protection for personnel. Multiple Class A GFCI protective devices shall be permitted but shall not be required. (1) Automotive vacuum machines (2) Drinking water coolers and bottle fill stations (3) Cord-and-plug-connected high-pressure spray washing machines (4) Tire inflation machines (5) Vending machines (6) Sump pumps (7) Dishwashers Informational Note: Section 210.8 specifies requirements for GFCI protection for the branch-circuit outlet where the covered location warrants such protection.

422.10(A) Individual Branch Circuits. The ampacities of branch-circuit conductors shall not be less than the marked rating of the appliance or the marked rating of an appliance having combined loads. The ampacities of branch-circuit conductors for motor-operated appliances not having a marked rating shall be in accordance with Part II of Article 430. The branch-circuit rating for an appliance that is a continuous load, other than a motor-operated appliance, shall not be less than 125 percent of the marked rating, or not less than 100 percent of the marked rating if the branch-circuit device and its assembly are listed for continuous loading at 100 percent of its rating. Branch circuits and branch-circuit conductors for household ranges and cooking appliances shall be permitted to be in accordance with Table 220.55 and shall be sized in accordance with 210.19(A)(3).
422.13 Storage-Type Water Heaters. The branch-circuit overcurrent device and conductors for fixed storage-type water heaters that have a capacity of 450 L (120 gal) or less shall be sized not smaller than 125 percent of the rating of the water heater.
422.40 Polarity in Cord-and-Plug-Connected Appliances. If the appliance is provided with a manually operated, line-connected, single-pole switch for appliance on–off operation, an Edison-base lampholder, or a 15- or 20-ampere receptacle, the attachment plug shall be of the polarized or grounding type. A 2-wire, nonpolarized attachment plug shall be permitted to be used on a listed double-insulated shaver. Informational Note: For polarity of Edison-base lampholders, see 410.82.

235. How many requirements must be met when supporting luminaires by outlet boxes?
    A. 3
    B. 2
    C. 1
    D. Luminaires are not permitted to be supported by an outlet box
236. What section should be referenced to determine the polarity of Edison-base lampholders?
    A. 410.53
    B. 410.82
    C. 408.24
    D. 404.15
237. What article applies to the ampacity of fixture wire, maximum operating temperature, voltage limitations, minimum wire size, and other information?
    A. Article 404
    B. Article 410
    C. Article 408
    D. Article 402
238. What part of Article 430 are ampacities of branch circuit conductors for motor-operated appliances not having a marked rating required to comply with?
    A. Part II
    B. Part III
    C. Part IV
    D. Part V
239. How are luminaires located where subject to shower spray required to be marked?
    A. Suitable for damp locations
    B. Sealed
    C. Suitable for wet locations
    D. Suitable for GFCI protected locations

240. At what percent of a 120 gallon or smaller storage type water heater are the branch-circuit overcurrent device and conductors required to be sized?

A. 150%
B. 120%
C. 135%
D. 125%

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

2023 NEC 240 Quiz Answer Sheet

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