



American Electrical Institute

CONTINUING EDUCATION FOR  
OREGON ELECTRICIANS



2017 NEC CODE CHANGE  
Part 1 ■ 8 Hours

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DISCLAIMER NOTE: This course is APPROVED by the Oregon Building Codes Division for continuing education to renew your electrical license and is not intended to replace or supersede any state or local adopted codes.

# 2017 NEC Code Change • Part 1

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

This course covers the changes, revisions and additions made to the 2017 Code.

**(Revised) 90.3 Code Arrangement.** This Code is divided into the introduction and nine chapters, as shown in Figure 90.3. Chapters 1, 2, 3, and 4 apply generally. Chapters 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions and may supplement or modify the requirements in Chapters 1 through 7.

**(Revised) 90.7 Informational Note No. 3:** Informative Annex A contains a list of product safety standards that are compatible with this Code.

**(Revised) 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. Other definitions are included in the article in which they are used but may be referenced in Article 100. 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.

**(Revised) Accessible, Readily (Readily Accessible).** Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to take actions such as to use tools (other than keys), to climb over or under, to remove obstacles, or to resort to portable ladders, and so forth.

**(NEW) Informational Note:** Use of keys is a common practice under controlled or supervised conditions and a common alternative to the ready access requirements under such supervised conditions as provided elsewhere in the NEC.



**(Revised) Building.** A structure that stands alone or that is separated from adjoining structures by fire walls.

**(Revised) Cable Routing Assembly.** A single channel or connected multiple channels, as well as associated fittings, forming a structural system that is used to support and route communications wires and cables, optical fiber cables, data cables associated with information technology and communications equipment, Class 2, Class 3, and Type PLTC cables, and power-limited fire alarm cables in plenum, riser, and general-purpose applications.

**(Revised) Combustible Dust [as applied to Hazardous (Classified) Locations].** Dust particles that are 500 microns or smaller (i.e., material passing a U.S. No. 35 Standard Sieve as defined in ASTM E11-2015, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves), and present a fire or explosion hazard when dispersed and ignited in air.



**(NEW) Informational Note:** As the telecommunications network transitions to a more data-centric network, computers, routers, servers, and their powering equipment, are becoming essential to the transmission of audio, video, and data and are finding increasing application in communications equipment installations.

**(NEW) Cord Connector [as applied to Hazardous (Classified) Locations].** A fitting intended to terminate a cord to a box or similar device and reduce the strain at points of termination and may include an explosionproof, a dust-ignitionproof, or a flameproof seal.

## PART 1 EXAM QUESTIONS

1. In a hazardous location, the fitting intended to terminate a cord to a box or similar device and reduce the strain at points of termination and may include an explosionproof, a dust-ignitionproof, or a flameproof seal is best defined as?
  - A. "CGB"
  - B. "Kalum's" grip
  - C. Cord Connector
  - D. All listed answers
2. What chapter(s) of the 2017 Code apply to special conditions for electrical installations?
  - A. 8
  - B. 1, 2, 3, and 4
  - C. 5, 6, and 7
  - D. 7
3. What article covers the definitions portion of the 2017 Code?
  - A. 100
  - B. 110
  - C. 90
  - D. 200
4. What item is used as a common practice under controlled or supervised conditions regarding access to electrical equipment?
  - A. Screw driver
  - B. Key
  - C. Motion switch
  - D. Access code
5. What chapter(s) of the 2017 Code apply to general electrical installations?
  - A. 7
  - B. 5, 6, and 7
  - C. 8
  - D. 1, 2, 3, and 4
6. What best defines a structure that is separated from adjoining structures by fire walls?
  - A. Building
  - B. Tower structure
  - C. Network room
  - D. Telecommunications room
7. What is the minimum system voltage that part II of Article 100 covers?
  - A. 600
  - B. 1000
  - C. 575
  - D. 480
8. What type of cables are generally used in a cable routing assembly?
  - A. PLTC cables
  - B. Class 2 cables
  - C. Class 3 cables
  - D. All listed answers
9. What is the minimum size dust particle that is considered hazardous?
  - A. 200 microns
  - B. 50 microns
  - C. 500 microns
  - D. 35 microns
10. What annex contains a list of product safety standards that are compatible with the 2017 Code?
  - A. A
  - B. B
  - C. C
  - D. D
11. How many Chapters are in the 2017 NEC?
  - A. 7
  - B. 10
  - C. 8
  - D. 9

**(Revised) Dusttight.** Enclosures constructed so that dust will not enter under specified test conditions.

**(NEW) Informational Note No. 1:** Enclosure Types 3, 3S, 3SX, 4, 4X, 5, 6, 6P, 12, 12K, and 13, per ANSI/NEMA 250-2014, Enclosures for Electrical Equipment, are considered dusttight and suitable for use in unclassified locations and in Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.

**(NEW) Informational Note No. 2:** For further information, see ANSI/ISA-12.12.01-2013, Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.

**(Revised) Electric Sign.** A fixed, stationary, or portable self-contained, electrically operated and/or electrically illuminated utilization equipment with words or symbols designed to convey information or attract attention.

**(NEW) Field Evaluation Body (FEB).** An organization or part of an organization that performs field evaluations of electrical or other equipment.

**(NEW) Field Labeled (as applied to evaluated products).** Equipment or materials to which has been attached a label, symbol, or other identifying mark of an FEB indicating the equipment or materials were evaluated and found to comply with requirements as described in an accompanying field evaluation report.

**(Revised) Information Technology Equipment (ITE).** Equipment and systems rated 1000 volts or less, normally found in offices or other business establishments and similar environments classified as ordinary locations, that are used for creation and manipulation of data, voice, video, and similar signals that are not communications equipment as defined in Part I of Article 100 and do not process communications circuits as defined in 800.2.

**(Revised) Receptacle.** A contact device installed at the outlet for the connection of an attachment plug, or for the direct connection of electrical utilization equipment designed to mate with the corresponding contact device. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is two or more contact devices on the same yoke.

**(NEW) Process Seal [as applied to Hazardous (Classified) Locations].** A seal between electrical systems and flammable or combustible process fluids where a failure could allow the migration of process fluids into the premises' wiring system.

**(Revised) Show Window.** Any window, including windows above doors, used or designed to be used for the display of goods or advertising material, whether it is fully or partly enclosed or entirely open at the rear and whether or not it has a platform raised higher than the street floor level.



## PART 1 EXAM QUESTIONS

12. What ANSI/ ISA should be referenced when using Nonincendive electrical equipment in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations?
- ANSI/ ISA-21.12.01-2013
  - ANSI/ ISA-12.21.01-2013
  - ANSI/ ISA-12.12.01-2013
  - Nonincendive electrical equipment is designed and approved for use in a telecommunication room only.
13. What are enclosures considered that are constructed so that dust will not enter under specified test conditions?
- Dust proof
  - Dusttight
  - Dust resistant
  - Ignitionproof
14. What best defines a fixed, stationary, or portable self-contained, electrically operated and/or electrically illuminated utilization equipment with words or symbols designed to convey information or attract attention?
- Billboard
  - Monument sign
  - Electric Sign
  - All listed answers
15. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an FEB indicating the equipment or materials were evaluated and found to comply with requirements as described in an accompanying field evaluation report best defines what listed term?
- Field Labeled
  - UL Listed
  - Field evaluated
  - Field tested label
16. How many contact devices on the same yoke would constitute a multiple receptacle?
- One
  - Two or more
  - Six to nine
  - Contact devices are not required for a multiple receptacle.
17. What hazardous (classified) zone location is a type 3SX enclosure allowed to be installed?
- A 3SX enclosure is NOT allowed to be installed in a hazardous (classified) location
  - Zone 250
  - Zone 13
  - Zone 22
18. What best defines a seal between electrical systems and combustible process fluids where a failure could allow the migration of process fluids into the premises' wiring system?
- Seal off
  - "Chico"
  - Process Seal
  - Neutralizing process liquid
19. What organization performs field evaluations of electrical or other equipment?
- CMP-7
  - Underwriter Laboratories
  - AHJ
  - Field Evaluation Body

**(Revised) Structure.** That which is built or constructed, other than equipment.

**110.3 (A)(1)(NEW) Informational Note No. 1:** Equipment may be new, reconditioned, refurbished, or remanufactured.

**(NEW) 110.3 (C) Listing.** Product testing, evaluation, and listing (product certification) shall be performed by recognized qualified electrical testing laboratories and shall be in accordance with





applicable product standards recognized as achieving equivalent and effective safety for equipment installed to comply with this Code.

**(Revised) 110.5 Conductors.** Conductors normally used to carry current shall be of copper or 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.

**(Revised) 110.9 Interrupting Rating.** Equipment intended to interrupt current at fault levels shall have an interrupting rating at nominal circuit voltage at least equal to the current that is available at the line terminals of the equipment. Equipment intended to interrupt current at other than fault levels shall have an interrupting rating at nominal circuit voltage at least equal to the current that must be interrupted.

**(NEW) 110.11 Informational Note No. 4:** Minimum flood provisions are provided in NFPA 5000-2015 Building Construction and Safety Code, the International Building Code (IBC), and the International Residential Code for One- and Two-Family Dwellings (IRC).

**(NEW) 110.14 (D) Installation.** Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

**(NEW) 110.16 (B) Service Equipment.** In other than dwelling units, in addition to the requirements in (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 -2015, 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 -2015 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.



**PART 1 EXAM QUESTIONS**

20. **Equipment intended to interrupt current at other than fault levels shall have an interrupting rating of what circuit voltage?**
- A. 125% at continuous duty
  - B. Nominal
  - C. Instantaneous short circuit condition voltage
  - D. 135% of the equipment inrush voltage
21. **What listed publication provides guidelines for the design of safety signs and labels for application to products?**
- A. NFPA 5000-2015 Building Construction and Safety Code
  - B. NFPA 70E -2015, Standard for Electrical Safety in the Workplace
  - C. International Building Code (IBC)
  - D. ANSI Z535.4-2011, Product Safety Signs and Labels
22. **If a conductor material is not specified, the sizes given in the 2017 Code shall apply to what type of conductor(s)?**
- A. Aluminum
  - B. Copper
  - C. Nickel
  - D. CO/AL
23. **What listed term is built or constructed other than equipment?**
- A. Stage
  - B. Building
  - C. Platform
  - D. Structure
24. **Where can you find information regarding minimum flood provisions?**
- A. NFPA 5000-2015 Building Construction and Safety Code
  - B. International Residential Code for One- and Two-Family Dwellings (IRC).
  - C. International Building Code (IBC)
  - D. All Listed answer
25. **What new section was added to the 2017 Code regarding tightening torque?**
- A. 110.41 (D)
  - B. 110.16 (B)
  - C. 110.14 (D)
  - D. 110.61 (B)
26. **What listed publication can be used to select personal protective equipment for electrical professionals?**
- A. NFPA 5000-2015 Building Construction and Safety Code
  - B. ANSI Z535.4-2011, Product Safety Signs and Labels
  - C. International Building Code (IBC)
  - D. NFPA 70E -2015, Standard for Electrical Safety in the Workplace
27. **What is the minimum current in other than dwelling units where a permanent label is required to be field or factory applied to service equipment?**
- A. 1200 amps
  - B. 1000 amps
  - C. 800 amps
  - D. 600 amps
28. **What can equipment be listed as?**
- A. Reconditioned
  - B. New
  - C. Remanufactured
  - D. All listed answers
29. **How many items are required to be listed on the label required by 110.21(B)?**
- A. 2
  - B. 3
  - C. 5
  - D. 4

**(NEW) 110.21(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.

**(Revised) 110.21(B)(1) Field-Applied Hazard Markings.** The marking shall warn of the hazards using effective words, colors, symbols, or any combination thereof.

**(Revised) 110.22(C) Informational Note:** See IEEE 3004.5-2014 Recommended Practice for the Application of Low-Voltage Circuit Breakers in Industrial and Commercial Power Systems, for further information on series tested systems.

**(Revised) 110.24 Available Fault Current.** (A) Field Marking. Service equipment at other than dwelling units shall be legibly marked in the field with the maximum 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.



**(Revised) 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.

**(NEW) 110.26 (A) (4) Limited Access.** Where equipment operating at 1000 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized is required by installation instructions or function to be located in a space with limited access, all of the following shall apply:



**(Revised) Table 110.26(A)(1) Working Spaces**

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
0-150	900 mm(3 ft)	900 mm(3 ft)	900 mm(3 ft)
151-600	900 mm(3 ft)	1.0m(3ft.6in.)	1.2M (4ft)
601-1000	900 mm(3 ft)	1.2M (4ft)	1.5m (5ft)

Note: Where the conditions are as follows:

Condition 1 — Exposed live parts on one side of the working space and no live or grounded parts on the other side of the working space, or exposed live parts on both sides of the working space that are effectively guarded by insulating materials.

Condition 2 — Exposed live parts on one side of the working space and grounded parts on the other side of the working space. Concrete, brick, or tile walls shall be considered as grounded.



Condition 3 — Exposed live parts on both sides of the working space.

**(NEW) 110.26 (A) (5) Separation from High-Voltage Equipment.** Where switches, cutouts, or other equipment operating at 1000 volts, nominal, or less are installed in a vault, room, or enclosure where there are exposed live parts or exposed wiring operating over 1000 volts, nominal, the high-voltage equipment shall be effectively separated from the space occupied by the low voltage equipment by a suitable partition, fence, or screen.

## PART 1 EXAM QUESTIONS

30. What is the minimum working distance from exposed live parts on one side of the working space and grounded parts on the other side of the working space if operating at 480 volts?
- 5ft
  - 4ft
  - 3ft 6in
  - 3ft
31. How is service equipment, other than at dwelling units, required to be marked in the field?
- With the maximum available short circuit fault current
  - With the nominal voltage
  - With the maximum Service voltage
  - With the maximum available fault current
32. 110.26(A)(1) through (A)(4) covers the working space for equipment operating at a maximum of how many volts nominal or less to ground?
- 600 Volts
  - 1000 Volts
  - 575 Volts
  - 480 Volts
33. What are Field-Applied Hazard Markings required to use to warn of a hazard?
- Words
  - Symbols
  - Colors
  - All listed answers
34. What is the minimum working distance from exposed live parts on both sides of the working space if operating at 480 volts?
- 3ft 6in
  - 4ft
  - 5ft
  - 3ft
35. How is reconditioned electrical equipment required to be marked?
- Date of the reconditioning
  - Name of organization responsible for reconditioning
  - Trademark of organization responsible for reconditioning
  - All listed answers
36. What is the minimum working distance from exposed live parts on one side of the working space and no live or grounded parts on the other side of the working space, or exposed live parts on both sides of the working space that are effectively guarded by insulating materials supplied by 480 volts?
- 5ft
  - 4ft
  - 3ft
  - 3ft 6in

**(Revised) 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 only shall not be permitted. 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.

**(Revised) 110.26(E) (2) Outdoor.** Outdoor installations shall comply with 110.26(E)(2)(a) through (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.

Exception: Structural overhangs or roof extensions shall be permitted in this zone.

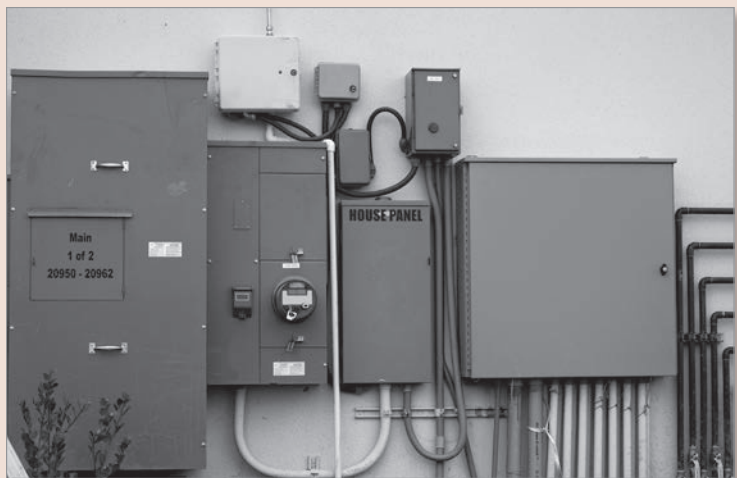


**(Revised) 110.27 Guarding of Live Parts.** (A) Live Parts Guarded Against Accidental Contact. Except as elsewhere required or permitted by this Code, live parts of electrical equipment operating at 50 to 1000 volts, nominal shall be guarded against accidental contact by approved enclosures or by any of the following means:

- (1) By location in a room, vault, or similar enclosure that is accessible only to qualified persons.
- (2) By permanent, substantial partitions or screens arranged so that only qualified persons have access to the space within reach of the live parts. Any openings in such partitions or screens shall be sized and located so that persons are not likely to come into accidental contact with the live parts or to bring conducting objects into contact with them.
- (3) By location on a balcony, gallery, or platform elevated and arranged so as to exclude unqualified persons.
- (4) By elevation above the floor or other working surface as follows:
  - a. A minimum of 2.5 m (8 ft) for 50 volts to 300 volts between ungrounded conductors
  - b. A minimum of 2.6 m (8 ft 6 in.) for 301 volts to 600 volts between ungrounded conductors
  - c. A minimum of 2.62 m (8 ft 7 in.) for 601 volts to 1000 volts between ungrounded conductors

**(Revised) 110.28 Enclosure Types.**

Enclosures (other than surrounding fences or walls covered in 110.31 ) of switchboards, switchgear, panelboards, industrial control panels, motor control centers, meter sockets, enclosed switches, transfer switches, power outlets, circuit breakers, adjustable-speed drive systems, pullout switches, portable power distribution equipment, termination boxes, general-purpose transformers, fire pump controllers, fire pump motors, and motor controllers, rated not over 1000 volts nominal and intended for such locations, shall be marked with an enclosure-type number as shown in Table 110.28.



**(Revised) 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 the provisions of this part apply to equipment on the supply side of the service point.

## PART 1 EXAM QUESTIONS

37. How far above the finished floor are live parts considered protected from accidental contact if there are 240 volts between ungrounded conductors?
- 8 ft
  - 8 ft 6 in.
  - 8 ft 7in.
  - Live parts must be guarded no matter their height
38. How are outdoor installations of electrical equipment required to be installed?
- Protected from accidental contact by unauthorized personnel or by vehicular traffic
  - Protected from accidental spillage or leakage from piping systems
  - In enclosures that are identified
  - All listed answers
39. What table is required to be used to mark fire pump controllers rated not over 1000 volts nominal?
- 110.27
  - 110.16
  - 110.28
  - 110.31
40. How far above the finished floor are live parts considered protected from accidental contact if there are 480 volts between ungrounded conductors?
- 9 ft
  - 8 ft
  - 8 ft 7in.
  - 8 ft 6 in.
41. What part of Article 110 are conductors and equipment operating on circuits over 1000 volts required to comply with?
- Part I
  - Part II
  - Part III
  - Part IV

**(Revised) 110.31 (A) Electrical Vaults.** Where an electrical vault is required or specified for conductors and equipment 110.31(A)(1) to (A)(5) shall apply.

**(Revised) 110.31 (B) (1) In Places Accessible to Unqualified Persons.** Indoor electrical installations that are accessible to unqualified persons shall be made with metal-enclosed equipment. Switchgear, transformers, pull boxes, connection boxes, and other similar associated equipment shall be marked with appropriate caution signs. Openings in ventilated dry-type transformers or similar openings in other equipment shall be designed so that foreign objects inserted through these openings are deflected from energized parts.



**(Revised) 110.31 (D) Enclosed Equipment Accessible to Unqualified Persons.** Ventilating or similar openings in equipment shall be designed such that foreign objects inserted through these openings are deflected from energized parts. Where exposed to physical damage from vehicular traffic, suitable guards shall be provided. Equipment located outdoors and accessible to unqualified persons shall be designed such that exposed nuts or bolts cannot be readily removed, permitting access to live parts. Where equipment is accessible to unqualified persons and the bottom of the enclosure is less than 2.5 m (8 ft) above the floor or grade level, the enclosure door or hinged cover shall be kept locked. Doors and covers of enclosures used solely as pull boxes, splice

boxes, or junction boxes shall be locked, bolted, or screwed on. Underground box covers that weigh over 45.4 kg (100 lb) shall be considered as meeting this requirement.

**(Revised) 110.33 (A)(2) Guarding.** Where bare energized parts at any voltage or insulated energized parts above 1000 volts, nominal, are located adjacent to such entrance, they shall be suitably guarded.

**(Revised) 110.34(B) Separation from Low-Voltage Equipment.** Where switches, cutouts, or other equipment operating at 1000 volts, nominal, or less are installed in a vault, room, or enclosure where there are exposed live parts or exposed wiring operating at over 1000 volts, nominal, the high-voltage equipment shall be effectively separated from the space occupied by the low-voltage equipment by a suitable partition, fence, or screen.

**Exception:** Switches or other equipment operating at 1000 volts, nominal, or less and serving only equipment within the high-voltage vault, room, or enclosure shall be permitted to be installed in the high-voltage vault, room, or enclosure without a partition, fence, or screen if accessible to qualified persons only.

**(Revised) 110.34 (C) Locked Rooms or Enclosures.** The entrance to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 1000 volts, nominal, shall be kept locked unless such entrances are under the observation of a qualified person at all times.

**(Revised) 110.34 (D) Illumination.** Illumination shall be provided for all workspaces about electrical equipment. Control by automatic means only shall not be permitted. The lighting outlets shall be arranged so that persons changing lamps or making repairs on the lighting system are not endangered by live parts or other equipment.

**(NEW) 110.41 (A) Pre-energization and Operating Tests.** Where required elsewhere in this Code, the complete electrical system design, including settings for protective, switching, and control circuits, shall be prepared in advance and made available on request to the authority having jurisdiction and shall be tested when first installed on-site.



## PART 1 EXAM QUESTIONS

42. What is the minimum voltage where insulated energized parts located adjacent to enclosures and access to working space entrances are required to be suitably guarded?
- 240
  - 600
  - 1000
  - Any voltage where energized insulated parts are located adjacent to an entrance for electrical equipment
43. When can lighting above electrical equipment be controlled by automatic means only?
- There are no special requirements for illumination above electrical equipment
  - If accessible to qualified persons only
  - If an access control policy is established
  - At no time can lighting above electrical equipment be controlled by automatic means only
44. What type of equipment is required to be used for indoor electrical installations if accessible to unqualified persons?
- Lockable enclosures and equipment
  - Metal-enclosed equipment
  - Controlled access equipment
  - Remotely monitored equipment
45. What is required for doors and covers of enclosures used solely as pull boxes, splice boxes, or junction boxes installed outdoors and accessible to unqualified persons?
- Screwed on
  - Locked
  - Bolted on
  - All listed answers



46. At what voltage are exposed insulated conductors considered high voltage and required to be effectively separated from the space occupied by the low-voltage conductors in an enclosure?
- 240 volts to 480 volts
  - 1000 volts to 480 volts
  - 1000 volts or more
  - Any voltage over 50 volts is considered high voltage
47. When is a pre-energization test required to be performed?
- When the equipment is first installed on-site
  - After all service terminations have been completed
  - After the primary service transformer conductors have passed and under gone a high-pot test
  - After the service lateral conductors have been terminated
48. What circumstance would allow high voltage and low voltage conductors to share the same enclosure without being separated?
- Arc fault zone signage is installed
  - Accessible to qualified persons only
  - The main service disconnect is GFCI protected
  - Arc blast zones are established using the appropriate methods
49. How many provisions are electrical vaults required to comply with if specified for conductors and equipment?
- 3
  - 4
  - 6
  - 5

**(NEW) 110.41 (B) Test Report.** A test report covering the results of the tests required in 110.41(A) shall be available to the authority having jurisdiction prior to energization and made available to those authorized to install, operate, test, and maintain the system.

**(Revised) 110.73 Equipment Work Space.** Where electrical equipment with live parts that is likely to require examination, adjustment, servicing, or maintenance while energized is installed in a manhole, vault, or other enclosure designed for personnel access, the work space and associated requirements in 110.26 shall be met for installations operating at 1000 volts or less. Where the installation is over 1000 volts, the work space and associated requirements in 110.34 shall be met. A manhole access cover that weighs over 45.4 kg (100 lb) shall be considered as meeting the requirements of 110.34(C).

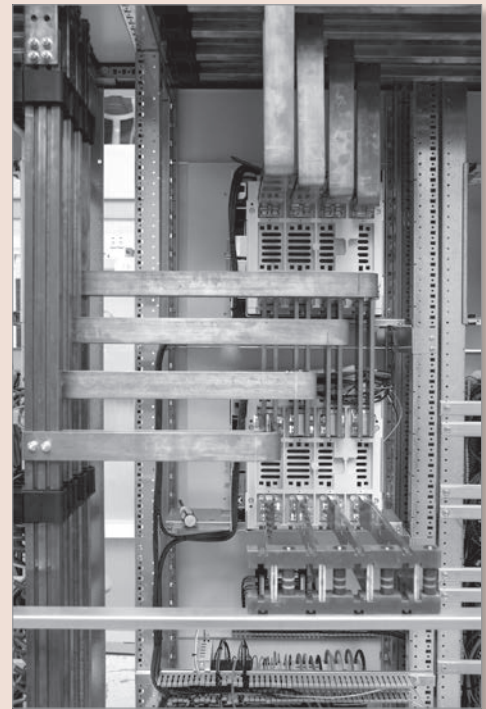
**(Revised) 110.74 (A) 1000 Volts, Nominal, or Less.** Wire bending space for conductors operating at 1000 volts or less shall be provided in accordance with the requirements of 314.28.

**(Revised) 110.74 (B) Over 1000 Volts, Nominal.** Conductors operating at over 1000 volts shall be provided with bending space in accordance with 314.71(A) and (B), as applicable.

**(Revised) 210.3 Other Articles for Specific-Purpose Branch Circuits.** Table 210.3 lists references for specific equipment and applications not located in Chapters 5, 6, and 7 that amend or supplement the requirements of this article.

**(Revised) 210.5 (C)(1)(b) Posting of Identification Means.** The method utilized for conductors originating within each branch-circuit panelboard or similar branch-circuit distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment. The label shall be of sufficient durability to withstand the environment involved and shall not be handwritten.

**(Revised) 210.4 (D) Grouping.** The ungrounded and grounded circuit conductors of each multiwire branch circuit shall be grouped in accordance with 200.4(B).





**(NEW) Exception:** In existing installations where a voltage system(s) already exists and a different voltage system is being added, it shall be permissible to mark only the new system voltage. Existing unidentified systems shall not be required to be identified at each termination, connection, and splice point in compliance with 210.5(C)(1)(a) and (b). Labeling shall be required at each voltage system distribution equipment to identify that only one voltage system has been marked for a new system(s). The new system label(s) shall include the words “other unidentified systems exist on the premises.”

**(Revised) 210.5 (C)(2) Branch Circuits Supplied from Direct-Current Systems.** Where a branch circuit is supplied from a dc system operating at more than 60 volts, each ungrounded conductor of 4 AWG or larger shall be identified by polarity at all termination, connection, and splice points by marking tape, tagging, or other approved means; each ungrounded conductor of 6 AWG or smaller shall be identified by polarity at all termination, connection, and splice points in compliance with 210.5(C)(2)(a) and (b). The identification methods utilized for conductors originating within each branch-circuit panelboard or similar branch-circuit distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment.



## PART 1 EXAM QUESTIONS

50. What section(s) of the 2017 code requires the ungrounded and grounded circuit conductors of each multiwire branch circuit to be grouped?
- 200.4(B)
  - 210.4 (D)
  - 210.3
  - 220.3
51. What work space requirement must be met for energized systems of 1000 volts or more in a vault where maintenance of the energized equipment is likely?
- 110.41
  - 110.26
  - 110.34
  - 110.34(B)
52. What requirement(s) must be met for DC branch circuits to be identified by polarity at all connection and termination points?
- The conductors must be 4 AWG or Larger
  - Must be over 60 volts DC
  - The conductors must be 6 AWG or smaller
  - All listed answers
53. What section should be consulted to determine the wire bending space for conductors operating at voltages of 1000 or less?
- 318.24
  - 314.71(A) and (B)
  - 110.74 (B)
  - 314.28
54. What table lists specific-purpose branch circuits not listed in Chapters 5, 6, and 7 that amend or supplement the requirements of Article 210?
- Table 215.3
  - Table 210.3
  - Table 310.16(A)(1)
  - Table 310.15(B)(2)
55. What section should be consulted to determine the wire bending space for conductors operating at voltages of 1000 or more?
- 110.74 (B)
  - 314.28
  - 314.71(A) and (B)
  - 318.24

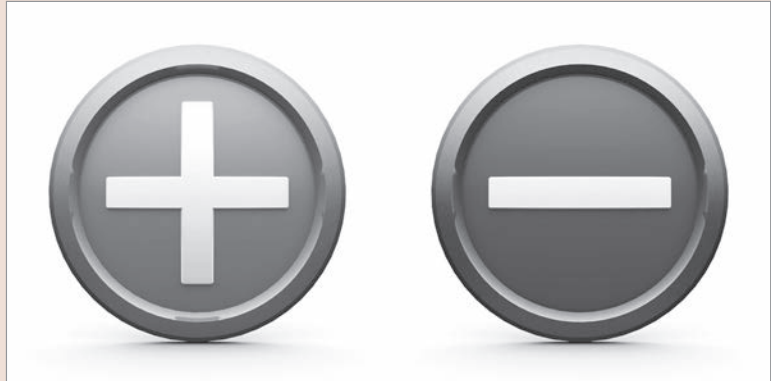
56. What section requires a test report to be made available to the AHJ, and individuals who install, operate, and maintain the system?

- A. 110.41 (A)
- B. 110.41 (B)
- C. 110.34 (D)
- D. 110.73

57. How are conductors originating within each branch-circuit panelboard or similar branch-circuit distribution equipment NOT allowed to be labeled?

- A. Printed shrink labels
- B. Phenolic labeling
- C. Handwritten label
- D. Printed label on double sided tape

**(NEW) 210.5 (C)(2)(a)(4)** An approved permanent marking means such as sleeving or shrink-tubing that is suitable for the conductor size, at all termination, connection, and splice points, with imprinted plus signs (+) or the word POSITIVE or POS durably marked on insulation of a color other than green, white, gray, or black.



**(NEW) 210.5 (C)(2)(b)(4)** An approved permanent marking means such as sleeving or shrink-tubing that is suitable for the conductor size, at all termination, connection, and splice points, with imprinted minus signs (-) or the word NEGATIVE or NEG durably marked on insulation of a color other than green, white, gray, or red.

**(Revised) 210.7 Multiple Branch Circuits.** Where two or more branch circuits supply devices or equipment on the same yoke or mounting strap, a means to simultaneously disconnect the ungrounded supply conductors shall be provided at the point at which the branch circuits originate.

**(Revised) 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 (E). 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. For the purposes of this section, when determining distance from receptacles the distance shall be measured as the shortest path the cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or passing through a door, doorway, or window.

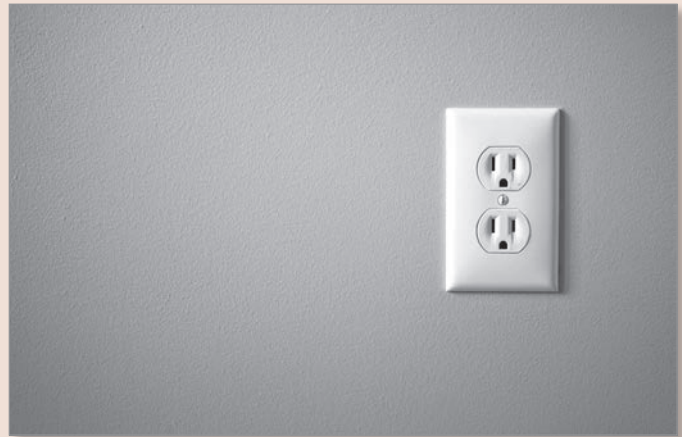
**(Revised) 210.8(B) Other Than Dwelling Units.** All single-phase receptacles rated 150 volts to ground or less, 50 amperes or less and three phase receptacles rated 150 volts to ground or less, 100 amperes or less installed in the following locations shall have ground-fault circuit-interrupter protection for personnel.

**(NEW) 210.8(E) Crawl Space Lighting Outlets.** GFCI protection shall be provided for lighting outlets not exceeding 120 volts installed in crawl spaces.

**(Revised) 210.11 Branch Circuits Required (C)(3) Bathroom Branch Circuits.** In addition to the number of branch circuits required by other parts of this section, at least one 120-volt, 20-ampere branch circuit shall be provided to supply the bathroom(s) receptacle outlet(s). Such circuits shall have no other outlets.

**(Revised) 210.12 (B) Dormitory Units.** All 120-volt, single-phase, 15- and 20- ampere branch circuits supplying outlets and devices installed in dormitory unit bedrooms, living rooms, hallways, closets, bathrooms, and similar rooms shall be protected by any of the means described in 210.12(A)(1) through (6).

**(New) 210.12 (C) Guest Rooms and Guest Suites.** 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 shall be protected by any of the means described in 210.12(A)(1) through (6).



## PART 1 EXAM QUESTIONS

58. What is the maximum voltage of a branch circuit located in a hotel guest room room that can be protected by any of the means described in 210.12(A)(1) through (6)?
- 220 Volts
  - 115 Volts
  - 120 Volts
  - 240 Volts
59. How many 20-amp branch circuits are required to supply the receptacle outlets for a bathroom?
- There are no special requirements for amperage to feed the branch circuit for bathrooms
  - Two 20-amp
  - Only one 15-amp circuit is required
  - One 20-amp
60. How is a 120-volt light located in a crawl space required to be protected?
- AFCI protection
  - GFCI protection
  - Wire basket around the bulb
  - There are no special requirements for lighting installed in crawl spaces
61. What color(s) cannot be used to mark polarity of the negative conductor on the sleeving or shrink tube used for DC systems?
- Blue
  - Yellow
  - Orange
  - Red
62. What is the maximum amperage of a branch circuit located in a dormitory living room that can be protected by any of the means described in 210.12(A)(1) through (6)?
- 15 Amps
  - 20 Amps
  - 25 Amps
  - 30 Amps
63. What section of the 2017 code would you look to determine the ground-fault circuit interrupter protection for personnel on feeders?
- 215.9
  - 422.5(A)
  - 210.7
  - 210.5 (C)(2)(b)(4)
64. What conductor(s) must be simultaneously disconnected where two or more branch circuits supply devices or equipment on the same yoke or mounting strap?
- Equipment Grounding Conductor(s)
  - Grounded Conductor(s)
  - Grounding Conductor(s)
  - Ungrounded Supply Conductor(s)
65. How is a three phase 60-amp receptacle located in an unfinished basement required to be protected?
- Solder pot over loads
  - AFCI protection
  - GFCI protection
  - Bi metal over load protection

**(NEW) 210.18 Rating.** Branch circuits recognized by this article shall be rated in accordance with the maximum permitted ampere rating or setting of the overcurrent device. The rating for other than individual branch circuits shall be 15, 20, 30, 40, and 50 amperes. Where conductors of higher ampacity are used for any reason, the ampere rating or setting of the specified overcurrent device shall determine the circuit rating.

**(Revised) 210.52(A)(2) Wall Space.** As used in this section, a wall space shall include the following:

- (1) Any space 600 mm (2 ft) or more in width (including space measured around corners) and unbroken along the floor line by doorways and similar openings, fireplaces, and fixed cabinets that do not have countertops or similar work surfaces
- (2) The space occupied by fixed panels in walls, excluding sliding panels
- (3) The space afforded by fixed room dividers, such as freestanding bar-type counters or railings.

**(Revised) 210.52(C) (3) Peninsular Countertop Spaces.**

At least one receptacle outlet shall be installed at each peninsular countertop long dimension space with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater. A peninsular countertop is measured from the connected perpendicular wall.



**(Revised) 210.52(C)(5) Receptacle Outlet Location.** Receptacle outlets shall be located on or above, but not more than 500 mm (20 in.) above, the countertop or work surface. Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces. 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 dedicated space shall not be considered as these required outlets.

**(Revised) 210.52 (D) Bathrooms.** At least one receptacle outlet shall be installed in bathrooms within 900 mm (3 ft) of the outside edge of each basin. The receptacle outlet shall be located on a wall or partition that is adjacent to the basin or basin countertop, located on the countertop, or installed on the side or face of the basin cabinet. In no case shall the receptacle be located more than 300 mm (12 in.) below the top of the basin or basin countertop. Receptacle outlet assemblies listed for use in countertops shall be permitted to be installed in the countertop.

**Informational Note:** See 406.5(E) and 406.5(G) for requirements for installation of receptacles in countertops.

**(Revised) 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.

**(Revised) 210.64 Electrical Service Areas.** At least one 125-volt, singlephase, 15- or 20-ampere-rated receptacle outlet shall be installed in an accessible location within 7.5 m (25 ft) of the indoor electrical service equipment. The required receptacle outlet shall be located within the same room or area as the service equipment.

**(Revised) 210.70(A) (1) Habitable Rooms.** At least one wall switch-controlled lighting outlet shall be installed in every habitable room, kitchen, and bathroom.





**(Revised) 210.70 (C) All Occupancies.** For attics and underfloor spaces, utility rooms, and basements, at least one lighting outlet containing a switch or controlled by a wall switch shall be installed where these spaces are used for storage or contain equipment requiring servicing. At least one point of control shall be at the usual point of entry to these spaces. The lighting outlet shall be provided at or near the equipment requiring servicing.

## PART 1 EXAM QUESTIONS

66. What is the maximum distance from indoor electrical service equipment in other than one or two family dwellings that a service receptacle is required to be installed?
- Within 25ft
  - Within 7ft 6 in
  - Within line of sight
  - As close as practical to the service equipment
67. What is the maximum height a receptacle can be located above a work surface or countertop?
- 24 Inches
  - 18 Inches
  - 20 Inches
  - 30 Inches
68. Where are switch controlled lighting circuits required for a dwelling unit?
- Habitable rooms
  - Kitchens
  - Bathrooms
  - All listed answers
69. How do you determine the measurement of a peninsular countertop space?
- Measure from the adjacent wall
  - Measure from the perpendicular wall
  - Measure from the unbroken wall
  - Measure from the outside edges of the peninsular countertop
70. What is the maximum distance from the outside edge of a basin that a receptacle can be installed in a bathroom?
- 12 Inches
  - 18 Inches
  - 2ft
  - 3ft
71. How many wall switched lights are required for under floor spaces used for storage?
- 1
  - 2
  - Under floor storage spaces do not require a wall switched light
  - No listed answers
72. What is the minimum width for an area to be considered wall space?
- 6ft
  - 3ft
  - 2ft
  - 18 inches
73. What is the maximum distance a receptacle can be placed below the top of a basin or basin countertop in a bathroom?
- 12 Inches
  - 18 Inches
  - 2ft
  - 3ft
74. How are Branch circuits recognized by article 210 rated?
- In accordance with the minimum permitted voltage rating or setting of the overcurrent device
  - In accordance with the minimum permitted ampere rating or setting of the overcurrent device
  - In accordance with the maximum permitted voltage rating or setting of the overcurrent device
  - In accordance with the maximum permitted ampere rating or setting of the overcurrent device



**(Revised) 215.1 Scope.** This article covers the installation requirements, overcurrent protection requirements, minimum size, and ampacity of conductors for feeders.

**(NEW) 215.2(A)(1) Exception No. 1:** If the assembly, including the overcurrent devices protecting the feeder(s), is listed for operation at 100 percent of its rating, the allowable ampacity of the feeder conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load.



**(NEW) 215.2(A)(1) Exception No. 2:** Where a portion of a feeder is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), it shall be permitted to have an allowable ampacity not less than the sum of the continuous load plus the noncontinuous load. No portion of a feeder installed under the provisions of this exception shall extend into an enclosure containing either the feeder supply or the feeder load terminations, as covered in 110.14(C)(1).

**(NEW) 215.2(A)(1) Exception No. 3:** Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100 percent of the continuous and noncontinuous load.

**(Revised) 215.3 Overcurrent Protection.** Exception No. 2: Overcurrent protection for feeders between 600 and 1000 volts shall comply with Parts I through VIII of Article 240. Feeders over 1000 volts, nominal, shall comply with Part IX of Article 240.

**(Revised) 215.12 (A) Grounded Conductor.** The grounded conductor of a feeder, if insulated, shall be identified in accordance with 200.6.

**(Revised) 220.1 Scope.** This article provides requirements for calculating branch-circuit, feeder, and service loads. Part I provides general requirements for calculation methods. Part II provides calculation methods for branch-circuit loads. Parts III and IV provide calculation methods for feeder and service loads. Part V provides calculation methods for farm loads.

**(Revised) 220.3 Other Articles for Specific-Purpose Calculations.** Table 220.3 shall provide references for specific-purpose calculation requirements not located in Chapters 5, 6, or 7 that amend or supplement the requirements of this article.

**(Revised) 225.1 Informational Note:** For additional information on wiring over 1000 volts, see ANSI/IEEE C2-2012, National Electrical Safety Code.

**(Revised) 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 rubber-covered or thermoplastic type.

**(Revised) 225.7 (D) 1000 Volts Between Conductors.** Circuits exceeding 277 volts, nominal, to ground and not exceeding 1000 volts, nominal, between conductors shall be permitted to supply the auxiliary equipment of electric-discharge lamps in accordance with 210.6(D)(1).

**(Revised) 225.12 Open-Conductor Supports.**

Open conductors shall be supported on knobs, racks, brackets, or strain insulators, that are made of glass, porcelain, or other approved materials.

**(Revised) 225.17 (A) Strength.** The mast shall have adequate strength or be supported by braces or guys to safely withstand the strain imposed by the overhead feeder or branch-circuit conductors. Hubs intended for use with a conduit serving as a mast for support of feeder or branch-circuit conductors shall be identified for use with a mast.



## PART 1 EXAM QUESTIONS

75. **How is the hub intended for use with a conduit serving as a mast for support of feeder or branch-circuit conductors required to be identified?**
- For use with a mast
  - With an imprinted weight maximum
  - For use outdoors
  - All listed answers
76. **Grounded conductors that are not connected to an overcurrent device are permitted to be sized at what percent of the continuous and noncontinuous load?**
- 100%
  - 125%
  - 135%
  - 150%
77. **What is the maximum voltage between conductors that can supply the auxiliary equipment of electric-discharge lamps in accordance with 210.6(D)(1)?**
- 480
  - 277
  - 1000
  - 600
78. **What section(s) are you required to comply with when identifying insulated grounded feeder conductor(s)?**
- 210.70
  - 240
  - 215.3
  - 200.6
79. **What part of Article 220 provides calculation methods for farm loads?**
- IV
  - V
  - VI
  - III
80. **What does Article 215 cover?**
- Conductor over current protection
  - Conductor correction factors
  - Conductor ambient air correction values
  - Feeders
81. **What ANSI should be referenced for additional information on wiring over 1000 volts?**
- ANSI/IEEE C2-2013
  - ANSI/IEEE C2-2012
  - ANSI/IEEE C3-2012
  - ANSI/IEEE C4-2014
82. **What is a common material used to make open conductor supports?**
- Porcelain
  - Aluminum
  - Copper
  - Lead
83. **The overcurrent protection for feeders between 600 and 1000 volts is required comply with what Parts of Article 240?**
- I through VII
  - I
  - I through VIII
  - I through IV

**(Revised) 225.18 Clearance for Overhead Conductors and Cables.** Overhead spans of open conductors and open multiconductor cables of not over 1000 volts, nominal, shall have a clearance of not less than the following:

(1) 3.0 m (10 ft) — above finished grade, sidewalks, or from any platform or projection that will permit personal contact where the voltage does not exceed 150 volts to ground and accessible to pedestrians only

(2) 3.7 m (12 ft) — over residential property and driveways, and those commercial areas not subject to truck traffic where the voltage does not exceed 300 volts to ground

(3) 4.5 m (15 ft) — for those areas listed in the 3.7 m (12 ft) classification where the voltage exceeds 300 volts to ground

(4) 5.5 m (18 ft) — over public streets, alleys, roads, parking areas subject to truck traffic, driveways on other than residential property, and other land traversed by vehicles, such as cultivated, grazing, forest, and orchard

(5) 7.5 m (24 1/2 ft) — over track rails of railroads



**(Revised) 225.19 (A) Above Roofs.** Overhead spans of open conductors and open multiconductor cables shall have a vertical clearance of not less than 2.7 m (8 ft 6 in.) above the roof surface. The vertical clearance above the roof level shall be maintained for a distance not less than 900 mm (3 ft) in all directions from the edge of the roof.

**(Revised) 225.19(B)(2) Vertical Clearance.** The vertical clearance of final spans above or within 900 mm (3 ft) measured horizontally of platforms, projections, or surfaces that will permit personal contact shall be maintained in accordance with 225.18.

**(Revised) 225.20 Protection Against Physical Damage.** Conductors installed on buildings, structures, or poles shall be protected against physical damage as provided for services in 230.50.

**(Revised) 225.27 Raceway Seal.** Where a raceway enters a building or structure from outside, it shall be sealed. Spare or unused raceways shall also be sealed. Sealants shall be identified for use with cable insulation, conductor insulation, bare conductor, shield, or other components.

**(Revised) 230.7 Other Conductors in Raceway or Cable.** Conductors other than service conductors shall not be installed in the same service raceway or service cable in which the service conductors are installed.

**(Revised) 230.10 Vegetation as Support.** Vegetation such as trees shall not be used for support of overhead service conductors or service equipment.

**(Revised) 230.29 Supports over Buildings.** Service conductors passing over a roof shall be securely supported by substantial structures. For a grounded system, where the substantial structure is metal, it shall be bonded by means of a bonding jumper and listed connector to the grounded overhead service conductor. Where practicable, such supports shall be independent of the building.

**(Revised) 230.42 (A) General.** Service-entrance conductors shall have an ampacity of not less than the maximum load to be served. Conductors shall be sized to carry not less than the largest of 230.42(A)(1) or (A)(2). Loads shall be determined in accordance with Part III, IV, or V of Article 220, as applicable.



Ampacity shall be determined from 310.15. The maximum allowable current of busways shall be that value for which the busway has been listed or labeled.

**(Revised) 230.42 (A)(1)** Where the service-entrance conductors supply continuous loads or any combination of noncontinuous and continuous loads, the minimum service-entrance conductor size shall have an allowable ampacity not less than the sum of the noncontinuous loads plus 125 percent of continuous loads.

## PART 1 EXAM QUESTIONS

- 84. How are service conductors passing over a roof required to be supported?**
- With a messenger wire
  - Independently
  - When possible
  - By substantial structures
- 85. What is required of a raceway that enters a building from the outside?**
- Install an expansion joint
  - Seal it
  - Install a Class 1 Division 1 seal off within 10ft
  - Install a form 7 C conduit at the transition
- 86. What is the minimum vertical distance above a roof that an overhead open multi conductor cable is required to be installed?**
- 12ft
  - 8ft 6in
  - 9ft 6in
  - 10ft
- 87. What cannot be installed in the same raceway as service conductors?**
- Yellow 77 pulling soap
  - Sealing Compound
  - Fire Alarm branch circuit
  - Strain relief bushing
- 88. What is the minimum height above a railroad track that an open multi conductor overhead cable can be installed?**
- 10ft
  - 12ft
  - 15ft
  - 24ft 6in
- 89. In general, how much current are service-entrance conductors required to be capable of handling?**
- 125% of the continuous load
  - Not less than the maximum load to be served
  - 135% of the continuous load
  - 80% of the maximum load
- 90. What section of the 2017 code is required to be referenced for protecting outside branch circuit open conductors from physical damage when installed on a building?**
- 230.40
  - 225.19
  - 230.50
  - 225.18
- 91. If service entrance conductors supply noncontinuous and continuous loads, how is the minimum service-entrance allowable ampacity required to be calculated?**
- Add the noncontinuous loads then multiply by 125%
  - Add the sum of the noncontinuous and continuous loads then multiply by 125%
  - Add the continuous loads then multiply by 125%
  - Add the sum of the noncontinuous loads plus 125 percent of continuous loads
- 92. What is the minimum height above a sidewalk that an open multi conductor overhead cable can be installed?**
- 10ft
  - 12ft
  - 15ft
  - 24ft 6in

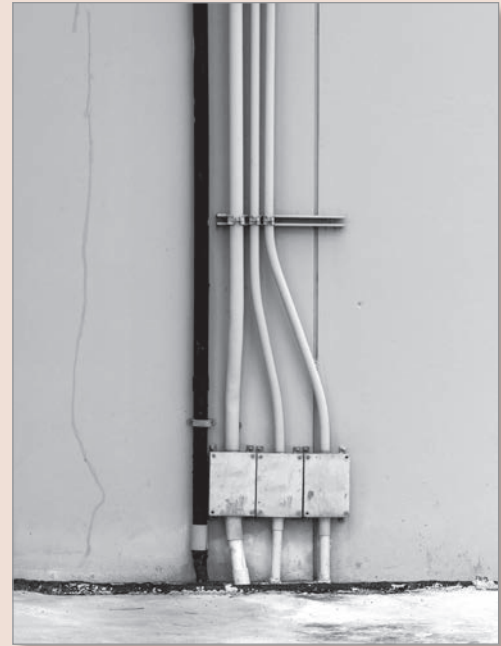


**(Revised) 230.53 Raceways to Drain.** Where exposed to the weather, raceways enclosing service-entrance conductors shall be listed or approved for use in wet locations and arranged to drain. Where embedded in masonry, raceways shall be arranged to drain.

**(Revised) 230.54 (C) Service Heads and Goosenecks Above Service-Drop or Overhead Service Attachment.** Service heads on raceways or service-entrance cables and goosenecks in service-entrance cables shall be located above the point of attachment of the service-drop or overhead service conductors to the building or other structure.

**(Revised) 230.66 Marking.** 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 labeled. Individual meter socket enclosures shall not be considered service equipment but shall be listed and rated for the voltage and ampacity of the service.

**Exception:** Meter sockets supplied by and under the exclusive control of an electric utility shall not be required to be listed.



**(Revised) 230.91 Location.** The service overcurrent device shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto. Where fuses are used as the service overcurrent device, the disconnecting means shall be located ahead of the supply side of the fuses.

**(Revised) 230.95 (C) Performance Testing.** The ground-fault protection system shall be performance tested when first installed on site. This testing shall be conducted by a qualified person(s) using a test process of primary current injection, in accordance with instructions that shall be provided with the equipment. A written record of this testing shall be made and shall be available to the authority having jurisdiction.

**(Revised) 240.6 (A) Fuses and Fixed-Trip Circuit Breakers.** The standard ampere ratings for fuses and inverse time circuit breakers shall be considered as shown in Table 240.6(A). Additional standard ampere ratings for fuses shall be 1, 3, 6, 10, and 601. The use of fuses and inverse time circuit breakers with non-standard ampere ratings shall be permitted.

**(NEW) 240.67 Arc Energy Reduction.** Where fuses rated 1200 A or higher are installed, 240.67(A) and (B) shall apply. This requirement shall become effective January 1, 2020.

**(NEW) 240.87 (B) Informational Note No. 3:** An instantaneous trip is a function that causes a circuit breaker to trip with no intentional delay when currents exceed the instantaneous trip setting or current level. If arcing currents are above the instantaneous trip level, the circuit breaker will trip in the minimum possible time.

**(NEW) 240.87 (B) Informational Note No. 4:** IEEE 1584–2002, IEEE Guide for Performing Arc Flash Hazard Calculations, is one of the available methods that provide guidance in determining arcing current.

**(NEW) 250.4(A)(1) Informational Note No. 2:** See NFPA 780-2014, Standard for the Installation of Lightning Protection Systems, for information on installation of grounding and bonding for lightning protection systems.



## PART 1 EXAM QUESTIONS

93. When is a ground-fault protection system performance test required to be performed?
- When first installed on site
  - When all terminations are complete
  - After the primary service transformer conductors have passed the High-pot test
  - After the current transformers have been installed
94. If arcing currents are above the instantaneous trip level, how fast will the circuit breaker trip?
- In 2 milli seconds
  - In the maximum possible time
  - In the minimum possible time
  - In 1 quarter cycle
95. Service equipment rated at 1000 volts or less required to be marked as being suitable for use as what?
- Suitable for use indoors
  - Suitable for use as service equipment
  - Suitable for use outdoors
  - Suitable for use in automatic controlled areas
96. Where are goosenecks in service-entrance cables required to be located?
- Perpendicular to the point of attachment of the service-drop
  - Below the point of attachment of the service-drop
  - Above the point of attachment of the service-drop
  - There are no special requirements for goosenecks in service-entrance cables
97. Where is the disconnecting means required to be located where fuses are used as the service overcurrent device?
- Located downstream of the supply side of the fuses
  - Located ahead of the supply side of the fuses
  - Inside the first service enclosure
  - Adjacent to the service transformer service laterals
98. What new table shows the standard ampere ratings for inverse time circuit breakers?
- 230.53
  - 240.6
  - 240.5(B)(2)
  - 240.6(A)
99. What listed publication is referenced for information on the installation of grounding and bonding for lightning protection systems?
- IEEE 1584–2002
  - NFPA 780-2014
  - IEEE 1548–2017
  - ANSI/IEEE C3-2012
100. Raceways that contain service entrance conductors installed outdoors are required to be listed for what type of location(s)?
- Class I division II
  - Weather proof
  - Weather resistant
  - Wet

**(Revised) 250.24(C)(2) Parallel Conductors in Two or More Raceways or Cables.** If the ungrounded service-entrance conductors are installed in parallel in two or more raceways or cables, the grounded conductor shall also be installed in parallel. The size of the grounded conductor in each raceway or cable shall be based on the total circular mil area of the parallel ungrounded conductors in the raceway or cable, as indicated in 250.24(C)(1), but not smaller than 1/0 AWG.

**(Revised) 250.30(A)(4)** The building or structure grounding electrode system shall be used as the grounding electrode for the separately derived system. If located outdoors, the grounding electrode shall be in accordance with 250.30(C).

**Exception:** If a separately derived system originates in equipment that is listed and identified as suitable for use as service equipment, the grounding electrode used for the service or feeder equipment shall be permitted to be used as the grounding electrode for the separately derived system.

**(Revised) 250.30(A)(6)(C) Connections.** All tap connections to the common grounding electrode conductor shall be made at an accessible location by one of the following methods:

(1) A connector listed as grounding and bonding equipment.

(2) Listed connections to aluminum or copper busbars not smaller than 6 mm thick × 50 mm wide (1/4 in. thick × 2 in. wide) and of sufficient length to accommodate the number of terminations necessary for the installation. If aluminum busbars are used, the installation shall also comply with 250.64(A).

(3) The exothermic welding process.

**(New) 250.52 (A)(2) Metal In-ground Support Structure(s).** One or more metal in-ground support structure(s) in direct contact with the earth vertically for 3.0 m (10 ft) or more, with or without concrete encasement. If multiple metal in-ground support structures are present at a building or a structure, it shall be permissible to bond only one into the grounding electrode system.

**Informational note:** Metal in-ground support structures include, but are not limited to pilings, casings, and other structural metal.

**(Revised) 250.52 (A)(7) Plate Electrodes.** Each plate electrode shall expose not less than 0.186 m<sup>2</sup> (2 ft<sup>2</sup>) of surface to exterior soil. Electrodes of bare or electrically conductive coated iron or steel plates shall be at least 6.4 mm (1/4 in.) in thickness. Solid, uncoated electrodes of nonferrous metal shall be at least 1.5 mm (0.06 in.) in thickness.

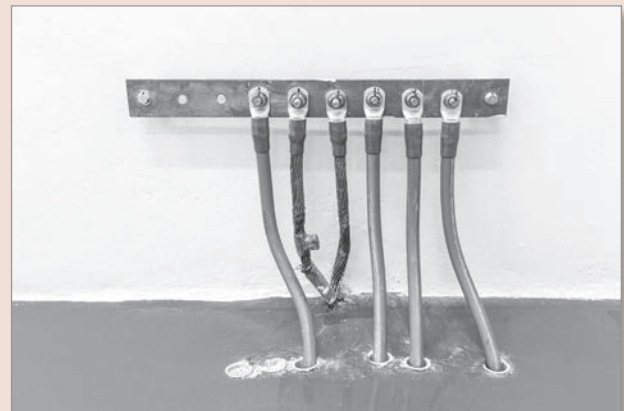
**(Revised) 250.53(F) Ground Ring.** The ground ring shall be installed not less than 750 mm (30 in.) below the surface of the earth.

**(Revised) 250.64 (B)(1) Not Exposed to Physical Damage.** A 6 AWG or larger copper or aluminum grounding electrode conductor not exposed to physical damage shall be permitted to be run along the surface of the building construction without metal covering or protection.

**(Revised) 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), rigid polyvinyl chloride conduit (PVC), reinforced thermosetting resin conduit Type XW (RTRC-XW), electrical metallic tubing (EMT), or cable armor.

**(Revised) 250.64 (B)(3) Smaller Than 6 AWG.** Grounding electrode conductors smaller than 6 AWG shall be protected in RMC, IMC, PVC, RTRC-XW, EMT, or cable armor.

**(Revised) 250.64 (B)(4) In Contact with the Earth.** Grounding electrode conductors and grounding electrode bonding jumpers in contact with the earth shall not be required to comply with 300.5, but shall be buried or otherwise protected if subject to physical damage.



## PART 1 EXAM QUESTIONS

101. What is the minimum size a grounding electrode conductor not exposed to physical damage can be run along the surface of a building without metal covering or protection?
- 1/0
  - 4 AWG
  - 2 AWG
  - 6 AWG
102. If using an aluminum busbar for the tap connections to a common grounding electrode conductor, what section is required to be referenced for this installation?
- 250.30(A)(4)
  - 250.24(C)(2)
  - 250.64(A)
  - 240.67
103. What is the minimum size grounding electrode conductor that must be protected from physical damage by RMC, IMC, PVC, RTRC-XW, EMT, or cable armor?
- 8
  - 6
  - 4
  - Either A or B
104. What is the minimum depth that a ground ring is required to be installed below finish grade?
- 36 in
  - 18 in
  - 24 in
  - 30 in
105. In general, if a new transformer is being added to an existing system, how do you establish the grounding electrode for the new transformer?
- Use one ground rod installed within 6ft of the new transformer
  - Tie into the building's existing grounding electrode system
  - Install a ground grid with a minimum of 4 contact points
  - Use two ground rods installed within 6ft of the new transformer
106. What is the minimum thickness required for a plate electrode?
- 1/2 in
  - 1/4 in
  - 3/4 in
  - 1/8 in

**(Revised) 250.66 (A) Connections to a Rod, Pipe, or Plate Electrode(s).** If the grounding electrode conductor or bonding jumper connected to a single or multiple rod, pipe, or plate electrode(s), or any combination thereof, as described in 250.52(A)(5) or (A)(7), does not extend on to other types of electrodes that require a larger size conductor, the grounding electrode conductor shall not be required to be larger than 6 AWG copper wire or 4 AWG aluminum wire.

**(Revised) 250.66 (B) Connections to Concrete-Encased Electrodes.** If the grounding electrode conductor or bonding jumper connected to a single or multiple concrete-encased electrode(s), as described in 250.52(A)(3), does not extend on to other types of electrodes that require a larger size of conductor, the grounding electrode conductor shall not be required to be larger than 4 AWG copper wire.

**(Revised) 250.66 (C) Connections to Ground Rings.** If the grounding electrode conductor or bonding jumper connected to a ground ring, as described in 250.52(A)(4), does not extend on to other types of electrodes that require a larger size of conductor, the grounding electrode conductor shall not be required to be larger than the conductor used for the ground ring.



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

**(Revised) (1)** Interior metal water piping that is electrically continuous with a metal underground water pipe electrode and is located not more than 1.52 m (5 ft) from the point of entrance to the building shall be permitted to extend the connection to an electrode(s). Interior metal water piping located more than 1.52 m (5 ft) from the point of entrance to the building shall not be used as a conductor to interconnect electrodes of the grounding electrode system.

**(Revised) (2)** The metal structural frame of a building shall be permitted to be used as a conductor to interconnect electrodes that are part of the grounding electrode system, or as a grounding electrode conductor. Hold-down bolts securing the structural steel column that are connected to a concrete-encased electrode that complies with 250.52(A)(3) and is located in the support footing or foundation shall be permitted to connect the metal structural frame of a building or structure to the concrete encased grounding electrode. The hold-down bolts shall be connected to the concrete-encased electrode by welding, exothermic welding, the usual steel tie wires, or other approved means.

**(Revised) (3)** A rebar-type concrete-encased electrode installed in accordance with 250.52(A)(3) with an additional rebar section extended from its location within the concrete to an accessible location that is not subject to corrosion shall be permitted for connection of grounding electrode conductors and bonding jumpers. The rebar extension shall not be exposed to contact with the earth without corrosion protection.

**(Revised) 250.94 Bonding for Communication Systems.** Communications system bonding terminations shall be connected in accordance with (A) or (B).

**(New) 250.94 (B) Other Means.** Connections to an aluminum or copper busbar not less than 6 mm thick  $\times$  50 mm wide (1/4 in. thick  $\times$  2 in. wide) and of sufficient length to accommodate at least three terminations for communication systems in addition to other connections. The busbar shall be securely fastened and shall be installed in an accessible location. Connections shall be made by a listed connector. If aluminum busbars are used, the installation shall also comply with 250.64(A).

**(Revised) 250.102 Grounded Conductor, Bonding Conductors, and Jumpers.** (A) Material. Bonding jumpers shall be of copper, aluminum, copper-clad aluminum, or other corrosion-resistant material. A bonding jumper shall be a wire, bus, screw, or similar suitable conductor.

**(Moved) 250.102 (C)(2) Informational Note No. 2:** See Chapter 9, Table 8, for the circular mil area of conductors 18 AWG through 4/0 AWG.



## PART 1 EXAM QUESTIONS

107. What table shows the circular mil area for conductors 18 AWG through 4/0 AWG?

- A. Table 8
- B. Table 250.102(C)(1)
- C. Table 5
- D. 250.122

108. How are the hold-down bolts securing a structural steel column required to be connected to a concrete-encased electrode?

- A. Steel tie wires
- B. Exothermic welding
- C. Welding
- D. All listed answers



- 109. If using a conductor for a concrete encased electrode, what type of conductor does it have to be?**
- Zinc alloy
  - Aluminum
  - Copper
  - All listed answers
- 110. Where are communications system bonding terminations required to be installed if using a busbar?**
- At each server rack for testing and maintenance
  - In the communications room
  - In the main electrical service room next to the service concrete encased electrode
  - In an accessible location
- 111. How many sections are listed with regards to terminating communications system bonding conductors?**
- 1
  - 2
  - 6
  - 7
- 112. If a bonding jumper connected to a plate electrode does not extend on to other types of electrodes that require a larger size conductor, what is the maximum size aluminum grounding electrode conductor required to be run?**
- 2 AWG
  - 6 AWG
  - 4 AWG
  - 1/0
- 113. What type of material can a bonding jumper be made of?**
- Copper
  - Aluminum
  - Copper-clad aluminum
  - All listed answers
- 114. What is the maximum distance to make the connection to an interior metal water pipe that enters a building so it can be used to extend the connection to an electrode?**
- 4ft
  - 5ft
  - 6ft
  - 3ft

**(Revised) 250.104 Bonding of Piping Systems and Exposed Structural Metal.** (A) Metal Water Piping. The metal water piping system shall be bonded as required in (A)(1), (A)(2), or (A)(3) of this section.

(1) General. Metal water piping system(s) installed in or attached to a building or structure shall be bonded to any of the following:

- Service equipment enclosure
- Grounded conductor at the service
- Grounding electrode conductor if of sufficient size
- One or more grounding electrodes used, if the grounding electrode conductor or bonding jumper to the grounding electrode is of sufficient size. The bonding jumper(s) shall be installed in accordance with 250.64(A), 250.64(B), and 250.64(E). The points of attachment of the bonding jumper(s) shall be accessible. The bonding jumper(s) shall be sized in accordance with Table 250.102(C)(1) except as permitted in 250.104(A)(2) and 250.104(A)(3).

**(Revised) 250.104 (A)(3) Multiple Buildings or Structures Supplied by a Feeder(s) or Branch Circuit(s).** The metal water piping system(s) installed in or attached to a building or structure shall be bonded to any of the following:

- Building or structure disconnecting means enclosure where located at the building or structure
- Equipment grounding conductor run with the supply conductors





(3) One or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with Table 250.102(C)(1), based on the size of the feeder or branch circuit conductors that supply the building or structure. The bonding jumper shall not be required to be larger than the largest ungrounded feeder or branch-circuit conductor supplying the building or structure.

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

- (1) Equipment grounding conductor for the circuit that is likely to energize the piping system
- (2) Service equipment enclosure
- (3) Grounded conductor at the service
- (4) Grounding electrode conductor, if of sufficient size
- (5) One or more grounding electrodes used, if the grounding electrode conductor or bonding jumper to the grounding electrode is of sufficient size. The bonding conductor(s) or jumper(s) shall be sized in accordance with Table 250.122, and equipment grounding conductors shall be sized in accordance with Table 250.122 using the rating of the circuit that is likely to energize the piping system(s). The points of attachment of the bonding jumper(s) shall be accessible.

**(Revised) 250.104 (C) Structural Metal.** Exposed structural metal that is interconnected to form a metal building frame and is not intentionally grounded or bonded and is likely to become energized shall be bonded to any of the following:

- (1) Service equipment enclosure
- (2) Grounded conductor at the service
- (3) Disconnecting means for buildings or structures supplied by a feeder or branch circuit
- (4) Grounding electrode conductor, if of sufficient size
- (5) One or more grounding electrodes used, if the grounding electrode conductor or bonding jumper to the grounding electrode is of sufficient size. The bonding conductor(s) or jumper(s) shall be sized in accordance with Table 250.102(C)(1) and installed in accordance with 250.64(A), 250.64(B), and 250.64(E). The points of attachment of the bonding jumper(s) shall be accessible unless installed in compliance with 250.68(A) Exception No. 2.

**(Revised) (D)(2) Structural Metal.** If exposed structural metal that is interconnected to form the building frame exists in the area served by the separately derived system, it shall be bonded to the grounded conductor of 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.

**250.119 (C) Flexible Cord.** Equipment grounding conductors in flexible cords shall be insulated and shall have a continuous outer finish that is either green or green with one or more yellow stripes.

## PART 1 EXAM QUESTIONS

**115. What is the bonding jumper connection that is connected to exposed structural metal that is interconnected to form a metal building required to be?**

- A. Accessible
- B. Readily accessible
- C. Secured
- D. Exothermic welded

**116. What is the equipment grounding conductor installed in a flexible cord required to be?**

- A. 12 AWG minimum
- B. Compact copper
- C. Insulated
- D. All listed answers

**117. What table should be used to size the bonding jumpers for metal gas piping systems?**

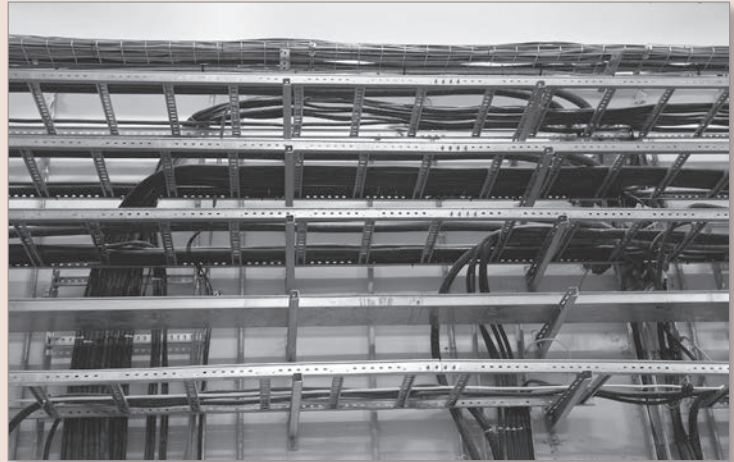
- A. 250.64(A)
- B. 250.102(C)(1)
- C. 250.104(A)(2)
- D. 250.122

**118. Where do you make the connection inside a transformer for the conductor that bonds the exposed structural metal that is interconnected to form a building frame?**

- A. At the equipment grounding conductor connection
- B. At the grounding electrode conductor connection
- C. On the transformer case
- D. To all corners where the isolation pads are being installed

**(NEW)250.122 (F)(1) Conductor Installations in Raceways, Auxiliary Gutters, or Cable Trays.**

(a) Single Raceway or Cable Tray. If conductors are installed in parallel in the same raceway or cable tray, a single wiretype conductor shall be permitted as the equipment grounding conductor. The wire-type equipment grounding conductor shall be sized in accordance with 250.122, based on the overcurrent protective device for the feeder or branch circuit. Wiretype equipment grounding conductors installed in cable trays shall meet the minimum requirements of 392.10(B)(1)(c). Metal raceways or auxiliary gutters in accordance with 250.118 or cable trays complying with 392.60(B) shall be permitted as the equipment grounding conductor.



(b) Multiple Raceways. If conductors are installed in parallel in multiple raceways, wire-type equipment grounding conductors, where used, shall be installed in parallel in each raceway. The equipment grounding conductor installed in each raceway shall be sized in compliance with 250.122 based on the overcurrent protective device for the feeder or branch circuit. Metal raceways or auxiliary gutters in accordance with 250.118 or cable trays complying with 392.60(B) shall be permitted as the equipment grounding conductor.

**(NEW)250.122 (F)(2) Multiconductor Cables.**

(a) If multiconductor cables are installed in parallel, the equipment grounding conductor(s) in each cable shall be connected in parallel.

(b) If multiconductor cables are installed in parallel in the same raceway, auxiliary gutter, or cable tray, a single equipment grounding conductor that is sized in accordance with 250.122 shall be permitted in combination with the equipment grounding conductors provided within the multiconductor cables and shall all be connected together.

(c) Equipment grounding conductors installed in cable trays shall meet the minimum requirements of 392.10(B)(1)(c). Cable trays complying with 392.60(B), metal raceways in accordance with 250.118, or auxiliary gutters shall be permitted as the equipment grounding conductor.

(d) Except as provided in 250.122(F)(2)(b) for raceway or cable tray installations, the equipment grounding conductor in each multiconductor cable shall be sized in accordance with 250.122 based on the overcurrent protective device for the feeder or branch circuit.

**(Revised)250.187 (B) Identified and Insulated.** The neutral conductor shall comply with both of the following:

- (1) The neutral conductor shall be identified.
- (2) The neutral conductor shall be insulated for the maximum neutral voltage.

**Informational Note:** The maximum neutral voltage in a threephase wye system is 57.7 percent of the phase-to-phase voltage.

**(Revised) 285.3 Uses Not Permitted.** An SPD device shall not be installed in the following:

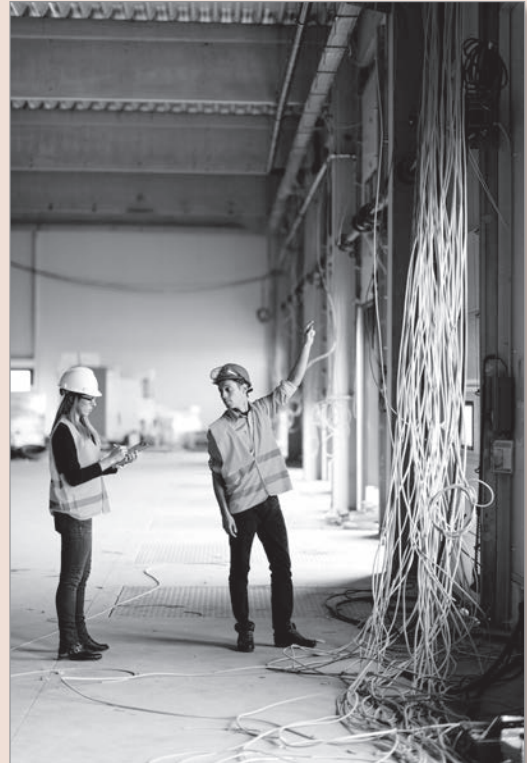
- (1) Circuits over 1000 volts
- (2) On ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems
- (3) Where the rating of the SPD is less than the maximum continuous phase-to-ground voltage at the power frequency available at the point of application.

**(Revised) 300.5(G) Raceway Seals.** Conduits or raceways through which moisture may contact live parts shall be sealed or plugged at either or both ends. Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, conductor insulation, bare conductor, shield, or other components.

**(NEW) 300.4 Informational note:** Minor damage to a raceway, cable armor, or cable insulation does not necessarily violate the integrity of either the contained conductors or the conductors' insulation.

**(Revised) 300.7 (B) Expansion, Expansion-Deflection, and Deflection Fittings.** Raceways shall be provided with expansion, expansion deflection, or deflection fittings where necessary to compensate for thermal expansion, deflection, and contraction.

**(Revised) 300.19(A) Spacing Intervals — Maximum.** Conductors in vertical raceways shall be supported if the vertical rise exceeds the values in Table 300.19(A). At least one support method shall be provided for each conductor at the top of the vertical raceway or as close to the top as practical. Intermediate supports shall be provided as necessary to limit supported conductor lengths to not greater than those values specified in Table 300.19(A).



## PART 1 EXAM QUESTIONS

**119. What should the maximum neutral voltage in a threephase wye system be?**

- A. 125% of the primary voltage
- B. 57.7 percent of the phase-to-ground voltage
- C. 125% of the primary neutral voltage
- D. 57.7 percent of the phase-to-phase voltage

**120. What table is required to be used to size a wire type equipment grounding conductor used in a cable tray?**

- A. 250.104(A)(2)
- B. 250.102(C)(1)
- C. 250.122
- D. 250.66

**121. What are you required to do with spare conduits?**

- A. Seal them
- B. Extend 3ft
- C. Identify with tape
- D. All listed answers

**122. What is the maximum circuit voltage that an SPD can be installed?**

- A. 480 volts
- B. 600 volts
- C. 575 volts
- D. 1000 volts

**123. What section should be referenced to determine the minimum installation requirements for equipment grounding conductors installed in a cable tray?**

- A. 250.122(F)(2)(b)
- B. 392.10(B)(1)(c)
- C. 250.118
- D. 392.60(B)

**124. What are raceway expansion fittings used for?**

- A. Earth erosion
- B. Seismic activity
- C. Thermal expansion
- D. House boats

**(NEW) 300.22(C)(3) Informational note:** One method to determine low smoke and heat release properties is that the equipment exhibits a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100kW or less when tested in accordance with ANSI/UL 2043-2013, Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.

**(Revised) 310.10(H)(5) Equipment Grounding Conductors.** Where parallel equipment grounding conductors are used, they shall be sized in accordance with 250.122. Sectioned equipment grounding conductors smaller than 1/0 AWG shall be permitted in multiconductor cables, if the combined circular mil area of the sectioned equipment grounding conductors in each cable complies with 250.122.

**(Revised) 310.15(A)(2) Selection of Ampacity.** Where more than one ampacity applies for a given circuit length, the lowest value shall be used.

**Exception:** Where different ampacities apply to portions of a circuit, the higher ampacity shall be permitted to be used if the total portion(s) of the circuit with lower ampacity does not exceed the lesser of 3.0 m (10 ft) or 10 percent of the total circuit.

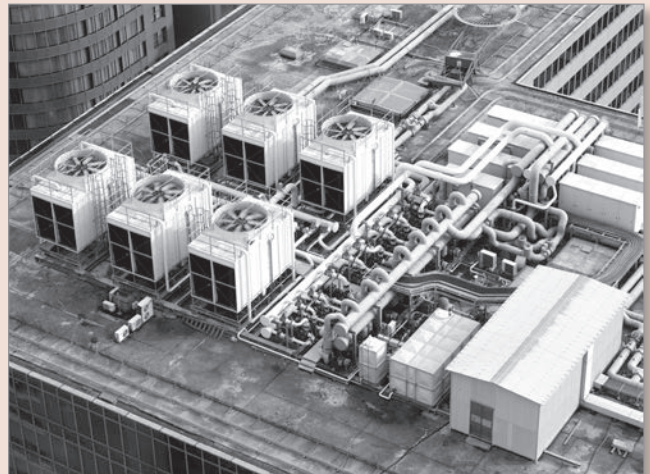
**(Revised) 310.15(B)(3) Informational Note No. 2:** See 366.23 for adjustment factors for conductors and ampacity for bare copper and aluminum bars in auxiliary gutters and 376.22(B) for adjustment factors for conductors in metal wireways.

**(Revised) 310.15(B)(3) (c) Raceways and Cables Exposed to Sunlight on Rooftops.** Where raceways or cables are exposed to direct sunlight on or above rooftops, raceways or cables shall be installed a minimum distance above the roof to the bottom of the raceway or cable of 23 mm (7/8 in.). Where the distance above the roof to the bottom of the raceway 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)(2)(a) or Table 310.15(B)(2)(b).

**(Revised) 310.60(C)(2) (a)** Where burial depths are increased in part(s) of an electrical duct run, a decrease in ampacity of the conductors shall not be required, provided the total length of parts of the duct run increased in depth is less than 25 percent of the total run length.

**(Revised) 310.60(C)(2) (b)** Where burial depths are deeper than shown in a specific underground ampacity table or figure, an ampacity derating factor of 6 percent per 300 mm (1 ft) increase in depth for all values of rho shall be permitted. No ampacity adjustments shall be required where the burial depth is decreased.

**(Revised) 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.





**(Revised) 312.8 Switch and Overcurrent Device Enclosures.** The wiring space within enclosures for switches and overcurrent devices shall be permitted for other wiring and equipment subject to limitations for specific equipment as provided in (A) and (B).

**(NEW) 312.8 (B) Power Monitoring Equipment.** The wiring space of enclosures for switches or overcurrent devices shall be permitted to contain power monitoring equipment where all of the following conditions are met:

- (1) The power monitoring equipment is 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.
- (2) The total area of all conductors, splices, taps, and equipment at any cross section of the wiring space does not exceed 75 percent of the cross-sectional area of that space.

**(Revised) 312.6(A) Note: 2.** This column shall be permitted to be used to determine the minimum wire-bending space for compact stranded aluminum conductors in sizes up to 1000 kcmil and manufactured using AA-8000 series electrical grade aluminum alloy conductor material in accordance with 310.106(B). The minimum width of the wire gutter space shall be determined using the all other conductors value in this table.

## PART 1 EXAM QUESTIONS

125. What value is required to be used where more than one ampacity applies for a given circuit length?
- A. Lowest value
  - B. Highest value
  - C. Medium Value
  - D. Nominal Value
126. What is the maximum peak optical density for a piece of equipment to be considered having low smoke and heat release properties?
- A. 0.50
  - B. 0.30
  - C. 0.70
  - D. 0.80
127. What section should be referenced to determine adjustment factors for conductors and ampacity for bare copper and aluminum bars in auxiliary gutters?
- A. 250.122
  - B. 376.22(B)
  - C. 310.10(H)(5)
  - D. 366.23
128. What table shows the minimum wire-bending space for compact stranded aluminum conductors in sizes up to 1000 kcmil?
- A. 310.10(H)(5)
  - B. 366.23
  - C. 312.6(A)
  - D. 250.122
129. What is the minimum distance above a roof that a raceway can be installed if exposed to direct sunlight?
- A. 3 inches
  - B. 3/4 in
  - C. 1 in
  - D. 7/8 in
130. How many conditions must be met for power monitoring equipment to be installed in the wiring space for overcurrent devices?
- A. 3
  - B. 2
  - C. 1
  - D. 4
131. What ampacity derating factor is required to be used if a duct bank burial depth is deeper than that shown in a specific underground ampacity table or figure?
- A. 5% per foot increase in depth over
  - B. 6% per foot decrease in depth under
  - C. 6% per foot increase in depth over
  - D. 5% per foot decrease in depth over
132. In general, Article 312 does not apply to equipment operating at over what voltage?
- A. 300 volts
  - B. 600 volts
  - C. 240 volts
  - D. 1000 volts

**(Revised) 314.15 Damp or Wet Locations.** In damp or wet locations, boxes, conduit bodies, outlet box hoods, and fittings shall be placed or equipped so as to prevent moisture from entering or accumulating within the box, conduit body, or fitting. Boxes, conduit bodies, outlet box hoods, and fittings installed in wet locations shall be listed for use in wet locations. Approved drainage openings not smaller than 3 mm (1/8 in.) and not larger than 6 mm (1/4 in.) in diameter shall be permitted to be installed in the field in boxes or conduit bodies listed for use in damp or wet locations. For installation of listed drain fittings, larger openings are permitted to be installed in the field in accordance with manufacturer's instructions.

**(Revised) 314.16 (B) Box Fill Calculations.** The volumes in paragraphs 314.16(B)(1) through (B)(5), as applicable, shall be added together. No allowance shall be required for small fittings such as locknuts and bushings. Each space within a box installed with a barrier shall be calculated separately.

**(Revised) 314.17 (B) Metal Boxes and Conduit Bodies.** Where metal boxes or conduit bodies are installed with messenger-supported wiring, open wiring on insulators, or concealed knob-and-tube wiring, conductors shall enter through insulating bushings or, in dry locations, through flexible tubing extending from the last insulating support to not less than 6 mm (1/4 in.) inside the box and beyond any cable clamps. Where nonmetallic-sheathed cable or multiconductor Type UF cable is 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 shall be firmly secured to the box or conduit body. Where raceway or cable is installed with metal boxes or conduit bodies, the raceway or cable shall be secured to such boxes and conduit bodies.

**(Revised) 314.23 (B) (1) Nails and Screws.** Nails and screws, where used as a fastening means, shall secure boxes by using brackets on the outside of the enclosure, or by using mounting holes in the back or in a single side of the enclosure, or they shall pass through the interior within 6 mm (1/4 in.) of the back or ends of the enclosure. Screws shall not be permitted to pass through the box unless exposed threads in the box are protected using approved means to avoid abrasion of conductor insulation. Mounting holes made in the field shall be approved.

**(Revised) 314.27 (A)(2) Ceiling Outlets.** At every outlet used exclusively for lighting, the box shall be designed or installed so that a luminaire or lampholder may be attached. Boxes shall be required to support a luminaire weighing a minimum of 23 kg (50 lb). A luminaire that weighs more than 23 kg (50 lb) shall be supported independently of the outlet box, unless the outlet box is listed for not less than the weight to be supported. The interior of the box shall be marked by the manufacturer to indicate the maximum weight the box shall be permitted to support.

**(NEW) 314.27 (E) Separable Attachment Fittings.** Outlet boxes required in 314.27 shall be permitted to support listed locking support and mounting receptacles used in combination with compatible attachment fittings. The combination shall be identified for the support of equipment within the weight and mounting orientation limits of the listing. Where the supporting receptacle is installed within a box, it shall be included in the fill calculation covered in 314.16(B)(4).

**(Revised) 314.28 (E) (1) Installation.** Power distribution blocks installed in boxes shall be listed. Power distribution blocks installed on the line side of the service equipment shall be listed and marked "suitable for use on the line side of service equipment" or equivalent.



**(NEW) 320.6 Listing Requirements.** Type AC cable and associated fittings shall be listed.

**(Revised) 320.30 (B) Securing.** Unless otherwise permitted, Type AC cable shall be secured within 300 mm (12 in.) of every outlet box, junction box, cabinet, or fitting and at intervals not exceeding 1.4 m (4½ ft).

**(Revised) 320.30 (C) Supporting.** Unless otherwise permitted, Type AC cable shall be supported at intervals not exceeding 1.4 m (4½ ft). Horizontal runs of Type AC cable installed in wooden or metal framing members or similar supporting means shall be considered supported where such support does not exceed 1.4 m (4½ ft) intervals.

**(NEW) 322.6 Listing Requirements.** Type FC and associated fittings shall be listed.

## PART 1 EXAM QUESTIONS

- 133. At what distance does type AC cable need to be supported when run horizontally?**
- A. 7 1/2 ft
  - B. 4 1/2 ft
  - C. 5 1/2 ft
  - D. 5 ft
- 134. How are spaces within a box divided by a barrier required to be calculated?**
- A. As a whole
  - B. Separately
  - C. Each barrier counts as a 10% deration factor in the calculation
  - D. Barrier sections count only as one space in a common box or enclosure
- 135. What are mounting holes made in the field for mounting a box required to be?**
- A. Approved
  - B. Listed
  - C. Readily accessible
  - D. Accessible
- 136. What is the minimum weight that a box installed for a luminaire is required to support?**
- A. 30 lb
  - B. 25 lb
  - C. 50 lb
  - D. 75 lb
- 137. What is type AC cable required to be?**
- A. Identified
  - B. Listed
  - C. Rated
  - D. All listed answers
- 138. If listed locking support and mounting receptacles are installed in a box, what section requires this to be added into the fill calculation?**
- A. 314.23 (B)(1)
  - B. 312.6(A)
  - C. 314.16(B)(4)
  - D. 314.15
- 139. Within how many inches to a junction box does type AC cable need to be supported?**
- A. 12 in
  - B. 14 in
  - C. 20 in
  - D. 18 in
- 140. How far beyond the last cable clamp does messenger-supported open wiring need to extend when using a metal box?**
- A. 6 in
  - B. 1/2 in
  - C. 3/8 in
  - D. 1/4 in
- 141. What is type FC cable required to be?**
- A. Identified
  - B. Listed
  - C. Rated
  - D. All listed answers

**(Revised) 324.12 Uses Not Permitted.** FCC systems shall not be used in the following locations:

- (1) Outdoors or in wet locations
- (2) Where subject to corrosive vapors
- (3) In any hazardous (classified) location
- (4) In residential buildings
- (5) In school and hospital buildings, other than administrative office areas

**(Revised) 326.24 Bending Radius.** Where the coilable nonmetallic conduit and cable are bent for installation purposes or are flexed or bent during shipment or installation, the radius of the curve of the inner edge measured to the inside of the bend shall not be less than specified in table 326.24

**(NEW) 328.30 Support.** Type MV cable terminated in equipment or installed in pull boxes or vaults shall be secured and supported by metallic or nonmetallic supports suitable to withstand the weight by cable ties listed and identified for securement and support, or other approved means, at intervals not exceeding 1.5 m (5 ft) from terminations or a maximum of 1.8 m (6 ft) between supports.

**(NEW) 330.15 Exposed Work.** Exposed runs of cable, except as provided in 300.11(A), shall closely follow the surface of the building finish or of running boards. Exposed runs shall also be permitted to be installed on the underside of joists where supported at each joist and located so as not to be subject to physical damage.

**(NEW) 332.6 Listing Requirements.** Type MI cable and associated fittings shall be listed.

**(NEW) 334.6 Listing Requirements.** Type NM, Type NMC, and Type NMS cables and associated fittings shall be listed.

**(Revised) 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. Flat cables shall not be stapled on edge.



The ampacity of types NM, NMC, and NMS cable shall be determined in accordance with 310.15. The allowable ampacity shall not exceed that of a 60°C (140°F) rated conductor. The 90°C (194°F) rating shall be permitted to be used for ampacity adjustment and correction calculations, provided the final calculated ampacity does not exceed that of a 60°C (140°F) rated conductor. The ampacity of Types NM, NMC, and NMS cable installed in cable trays shall be determined in accordance with 392.80(A).

**(NEW) 336.6 Listing Requirements.** Type TC cables and associated fittings shall be listed.

**(NEW) 336.10 (9)** In one- and two-family dwelling units, Type TC-ER cable containing both power and control conductors that is identified for pulling through structural members shall be permitted. Type TC-ER cable used as interior wiring shall be installed per the requirements of Part II of Article 334.

**(NEW) 336.10 (9) Exception:** Where used to connect a generator and associated equipment having terminals rated 75°C (140°F) or higher, the cable shall not be limited in ampacity by 334.80 or 340.80.

**(NEW) 336.10 (9) Informational Note No. 1:** TC-ER cable that is suitable for pulling through structural members is marked "JP."



**(NEW) 336.10 (9) Informational Note No. 2:** See 725.136 for limitations on Class 2 or 3 circuits contained within the same cable with conductors of electric light, power, or Class 1 circuits.

**(NEW) 336.10 (10)** Direct buried, where identified for such use.

## PART 1 EXAM QUESTIONS

- 142. What is the maximum distance nonmetallic-sheathed cable can be supported from a termination box?**
- A. 8 in
  - B. 6 in
  - C. 18 in
  - D. 12 in
- 143. What location can type FCC cable be installed?**
- A. Patient bed location
  - B. Wet location
  - C. Damp location
  - D. In residential buildings
- 144. What are the associated fittings used with type NMS cables required to be?**
- A. Listed
  - B. Identified
  - C. Rated
  - D. All listed answers
- 145. What is the maximum distance type MV cable can be supported from a termination box?**
- A. 4ft
  - B. 6ft
  - C. 3ft
  - D. 5ft
- 146. MC cable can be run on the underside of joists if what listed requirement is met?**
- A. Installed where foot traffic is likely to occur
  - B. Not subject to physical damage
  - C. Installed in an accessible location
  - D. Installed in a readily accessible location
- 147. What table shows the minimum bending radius for coilable cable?**
- A. 314.23 (B)(1)
  - B. 324.26
  - C. 326.24
  - D. 314.15
- 148. What is type MI cable required to be?**
- A. Identified
  - B. Listed
  - C. Rated
  - D. All listed answers
- 149. What is the maximum allowable distance between supports for type MV cable?**
- A. 6ft
  - B. 5ft
  - C. 3ft
  - D. 4ft
- 150. What is the maximum allowable distance between supports for nonmetallic-sheathed cable?**
- A. 4ft
  - B. 5ft
  - C. 3ft
  - D. 4 ft 6 in
- 151. What section should be used to determine the limitations on Class 2 or 3 circuits contained within the same cable with conductors of electric light, power, or Class 1 circuits?**
- A. 752.136
  - B. 725.136
  - C. 832.74
  - D. 823.47
- 152. What are the associated fittings used with type TC cables required to be?**
- A. Rated
  - B. Identified
  - C. Listed
  - D. All listed answers
- 153. What must the marking on a TC-ER cable indicate when being installed in a single family dwelling through structural members?**
- A. JP
  - B. UV
  - C. RS
  - D. JS

**(NEW) 338.6 Listing Requirements.** Type SE and USE cables and associated fittings shall be listed.

**(NEW) 340.6 Listing Requirements.** Type UF cable and associated fittings shall be listed.

**(Revised) 342.14 Dissimilar Metals.** Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. 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 stainless steel fittings and approved accessories, outlet boxes, and enclosures.

**(NEW) 342.100 Construction.** IMC shall be made of one of the following:

- (1) Steel, with protective coatings
- (2) Stainless steel

**(Revised) 342.120 Marking.** Each length shall be clearly and durably marked at least every 1.5 m (5 ft) with the letters IMC. Each length shall be marked as required in the first sentence of 110.21(A).

**(Revised) 344.14 Dissimilar Metals.** Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. 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 RMC shall only be used with stainless steel fittings and approved accessories, outlet boxes, and enclosures.

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

- (1) Steel with protective coatings
- (2) Aluminum
- (3) Red brass
- (4) Stainless steel

**(Revised) 348.30 (A) Securely Fastened.** FMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4 1/2 ft). Where used, cable ties shall be listed and be identified for securement and support.

**(Revised) 350.10 Uses Permitted.** LFMC shall be permitted to be used in exposed or concealed locations as follows:

- (1) Where conditions of installation, operation, or maintenance require flexibility or protection from liquids, vapors, or solids
- (2) In hazardous (classified) locations where specifically permitted by Chapter 5
- (3) For direct burial where listed and marked for the purpose liquidtight flexible metal conduit



**(NEW) 350.28 Trimming.** All cut ends of conduit shall be trimmed inside and outside to remove rough edges.

**(Revised) 358.10 (A) Exposed and Concealed.** The use of EMT shall be permitted for both exposed and concealed work for the following:

- (1) In concrete, in direct contact with the earth or in areas subject to severe corrosive influences where installed in accordance with 358.10(B)
- (2) In dry, damp, and wet locations
- (3) In any hazardous (classified) location as permitted by other articles in this Code

## PART 1 EXAM QUESTIONS

**154. What are you required to do to the cut ends of all liquidtight flexible metal conduit?**

- A. Trim inside and outside to remove rough edges
- B. Rough the edges and interior
- C. Cut the ends at a 45 degree angle
- D. Mark the ends with white phase tape

**155. What section applies to service entrance cable identified for use underground?**

- A. 338
- B. 336
- C. 334
- D. 340

**156. What term is used when two dissimilar metals are in contact with each other?**

- A. Lock set
- B. Pluribus Unum
- C. Galvanic action
- D. Top set

**157. What section is required to be followed when installing EMT in direct contact with the earth or in areas subject to severe corrosive influences?**

- A. 358.10(D)
- B. 385.10(A)
- C. 358.10(B)
- D. 358.14

**158. What section describes the construction of Intermediate Metal Conduit?**

- A. 342.14
- B. 342.100
- C. 336.10
- D. 342.140

**159. What is the maximum allowable distance between supports for flexible metal conduit?**

- A. 4 ft 6 in
- B. 5ft
- C. 3ft
- D. 4ft

**160. What is rigid metal conduit typically made from?**

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

**161. At what interval does Intermediate Metal Conduit need to be durably marked?**

- A. 4 ft 6 in
- B. 5ft
- C. 3ft
- D. 4ft

**162. What is the maximum distance from an electrical cabinet that 3/4-inch flexible metal conduit needs to be supported?**

- A. 8 in
- B. 6 in
- C. 18 in
- D. 12 in

**163. What Chapter of the 2017 code allows liquidtight flexible metal conduit to be installed in specific hazardous areas?**

- A. 6
- B. 7
- C. 5
- D. 4

**(NEW) 358.10 (B) (1) Galvanized Steel and Stainless Steel EMT, Elbows, and Fittings.** Galvanized steel and stainless steel EMT, elbows, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and approved as suitable for the condition.

**(NEW) 358.10 (B) (2) Supplementary Protection of Aluminum EMT.** Aluminum EMT shall be provided with approved supplementary corrosion protection where encased in concrete or in direct contact with the earth.



**(NEW) 358.10 (B) (C) Cinder Fill.** Galvanized steel and stainless steel EMT shall be permitted to be installed in cinder concrete or cinder fill where subject to permanent moisture when protected on all sides by a layer of noncinder concrete at least 50 mm (2 in.) thick or when the tubing is installed at least 450 mm (18 in.) under the fill.

**(NEW) 358.14 Dissimilar Metals.** Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. 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 stainless steel fittings and approved accessories, outlet boxes, and enclosures.

**(Revised) 358.30 (A) Securely Fastened.** EMT shall be securely fastened in place at intervals not to exceed 3 m (10 ft). In addition, each EMT run between termination points shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other tubing termination.

**(Revised) 360.2 Flexible Metallic Tubing (FMT).** A metal raceway that is circular in cross section, flexible, and liquidtight without a nonmetallic jacket.

**(Revised) 362.30 (A) Securely Fastened.** ENT shall be securely fastened at intervals not exceeding 900 mm (3 ft). In addition, ENT shall be securely fastened in place within 900 mm (3 ft) of each outlet box, device box, junction box, cabinet, or fitting where it terminates. Where used, cable ties shall be listed as suitable for the application and for securing and supporting.



**(Revised) 366.30 (A) Sheet Metal Auxiliary Gutters.** Sheet metal auxiliary gutters shall be supported and secured throughout their entire length at intervals not exceeding 1.5 m (5 ft).

**(NEW) 372.18 Cellular Concrete Floor Raceways Installation.** Installation of cellular concrete floor raceways shall comply with 372.18(A) through 372.18(E).

**(MOVED/Revised) 372.23 Ampacity of Conductors.** The ampacity adjustment factors as provided in 310.15(B) (3) shall apply to conductors installed in cellular concrete floor raceways.

**(NEW) 374.18 Cellular Metal Floor Raceways Installations.** Installation of cellular metal floor raceways shall comply with 374.18(A) through 374.18(D).



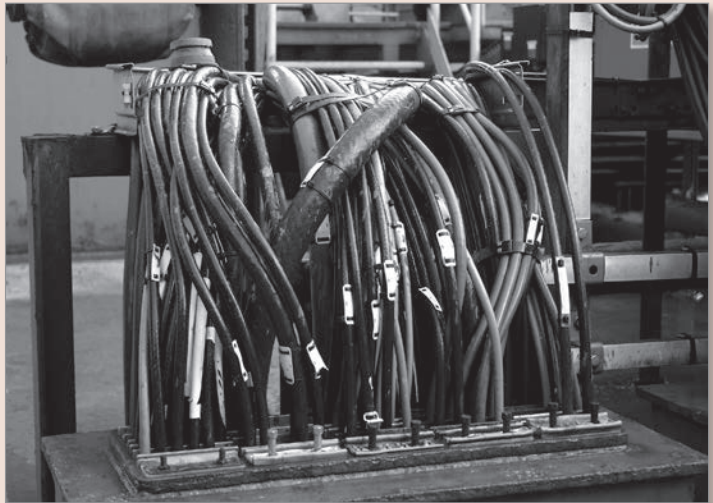
## PART 1 EXAM QUESTIONS

- 164. What is the maximum distance from a device box that 1/2-inch EMT conduit needs to be supported?**
- A. 18 in
  - B. 6 in
  - C. 3ft
  - D. 2ft
- 165. What does Aluminum EMT have to be protected with if installed in concrete?**
- A. A PVC Conduit sleeve
  - B. No Locks
  - C. Supplementary corrosion protection
  - D. There is no requirement as EMT is not made from aluminum
- 166. What section should be referenced to determine if galvanized steel EMT and aluminum EMT fittings can be used together?**
- A. 385.10(A)
  - B. 358.14
  - C. 358.10(D)
  - D. 358.10(B)
- 167. What is the minimum thickness of noncinder concrete that needs to protect Galvanized steel EMT installed in cinder concrete?**
- A. 4 inches
  - B. 2 inches
  - C. 18 inches
  - D. 3 inches
- 168. What is the maximum distance between supports that ENT conduit can be supported?**
- A. 6ft
  - B. 5ft
  - C. 10ft
  - D. 3ft
- 169. Where are you directed to find the ampacity adjustment factors for conductors installed in cellular concrete floor raceways?**
- A. 316.16(B)(3)
  - B. 310.10(H)
  - C. 310.15(B)(3)
  - D. 315.15(A)(3)
- 170. What is the maximum allowable distance between supports for EMT conduit?**
- A. 5ft
  - B. 10ft
  - C. 3ft
  - D. 6ft
- 171. How far from a junction box does 1-inch ENT conduit need to be supported?**
- A. 3ft
  - B. 6 in
  - C. 18 in
  - D. 2ft
- 172. What is the maximum allowable distance between supports for sheet metal auxiliary gutters?**
- A. 10ft
  - B. 3ft
  - C. 5ft
  - D. 6ft
- 173. How many installation provisions are cellular metal floor raceways required to comply with?**
- A. 5
  - B. 6
  - C. 4
  - D. 3
- 174. How many installation provisions are cellular concrete floor raceways required to comply with?**
- A. 5
  - B. 6
  - C. 4
  - D. 3
- 175. What best defines a metal raceway that is circular in cross section, flexible, and liquidtight without a nonmetallic jacket?**
- A. Flexible Non-Metallic Conduit (FNC)
  - B. Flexible Non-Metallic Tubing (FNT)
  - C. Buss duct
  - D. Flexible Metallic Tubing (FMT)
- 176. Where are galvanized steel and stainless steel EMT, elbows, and fittings permitted to be installed?**
- A. In areas subject to severe corrosive influences where protected by corrosion protection
  - B. In concrete
  - C. In direct contact with the earth
  - D. All listed answers

**(NEW) 376.20 Conductors Connected in Parallel.**

Where single conductor cables comprising each phase, neutral, or grounded conductor of an alternating-current circuit are connected in parallel as permitted in 310.10(H), the conductors shall be installed in groups consisting of not more than one conductor per phase, neutral, or grounded conductor to prevent current imbalance in the paralleled conductors due to inductive reactance.

**(Revised) 376.22 (A) Cross-Sectional Areas of Wireway.** The sum of the cross-sectional areas of all contained conductors and cables at any cross section of a wireway shall not exceed 20 percent of the interior cross-sectional area of the wireway.



**(Revised) 376.56 (B) (1) Installation.** Power distribution blocks installed in metal wireways shall be listed. Power distribution blocks installed on the line side of the service equipment shall be marked "suitable for use on the line side of service equipment" or equivalent.

**(NEW) 378.20 Conductors Connected in Parallel.** Where single conductor cables comprising each phase, neutral, or grounded conductor of an alternating-current circuit are connected in parallel as permitted in 310.10(H), the conductors shall be installed in groups consisting of not more than one conductor per phase, neutral, or grounded conductor to prevent current imbalance in the paralleled conductors due to inductive reactance.

**(NEW) 392.10 (E) Airfield Lighting Cable Tray.** In airports where maintenance and supervision conditions ensure that only qualified persons can access, install, or service the cable, airfield lighting cable used in series circuits that are rated up to 5000 volts and are powered by constant current regulators shall be permitted to be installed in cable trays.

**(NEW) 392.80 (A) Informational Note:** See 110.14(C) for conductor temperature limitations due to termination provisions.

**(NEW) 400.1 Informational Note:** UL 817, Cord Sets and Power-Supply Cords, allows the use of flexible cords manufactured in accordance with UL 62, Flexible Cords and Cables. See 400.10 and 400.12 for flexible cords that are part of a listed cord set or power-supply cord.

**(Revised) 400.12 Uses Not Permitted.** Unless specifically permitted in 400.10, flexible cables, flexible cord sets, and power supply cords shall not be used for the following:

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

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

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

**Exception to (5):** Flexible cord and flexible cable shall be permitted if contained within an enclosure for use in Other Spaces Used for Environmental Air as permitted by 300.22(C)(3).

(6) Where installed in raceways, except as otherwise permitted in this Code

(7) Where subject to physical damage

**(Revised) 400.21 (A) Conductors.** The individual conductors of a flexible cord or flexible cable shall have copper flexible stranding and shall not be smaller than the sizes specified in Table 400.4.



## PART 1 EXAM QUESTIONS

- 177. What table specifies the minimum size for individual conductors in flexible cords?**
- 400.21
  - 400.4
  - 300.22(C)(3)
  - 110.14(C)
- 178. What is the maximum rated cable voltage that airfield lighting cable used in series circuits can be installed in a cable tray?**
- 3000 volts
  - 1000 volts
  - 600 volts
  - 5000 volts
- 179. What is the maximum interior cross-sectional area at any cross section that cables installed in a metal wireway can account for?**
- 20%
  - 40%
  - 80%
  - 25%
- 180. Where can a flexible power supply cord not be installed?**
- Prevention of the transmission of noise or vibration
  - Wiring of luminaires
  - Where run through doorways, windows, or similar openings
  - For powering pendants
- 181. What causes a current imbalance with regards to conductors in parallel?**
- Inductive Capacitance
  - Inductive reactance
  - Resonance
  - Eddy currents
- 182. What are power distribution blocks installed in metal wireways required to be?**
- Accessible
  - Readily accessible
  - Guarded
  - Listed
- 183. How many sections are referenced in the 2017 code for information pertaining to flexible cords that are part of a listed cord set or power-supply cord?**
- 2
  - 3
  - 1
  - 4
- 184. What section would you find conductor temperature limitations due to termination provisions with regards to cable trays?**
- 310.15(B)(3)
  - 110.14(C)
  - 358.14
  - 310.10(H)
- 185. If installing single conductor cables connected in parallel in a metal wireway as permitted in 310.10(H), the conductors have to be installed a certain way as to prevent what?**
- Eddy currents
  - Inductive Capacitance
  - Resonance
  - Current imbalance

**(Revised) 404.2 (C) Switches Controlling Lighting Loads.** The grounded circuit conductor for the controlled lighting circuit shall be installed at the location where switches control lighting loads that are supplied by a grounded general-purpose branch circuit serving bathrooms, hallways, stairways, or rooms suitable for human habitation or occupancy as defined in the applicable building code. Where multiple switch locations control the same lighting load such that the entire floor area of the room or space is visible from the single or combined switch locations, the grounded circuit conductor shall only be required at one location. A grounded conductor shall not be required to be installed at lighting switch locations under any of the following conditions:

- (1) Where conductors enter the box enclosing the switch through a raceway, provided that the raceway is large enough for all contained conductors, including a grounded conductor
- (2) Where the box enclosing the switch is accessible for the installation of an additional or replacement cable without removing finish materials
- (3) Where snap switches with integral enclosures comply with 300.15(E)
- (4) Where lighting in the area is controlled by automatic means
- (5) Where a switch controls a receptacle load

**(Revised) 404.9 (B) Grounding.** Snap switches, including dimmer and similar control switches, shall be connected to an equipment grounding conductor and shall provide a means to connect metal faceplates to the equipment grounding conductor, whether or not a metal faceplate is installed. Metal faceplates shall be grounded. Snap switches shall be considered to be part of an effective ground-fault current path if either of the following conditions is met:

- (1) The switch is mounted with metal screws to a metal box or metal cover that is connected to an equipment grounding conductor or to a nonmetallic box with integral means for connecting to an equipment grounding conductor.
- (2) An equipment grounding conductor or equipment bonding jumper is connected to an equipment grounding termination of the snap switch.

**(Revised) 404.13 (B) To Interrupt Currents.** To interrupt currents over 1200 amperes at 250 volts, nominal, or less, or over 600 amperes at 251 to 1000 volts, nominal, a circuit breaker or a switch listed for such purpose shall be used.

**(Revised) 404.22** Electronic lighting control switches shall be listed. Electronic lighting control switches shall not introduce current on the equipment grounding conductor during normal operation. The requirement to not introduce current on the equipment grounding conductor shall take effect on January 1, 2020.

**(NEW) 406.2 Outlet Box Hood.** A housing shield intended to fit over a faceplate for flush mounted wiring devices, or an integral component of an outlet box or of a faceplate for flush-mounted wiring devices. The hood does not serve to complete the electrical enclosure; it reduces the risk of water coming in contact with electrical components within the hood, such as attachment plugs, current taps, surge protective devices, direct plugin transformer units, or wiring devices.

**(Revised) 406.3 (E) Controlled Receptacle Marking.** All nonlocking-type, 125-volt, 15- and 20-ampere receptacles that are controlled by an automatic control device, or that incorporate control features that remove power from the receptacle for the purpose of energy management or building automation, shall be permanently marked with the symbol shown in Figure 406.3(E) and the word "controlled."





## PART 1 EXAM QUESTIONS

186. What is a metal faceplate used with a snap switch required to be?
- Listed
  - Bonded
  - Insulated
  - Grounded
187. What conductor is required to be at the location where switches control lighting loads that are supplied by a grounded general-purpose branch circuit?
- The grounded circuit conductor
  - The grounding electrode conductor
  - Bonding Jumper
  - Each phase conductor of a 3 phase system
188. How is the receptacle controlled by an automatic control device, or that incorporates control features that remove power from the receptacle for the purpose of energy management or building automation required to be identified?
- The word "controlled"
  - The word "automated"
  - With a "red" triangle
  - With the letters "BMS"
189. What is the switch or circuit breaker used to interrupt currents over 1200 amperes at 250 volts, nominal, or less, or over 600 amperes at 251 to 1000 volts required to be?
- Identified
  - Bonded
  - Listed
  - Grounded
190. What does a housing shield intended to fit over a faceplate for flush mounted wiring devices installed to protect against?
- Completes the electrical enclosure
  - Reduces the risk of water coming in contact with electrical components
  - Grounds an attachment plug to the EGC
  - All listed answers
191. When is the requirement to not introduce current on the equipment grounding conductor required to take effect?
- January 1, 2020
  - January 1, 2017
  - July 1, 2020
  - October 1, 2017

**(NEW) 406.3 (F) Receptacle with USB Charger.** A 125-volt 15- or 20-ampere receptacle that additionally provides Class 2 power shall be listed and constructed such that the Class 2 circuitry is integral with the receptacle.

**(Revised) 406.5 (E) Receptacles in Countertops.** Receptacle assemblies for installation in countertop surfaces shall be listed for countertop applications. Where receptacle assemblies for countertop applications are required to provide ground-fault circuit-interrupter protection for personnel in accordance with 210.8, such assemblies shall be permitted to be listed as GFCI receptacle assemblies for countertop applications.

**(NEW) 406.5 (F) Receptacles in Work Surfaces.** Receptacle assemblies and GFCI receptacle assemblies listed for work surface or countertop applications shall be permitted to be installed in work surfaces.

**(NEW) 406.5 (G) Receptacle Orientation.** 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.

**(NEW) 406.6 (D) Receptacle Faceplate (Cover Plates) with Integral Night Light and/or USB Charger.** A flush device cover plate that additionally provides a night light and/or Class 2 output connector(s) shall be listed and constructed such that the night light and/or Class 2 circuitry is integral with the flush device cover plate.



**(Revised) 406.9 (B) (1) Receptacles of 15 and 20 Amperes in a Wet Location.** Receptacles of 15 and 20 amperes, 125 and 250 volts installed in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted. An outlet box hood installed for this purpose shall be listed and shall be identified as “extra-duty.” Other listed products, enclosures, or assemblies providing weatherproof protection that do not utilize an outlet box hood need not be marked “extra duty.” All 15- and 20-ampere, 125- and 250-volt nonlocking-type receptacles shall be listed and so identified as the weather resistant type.

**(Revised) 406.9 (B) (1) Informational Note No. 1:** Requirements for extra-duty outlet box hoods are found in ANSI/UL 514D–2013, Cover Plates for Flush-Mounted Wiring Devices. “Extra duty” identification and requirements are not applicable to listed receptacles, faceplates, outlet boxes, enclosures, or assemblies that are identified as either being suitable for wet locations or rated as one of the outdoor enclosure–type numbers of Table 110.28 that does not utilize an outlet box hood.

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

(1) Dwelling units in all areas specified in 210.52 and 550.13

(2) Guest rooms and guest suites of hotels and motels

(3) Child care facilities

(4) Preschools and elementary education facilities

(5) Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities

(6) Subset of assembly occupancies described in 518.2 to include places of waiting transportation, gymnasiums, skating rinks, and auditoriums

(7) Dormitories



**Informational Note:** 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.

## PART 1 EXAM QUESTIONS

**192. What are receptacles installed in counter top surfaces required to be listed as?**

- A. Listed for use with an AFCI breaker
- B. Listed as water proof
- C. Listed as water resistant
- D. Listed for countertop applications

**193. Where are the requirements for extra-duty outlet box hoods found?**

- A. ANSI/UL 514C–2017
- B. ANSI/UL 514D–2013
- C. IEEE/UL 514B–2013
- D. ANSI/IEE 514D–2017

**194. What section of the 2017 code should be referenced when installing receptacles in work surfaces?**

- A. 406.5 (G)
- B. 406.5 (E)
- C. 406.5 (F)
- D. 406.3 (F)

**195. What type are all 15- and 20-ampere, 125- and 250-volt nonlocking-type receptacles required to be listed and identified as?**

- A. Weather resistant
- B. Weatherproof
- C. Waterproof
- D. Water resistant

**196. What listed voltage class is required to be integral to a night light/USB receptacle?**

- A. 1
- B. 2
- C. 3
- D. All listed answers

**197. How many general areas are listed in the 2017 code where tamper resistant receptacles are required to be installed?**

- A. 8
- B. 9
- C. 7
- D. 6

**198. What is the enclosure that houses a 20-amp receptacle, and is installed in a wet location, required to be?**

- A. Water resistant
- B. Weather resistant
- C. Waterproof
- D. Weatherproof

**199. What position are general receptacles not allowed to be installed in?**

- A. Ground up
- B. Face-up position
- C. Horizontally
- D. Vertically

**200. What has to be integral for a USB receptacle?**

- A. Class 2 circuitry
- B. Class 1 circuitry
- C. An isolation transformer
- D. A Wheatstone bridge

**ANSWER SHEET • 2017 NEC CODE CHANGE • PART 1**

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_ Date: \_\_\_\_\_

Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ ZIP: \_\_\_\_\_

License #: \_\_\_\_\_ Phone: \_\_\_\_\_ Email: \_\_\_\_\_

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

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| 16. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 42. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 68. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 94. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D  |
| 17. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 43. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 69. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 95. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D  |
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- 105.  A  B  C  D
- 106.  A  B  C  D

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- 107.  A  B  C  D
- 108.  A  B  C  D
- 109.  A  B  C  D
- 110.  A  B  C  D
- 111.  A  B  C  D
- 112.  A  B  C  D
- 113.  A  B  C  D
- 114.  A  B  C  D

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- 115.  A  B  C  D
- 116.  A  B  C  D
- 117.  A  B  C  D
- 118.  A  B  C  D

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- 119.  A  B  C  D
- 120.  A  B  C  D
- 121.  A  B  C  D
- 122.  A  B  C  D
- 123.  A  B  C  D
- 124.  A  B  C  D

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- 125.  A  B  C  D
- 126.  A  B  C  D
- 127.  A  B  C  D
- 128.  A  B  C  D

- 129.  A  B  C  D
- 130.  A  B  C  D
- 131.  A  B  C  D
- 132.  A  B  C  D

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- 133.  A  B  C  D
- 134.  A  B  C  D
- 135.  A  B  C  D
- 136.  A  B  C  D
- 137.  A  B  C  D
- 138.  A  B  C  D
- 139.  A  B  C  D
- 140.  A  B  C  D
- 141.  A  B  C  D

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- 142.  A  B  C  D
- 143.  A  B  C  D
- 144.  A  B  C  D
- 145.  A  B  C  D
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- 147.  A  B  C  D
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- 150.  A  B  C  D
- 151.  A  B  C  D
- 152.  A  B  C  D

- 153.  A  B  C  D

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- 154.  A  B  C  D
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- 159.  A  B  C  D
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- 162.  A  B  C  D
- 163.  A  B  C  D

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- 164.  A  B  C  D
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- 174.  A  B  C  D
- 175.  A  B  C  D
- 176.  A  B  C  D

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- 177.  A  B  C  D
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- 184.  A  B  C  D
- 185.  A  B  C  D

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- 186.  A  B  C  D
- 187.  A  B  C  D
- 188.  A  B  C  D
- 189.  A  B  C  D
- 190.  A  B  C  D
- 191.  A  B  C  D

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- 192.  A  B  C  D
- 193.  A  B  C  D
- 194.  A  B  C  D
- 195.  A  B  C  D
- 196.  A  B  C  D
- 197.  A  B  C  D
- 198.  A  B  C  D
- 199.  A  B  C  D
- 200.  A  B  C  D

