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Wisconsin Contractors Institute

Continuing Education

NEC 2011 Significant Changes Part 1
8 Hours

Wisconsin Contractors Institute
N27 W23953 Paul Road, Suite 203
Pewaukee, WI 53072
www.wcittraining.com

NEC 2011 Code Change Part 1

The following course will summarize many of the important changes to the NEC 2011 code.

The 2011 Code has added 3 new articles:

- (1) Article 399: Outdoor Overhead Conductors over 600 volts
- (2) Article 694: Small Wind Electric Systems
- (3) Article 840: Premise Powered Broadband Communications Systems

For the 2011 Code, a new annex has been added: Annex I gives the recommended tightening Torque Tables from UL Standard 486A-B

In the 2011 Code, the term grounding conductor has been changed to better explain and to clarify its function with regards to articles 770, 800, 810, and 840. The new terms are:

- (1) Grounding Electrode Conductor
- (2) Bonding Jumper
- (3) Bonding Conductor

Article 90.5 (C)

This section has been changed from Fine print Note to the term Informational Notes. Informational Notes are not enforceable as required in this code. Subdivision D has been added to clarify Informational Notes with regards to the Annexes.

90.5 (D) Informative Annexes Added

Informative annexes. These annexes provide Non-mandatory Information with regards to the use of this code and are not enforceable. They were added for informational purposes only. The informative annexes include:

- Informative Annex: A Product Safety Standards
- Informative Annex: B Application Information for Ampacity Calculation
- Informative Annex: C Conduit and Tubing fill Tables
- Informative Annex: D Examples
- Informative Annex: E Types of Construction
- Informative Annex: F Critical Operations Power Systems
- Informative Annex: G Supervisory Control and Data Acquisition (SCADA)
- Informative Annex: H Administration and Enforcement
- Informative Annex: I Recommended Tightening Torque Tables UL 486 A-B

Test Questions:

1) If you were to install a Small Wind Electric System using the 2011 Code, what article would you reference for the install?

- A) 250
- B) 399
- C) 694
- D) 840

2) An installation performed under the 2011 code using outdoor Overhead Conductors over 600 volts would require looking at section _____?

- A) 110
- B) 399
- C) 694
- D) 840

3) An installation for a premise powered broadband communication system would require looking at article _____ of the 2011 Code.

- A) 399
- B) 420
- C) 694
- D) 840

4) The information contained in Annex I would allow for the proper _____ to be applied to a specific type of equipment.

- A) Torque
- B) Spec
- C) Range
- D) Load

5) The language Grounding Conductor has been changed to Bonding Jumper, Bonding Conductor, and Grounding Electrode Conductor to better clarify its function with regards to other articles.

- A) True
- B) False

6) The 2011 Code has changed Fine Print Notes to _____.

- A) Informal Thoughts
- B) Links
- C) Suggested Information
- D) Informational Notes

7) If you wanted to know a specific tightening torque, what annex in the 2011 Code would you look at?

- A) A
- B) C
- C) D
- D) I

8) Non-mandatory information that pertains to certain installations can be found in the _____.

- A) C stop
- B) Informative annexes
- C) OSHA 10
- D) OSHA 30

9) What Informative annex would you use to find information regarding the enforcement and administration of this code?

- A) D
- B) H
- C) S
- D) T

10) If you were looking for information on certain product safety standards, what informative annex would you look?

- A) A
- B) B
- C) C
- D) D

11) Informative annex D contains _____ of Code Calculations that can be applied to various sections of this Code.

- A) Tables
- B) Pictures
- C) Examples
- D) Graphs

12) The informative annex showing how many No. 12 RHH conductors that can be installed in a 2" EMT would be?

- A) C
- B) G
- C) L
- D) M

13) To find the ampacity of a multiconductor cable containing no more than 3 insulated conductors rated 0 to 2000 volts in a free air application, Informative annex _____ would be used.

- A) A
- B) B
- C) L
- D) S

14) If you needed to find information regarding types 1 through 5 construction, Informative annex _____ is where you would look in the new 2011 Code.

- A) A
- B) C
- C) E
- D) M

15) Often, Critical Operations Power systems are of the utmost importance that downtime of these systems can have a massive impact to security, economy, and mission that Informative annex _____ should be taken into consideration when performing this work.

- A) F
- B) G
- C) I
- D) S

16) Before the installation of a SCADA system, a risk and maintenance study needs to be performed. Information with regards to how such a system can be designed and installed can be had by looking at Informative annex _____.

- A) G
- B) S
- C) L
- D) T

17) The recommended tightening torque tables listed in the 2011 Code are based on UL standard

A-B

- A) 468
 - B) 486
 - C) 533
 - D) 864
-

ARTICLE 100—DEFINITIONS : Ampacity.

The maximum current in amperes, that a conductor can carry continuously under the conditions of use without exceeding its temperature rating.

The word maximum was added to this definition for clarification.

ARTICLE 100—DEFINITIONS: Arc-Fault Circuit Interrupter (AFCI).

A device intended to provide protection from the effects of arc faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc fault is detected.

The definition of this has been moved from article 210.12(A) to where it is located now which is Article 100 definitions.

ARTICLE 100—DEFINITIONS: Automatic.

Performing a function without the necessity of human intervention.

The definition has been revised and simplified to be consistent with other 2011 Code definitions.

ARTICLE 100—DEFINITIONS: Bathroom.

An area including a basin with one or more of the following: a toilet, a urinal, a tub, a shower, a bidet, or similar plumbing fixtures.

The 2011 Code has revised this definition to include the terms Bidet, urinal, and similar plumbing fixtures.

ARTICLE 100—DEFINITIONS: Bonding Jumper, System.

The connection between the grounded circuit conductor and the supply-side bonding jumper, or the equipment grounding conductor, or both, at a separately derived system.

Article 100 definitions: Grounding Conductor-DELETED.

The 2011 Code has deleted the definition Grounding Conductor. The term Grounding Conductor has been replaced with Bonding Conductor or Grounding Electrode Conductor.

Article 100 Definitions: Ground Fault.

An unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and the normally non-current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.

The definition of Ground Fault used to be located in article 250.2. The 2011 Code has moved the definition to article 100 with no changes in verbiage.

Article 100 Definitions: Intersystem Bonding Termination.

A device that provides a means for connecting bonding conductors for communications systems to the grounding electrode system.

This definition has been revised to indicate communication systems are now to be connected to the grounding electrode system, and that connection can be made at any point. Examples of these systems are CATV, Telephone, Network Broad band, and satellite TV.

Test Questions:

18) Ampacity is the _____ current a conductor can handle continuously and not surpass its temperature rating.

- A) Average
- B) Maximum
- C) Least
- D) New

19) Before Arc-Fault Circuit Interrupter (AFCI) was moved to Article 100 definitions, it used to exist in article _____.

- A) 250.43
- B) 210.3
- C) 210.12(A)
- D) 100

20) The ability to perform a function without _____ intervention would be considered automatic.

- A) Human
- B) Divine
- C) Natural
- D) Required

21) For An area to be considered a bathroom, it shall contain a _____.

- A) Sink
- B) Urinal
- C) Shower and toilet
- D) Shower, bidet, urinal, sink, or toilet

22) When installing a separately derived system, do the requirements of this code call for the use of a Bonding Jumper System?

- A) Yes
- B) No

23) As stated in the 2011 Code, the term Grounding Conductor has been _____.

- A) Added
- B) Revised
- C) Deleted
- D) None of the above

24) The 2008 code had the definition of Ground Fault located in article _____.

- A) 210
- B) 250.2
- C) 310.4
- D) 430.2

25) True or False, A CATV system is now required to be connected to the Grounding Electrode System.

- A) True
- B) False

26) If installing a telephone system in a residential application, you need to bond that system to the _____ of the residence to which you are installing the phone system.

- A) Window seal
 - B) AC unit
 - C) Furnace
 - D) Grounding electrode system
-

Article 100 Definitions. Kitchen.

An area with a sink and permanent provisions for food preparation and cooking.

Kitchen has been revised by adding the word provisions and deleting the word facilities.

Article 100 Definitions. Separately Derived System.

A premises wiring system whose power is derived from a source of electric energy or equipment other than a service. Such systems have no direct connection from circuit conductors of one system to circuit conductors of another system, other than connections through the earth, metal enclosures, metallic raceways, or equipment grounding conductors.

A Separately Derived System has been revised to indicate that there will be no direct connection of the circuit conductors of the two systems. The only connection allowed is between the bonding and grounding conductors.

Article 100 Definitions: Service Conductors Overhead

The overhead conductors between the service point and the first point of connection to the service entrance conductors at the building or other structure.

This is a new definition added in the 2011 Code to indicate the conductors that route through a riser and exit through a weather head. The term service drop now makes it clearer that those are the overhead conductors from the utility to the service point. The service point is where the connection is made between the service overhead conductors and the service drop conductors from the utility.

Article 100 definitions: Service Conductors, Underground.

The underground conductors between the service point and the first point of connection to the service-entrance conductors in a terminal box, meter, or other enclosure, inside or outside the building wall.

This is a new definition added to the 2011 Code to clarify that underground conductors are not always controlled by the utility, and they shall be installed as per the NEC. These are the conductors from the load side of the utility transformer to the service entrance conductors.

Article 100 Definitions: Uninterruptible Power Supply.

A power supply used to provide alternating current power to a load for some period of time in the event of a power failure.

This is a new definition added to the 2011 Code to cover (UPS) systems that provide AC current to equipment in a power loss condition. With the more frequent use of sensitive electronic equipment controlling safety systems, it more important than ever to provide an Uninterruptible Power Supply to keep such electronic systems from crashing and causing disruptions to those critical systems.

Article 110.3(A)(1) informational note.

A new sentence was added and reads as follows:

Special conditions of use or other limitations and other pertinent information may be marked on the equipment, included in the product instructions, or included in the appropriate listing and labeling information.

The revision to this note now takes into account any special conditions that may affect the operation of any such equipment like temperature, weather and power requirements. With the addition of this sentence, the installer is now aware of any special requirements that the manufacturer requires prior to installation that will affect performance and longevity of the equipment.

Article 110.10 Circuit Impedance, Short circuit Current Ratings and other characteristics.

This section was revised in the 2011 Code. The wording Short Circuit current rating was added to the title to make clear the intent of this section.

This section requires that equipment installed will have its short circuit rating equal or larger than the available short circuit current of the source. This is safety measure in the event of a ground fault condition.

Article 110.14 Electrical Connections.

Connectors and terminals for conductors more finely stranded than Class B and Class C stranding as shown in Chapter 9, Table 10, shall be identified for the specific conductor class or classes. Finely stranded wire does not fit in your standard pressure connector or terminal correctly. If you were to use a standard type connector not rated for finely stranded wire, this would result in a poor and possibly hazardous termination.

The new chapter 9 table 10 was added for these types of finely stranded conductors.

Test Questions:

27) A kitchen shall contain permanent areas having a _____.

- A) Sink, food prep and cooking area
- B) Closet
- C) Refrigerator
- D) Dishwasher

28) Under certain circumstances, the phase conductors of the two systems can be directly connected.

- A) True
- B) False

29) Service Conductors Overhead route through a vertical riser and exit by means of a _____.

- A) Grommet
- B) Conduit
- C) Weather head
- D) Ladder

30) The point where the connection between the Overhead service Conductors and the service drop conductors terminate is known as the _____.

- A) Service point
- B) Dead zone
- C) Live wire
- D) Gravity zone

31) Are the conductors from the load side of the utility transformer to the service entrance conductors considered the utility's jurisdiction when run underground?

- A) Yes
- B) No

32) Uninterruptible Power Supply's are usually installed to provide _____ current to critical systems and devices.

- A) Direct
- B) Focused
- C) Alternating
- D) Random

33) With the addition of this sentence to the existing informational note, all equipment shall be installed to the _____ requirements.

- A) AHJ
- B) Local municipality
- C) NEC
- D) Manufacturers

34) True or false, the manufacturer's special conditions requirement can be ignored by a field installation call.

- A) True
- B) False

35) In the event of a ground fault condition, a piece of equipment shall have its short circuit rating be less than the available fault current from the source.

- A) True
- B) False

36) The new table in chapter 9 for finely stranded wire is table _____.

- A) 10
- B) 9
- C) 5B
- D) 5A

37) If using finely stranded wire and you don't have terminals or connectors as stated in Table 10, then the use of standard terminals and connectors is encouraged.

- A) True
 - B) False
-

Article 110.16 Arch Flash Hazard Warning.

The title of this section was changed in the 2011 code from Flash protection to Arc Flash Hazard Warning. The requirement of this section is to apply a label to equipment like panel boards, switchboards, meter sockets industrial control panels, and motor control centers where servicing may be required. The label shall be installed in an area clearly visible to the qualified person to warn of the potential hazard when servicing. This type of label is not required in dwelling units.

Article 110.24(A) Available Fault Current.

This new section was added in the 2011 Code. This section requires service equipment to be field marked legibly with the maximum fault current available as well as the date the calculation was performed. This label must also to be able to stand up to the environment in which the service equipment is installed.

Section (B) of 110.24 requires that if any modifications take place to this system, a new label with the information described in section A is to be added. Dwelling units do not require this label.

Article 110.26(A)(3) Height of Working Space.

The height requirement for electrical equipment with regards to working space is a minimum of 6 1/2 feet or the height of the equipment whichever is higher. If other equipment is installed below or above the electrical equipment, it cannot extend more than 6 inches beyond the front of such equipment.

The 2011 Code has added a new exception (2): which allows a meter to extend more than 6 inches into the dedicated space for the electrical equipment. The meter socket is still limited to the 6 inch rule; additionally, exception(1): allows us to install electrical equipment in spaces less than 6 1/2 feet if in an existing dwelling and the panelboard is less than 200 amps.

Article 110.26(D) Illumination.

The Code now requires that all spaces containing service equipment, panel boards, switchboards, and motor control centers be illuminated, and that the illumination in these areas cannot be controlled by automatic means only. If the room has only automatic control for lighting, then a manual override shall be installed.

Test Questions:

38) An arc flash warning _____ is not required for dwelling units.

- A) Label
- B) Light
- C) Horn
- D) Strobe

39) An arc flash warning label is required to be installed in a _____ visible location to the qualified person.

- A) Obstructed
- B) Low
- C) Clearly
- D) New

40) A Motor Control Center requires an arc flash warning label.

- A) True
- B) False

41) The _____ the fault current calculation was performed as well as the maximum available fault current need to be listed on this label.

- A) Location
- B) Date
- C) Department
- D) Unit

42) If the service equipment is installed in a corrosive area, the label must be designed for that environment.

- A) True
- B) False

43) A service was just upgraded with a new breaker. Section B would then require a new _____ be installed with the same information as required by section A of this Code.

- A) Disconnect
- B) Set of conductors
- C) Set of CT's
- D) Label

44) A new dwelling unit has just been built and brand new service equipment installed. Does this section require a label with the maximum available fault current to be installed as describes in this section?

- A) Yes
- B) No

45) What is the minimum working height space for electrical equipment?

- A) 5 1/2 feet
- B) 6 feet
- C) 6 1/2 feet
- D) 7 feet

46) A meter is now allowed to extend more than _____ inches into the work space.

- A) 2
- B) 4
- C) 5
- D) 6

47) A meter socket is allowed to extend more than 6 inches into the work space.

- A) True
- B) False

48) A piece of equipment has been installed that is 8 Ft. tall. As required by this section, how tall would the work space need to be to accommodate this equipment?

- A) 5 ft.
- B) 6 1/2 ft.
- C) 7 ft.
- D) 8 ft.

49) A gutter needs to be installed above a meter socket to accommodate multiple tenants. The gutter section extends 7 inches into the working space reserved for the equipment. According to this section, would this be acceptable or a violation?

- A) Acceptable
- B) Violation

50) An existing dwelling needs a 100 amp panel installed. However, the available working space is only 6 feet. According to this section, would this be considered a an acceptable installation or a violation?

- A) Acceptable
- B) Violation

51) A room that is used for storage has a panel board installed in this space. Does this room need to be illuminated?

- A) Yes
- B) No

52) An electrical room that houses all a buildings service equipment contains motion activated lighting ONLY. As described in this code, would that be considered acceptable or a violation?

- A) Acceptable
- B) Violation

53) A schools main electrical room that houses all its service equipment contains a motion activated lighting system that is also equipped with a manual override for the lighting in the room at each entrance location. Would this be considered acceptable or a violation according to the code?

- A) Acceptable
- B) Violation

Article 110.28 Enclosure types.

Section 110.28 as well as the 110.28 table has been relocated from section 110.20. This section pertains to enclosure types. While the table has not changed, the verbiage of section 110.28 has added a host of new enclosure types that must be marked with the number and letter classifications listed in the 110.28 table. The numbers and letter are used to designate the type of environment and location an enclosure can be installed. This table and number letter designations apply to enclosures 600v and less.

Article 110.31(A) Electrical vaults.

Electrical vaults for electrical systems 600 volts or greater has been re-organized in the 2011 Code. All electrical vaults will be so constructed as to give a 3 hour fire rating for such a vault. The use of concrete is the acceptable method for construction. Stud and wall board construction for an electrical vault is not acceptable.

A new exception allows Vaults to now be so constructed for the roofs and walls to allow a 1 hour fire rating provided an automatic fire suppression system is installed. Transformer requirements now point us to part III of article 450.

Test Questions:

54) Section 110.28 and its corresponding table have been moved from section _____.

- A) 110.20
- B) 110.23
- C) 110.34
- D) 110.5

55) The enclosure types listed in table 110.28 only apply to enclosures _____ volts and below.

- A) 240
- B) 300
- C) 480
- D) 600

56) The numbers and letters listed in table 110.28 are used to designate the type of _____ an enclosure should be installed.

- A) Building
- B) Space
- C) Environment
- D) Room

57) Table 110.28 changed when it was moved from section 110.20.

- A) True
- B) False

58) Electrical vaults are required to provide a _____ hour fire rating.

- A) 2
- B) 3
- C) 7
- D) 8

59) Would the construction of an electrical vault from studs and wallboard be considered acceptable or a violation?

- A) Acceptable
- B) Violation

60) If an electrical vault has a fire suppression system installed, it can now have its structure designed and built to provide a _____ hour fire rating.

- A) 1
- B) 2
- C) 3
- D) 5

61) Article 110.31(A) points us to part _____ of article 450 for additional requirements for transformers.

- A) II
- B) III
- C) IV
- D) VII

62) Construction of an electrical vault is for systems 600 volts and _____.

- A) Larger
- B) Lower

63) True or False, Concrete is not an acceptable method of construction for an electrical vault.

- A) True
- B) False

Article 200.2(B) Continuity.

Informational note: See 300.13(B) for the continuity of grounded conductors used in multi-wire branch circuits.

A new informational note was added for the 2011 Code. This note now points us to section 300.13(B) with regards to continuity of the grounded conductor in a multi-wire branch circuit. This section simply states that if the grounded conductor was disconnected for any reason at a device, it shall not affect the grounded conductor

downstream for any other devices. A device connection is not acceptable to ensure that the neutral can maintain continuity. Wire nut the neutral before connecting it to any device as to ensure the integrity of the neutral if a device were to fail for any reason.

Article 200.4 Neutral Conductors.

This is a completely new section added for the 2011 Code. This new section makes clear that the neutral conductor shall not be used for more than one multi-wire branch circuit, branch circuit, and ungrounded feeder conductors. There are other areas in this code where this practice is acceptable, but shall only be used where specifically allowed.

Article 200.6(D) Grounded Conductors of Different Systems.

If the (Neutral) Grounded Conductor of different systems shares the same raceway, then each system grounded conductor must be identified independently by system. A color scheme was required by the 2008 code as well as a permanent way of marking posted on the panelboards from which the grounded conductor was sourced.

The 2011 Code allows for an alternate method for this marking as long as the information is documented in a manner that is readily available. This means that the permanent method of marking is now not required as long as the information is documented and readily available.

Article 210.4(B) Disconnecting means. Multi-wire Branch Circuit.

For the 2011 Code, a new informational note was added that directs us to 240.15(B) for the use of single pole breakers when installing multiwire branch circuits. This section allows the use of single pole breakers on multiwire branch circuits provided they have identified handle ties. A multiwire branch circuit would be 2 or 3 ungrounded conductors sharing a common neutral. For example: Black, Red, Blue and one common white neutral. A multiwire branch circuit sharing a common neutral is not just for a multiwire cable. Three individual conductors sharing a common neutral in a raceway is also considered a multiwire branch circuit and subject to this code. When one phase trips, the code requires the other phase conductors to be disconnected as well. Article 240.15(B) allows us to use single pull breakers also instead of just 2pole and 3pole breakers.

Test Questions:

64) A new _____ note was added to article 200.2(B) with regards to the grounded conductor.

- A) Fine print
- B) Disclosure
- C) Informational

65) Would connecting a neutral directly to a device to ensure continuity downstream be considered acceptable or a violating?

- A) Acceptable
- B) Violation

66) An acceptable method to ensure the integrity of the grounded conductor (neutral) to devices downstream would be to wire nut the grounded conductor together before connecting it to a device.

- A) True
- B) False

67) The new informational note added to article 200.2(B) now directs us to look in _____ with regards to continuity of the grounded conductor in a multiwire branch circuit.

- A) 202.4
- B) 250.66
- C) 300.13
- D) 300.13(B)

68) Article _____ was added to the 2011 Code to specify how a neutral can be used with regards to a branch circuit, multi wire branch circuit, and ungrounded feeder conductors.

- A) 200.3
- B) 200.4
- C) 220
- D) 318

69) Under no circumstance will a neutral be allowed to be used for more than one branch circuit, multiwire branch circuit, or set of ungrounded feeder conductors.

- A) True
- B) False

70) When the grounded conductor of multiple sources share the same raceway, a permanent marking is no longer required on the panelboard as long as the information is documented and readily _____.

- A) Used
- B) Explained
- C) Available
- D) Accessed

71) The 2011 Code still requires a panelboard to have a permanent label installed indicating where the grounded conductor is sourced when sharing a common raceway with other grounded conductors from different sources.

- A) True
- B) False

72) Article 210.4(B) informational note now directs us to section _____ .

- A) 240.10
- B) 240.12
- C) 240.15(B)
- D) 230.5

73) True or False, a multiwire branch circuit is only considered such if it is a factory produced cable containing ungrounded conductors sharing a single grounded conductor.

- A) True
- B) False

74) When installing a multiwire branch circuit, would this code consider the use of single pole breakers for the ungrounded conductors without identified handle ties acceptable or a violation?

- A) Acceptable
- B) Violation

75) Is it acceptable or a violation for multiwire branch circuit phase conductors to terminate on a 2 pole or 3 pole breaker?

- A) Acceptable
- B) Violation

76) True or false, a branch circuit is considered a multiwire branch circuit when two or more ungrounded conductors share a common neutral.

- A) True
- B) False

Article 210.5(C) Identification of Ungrounded Conductors.

This section has been revised to now indicate 3 separate requirements when identifying the ungrounded conductors. The requirements are as follows:

- (1) Application: the ungrounded conductors shall be identified by phase or line.
- (2) Means of Identification: the permitted methods are marking tape, color coding, tagging or other approved methods.
- (3) Posting of Identification means: A permanent posting at the panelboard where the circuits are sourced.

This change makes it clearer to the reader and easier to meet the requirements as described in this code.

Article 210.6(C)

Light emitting Diodes (LEDs) have now been incorporated into this code revision where it addresses the code requirements for luminaires. LEDs are very efficient and reduce the cost to operate over their incandescent counter parts. These are solid state devices that convert electrical energy into a single color light. These apply to circuits that are 277 volts or less to ground.

Article 210.8 Ground Fault Circuit interrupter protection for personnel.

Ground Fault circuit interrupters are required to be installed where a shock hazard is the greatest. A Ground Fault circuit interrupter is required to be readily acceptable. This section applies to Ground Fault circuit interrupters installed in dwellings and public places. A Ground Fault circuit interrupter should be tested regularly to ensure the proper operation.

Article 210.8(A)(7). Ground fault Circuit interrupter within 6 feet of a sink.

The 2011 Code recognizes sinks may be installed in a dwelling unit other than in traditional areas. The Code requires all receptacles installed within 6 feet of a sink other than kitchens to be GFCI protected.

Test Questions:

77) Would it be acceptable or a violation for the ungrounded conductors to be identified by phase or line?

- A) Acceptable
- B) Violation

78) The 2011 Code has revised section 210.5(C) to include _____ separate requirements for identifying the ungrounded Conductor.

- A) 1
- B) 2
- C) 3
- D) 11

79) Is the use of marking ungrounded conductors with marking tape acceptable or a violation?

- A) Acceptable
- B) Violation

80) According to this code, is it required or suggested that the panel board have a permanent marking to indicate the identification of the ungrounded conductors.

- A) Suggested
- B) Required

81) LEDs are permitted to be used on circuits that are _____ volts or less to ground.

- A) 277
- B) 480
- C) 600
- D) 1000

82) LED stands for?

- A) Light Escaping Device
- B) Large Electric Device
- C) Large Echoing Discharge
- D) Light Emitting Diode

83) An LED is a _____ state device that emits light of a single color.

- A) Air
- B) Sound
- C) Solid

84) A Ground Fault circuit interrupter is required where a _____ hazard potentially exists.

- A) Acceptable
- B) Shock
- C) New
- D) Old

85) As a matter of safety, a GFCI should be _____ regularly to ensure its proper operation.

- A) Tested
- B) Used
- C) Replaced
- D) Re-designed

86) A GFCI is only required in dwelling units.

- A) True
- B) False

87) Would it be considered acceptable or a violation if a GFCI was installed behind a refrigerator.

- A) Acceptable
- B) Violation

88) This Code requires a GFCI receptacle to be installed within _____ feet of a sink.

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

89) In a dwelling, a receptacle is required to be GFCI protected within 6 feet of a sink other than in a

- A) Bedroom
- B) Closet
- C) Kitchen
- D) Rec. room

Article 210.8(B)(6) GFCI protection other than Dwelling Units. Indoor Wet Locations.

Commercial areas where daily a washdown of the facilities occurs or the nature of the business is wet, all 125v 15 and 20 amp receptacles are required to be GFCI protected. When people use hoses to wash down their work area, they are subject to shock hazards associated with this activity. The GFCI requirement is to protect personnel from this shock hazard.

Article 210.8(B)(7) GFCI Protection for Personnel Other than Dwelling Units. Locker Rooms

This section tells us that locker rooms that have associated showering facilities will have their receptacles GFCI protected. The shower area would not be the only wet area in this facility as many people or clothes may be wet when they finish showering and go to the dressing area. It would not be surprising that all receptacles in these areas will be required to be GFCI protected by the AHJ.

Article 210.8(B)(8) GFCI Protection for Personnel Other than Dwelling Units. Garages, service bays and similar areas

All 125 volt 15 and 20 amp receptacles outlets in garages, service bays, and similar areas are required to be GFCI protected. This is a significant addition to this code cycle and recognizes the use of equipment and hand tools for these areas. It is likely a liquid may be spilled or brought into these areas and with that likelihood, personnel could be exposed to a shock hazard while using equipment associated with this type of work.

Article 210.12(A) Exception 1&2. Arc Fault Circuit Interrupter Protection. Dwelling Units

Exception (1) A new device will be available that is an AFCI receptacle. This device will look very similar to a GFCI. The AFCI receptacle will be installed as the first device on a branch circuit and provide AFCI protection downstream. The AFCI receptacle can be used for AFCI protection for a branch circuit if the serving branch circuit conductors are installed in EMT, MC, IMC, RMC and steel AC Cable.

Exception (2): will permit the conductors feeding this new AFCI receptacle to be run in non-metallic or metallic tubing as long as it is encased in at least 2 in of concrete to the first outlet. If encased in a minimum of 2 inches of concrete, enough protection will be available to prevent staples, screws, or nails from damaging the conductors feeding this receptacle.

Article 210.12(B) Branch Circuit Modifications or Extensions.

Any modifications to branch circuits in existing dwellings that did not require to be AFCI protected, the 2011 Code now requires that they shall be upgraded with AFCI protection if modified or extended and the 2011 Code now requires those areas to be AFCI protected. The Branch circuit conductors providing power to the first AFCI outlet will also need to be protected with EMT, IMC, MC, RMC, or steel type AC. Upgrading the modified circuit with an AFCI breaker or Receptacle could be accomplished with little issue, but protecting the branch circuit conductors to the first AFCI device may present more of an issue.

Test Questions:

90) Where indoor wet locations exist due to equipment being washed down or just the nature of the business is considered a wet location, all receptacles shall be provided with _____ protection.

- A) AFCI
- B) GFCI
- C) Fault
- D) Electric

91) A GFCI receptacle is installed to protect _____ from a shock hazard.

- A) Equipment
- B) Siding
- C) Windows
- D) Personnel

92) A locker room that has an associated shower facility is required to have its receptacles _____ protected.

- A) AFCI
- B) GFCI
- C) Ground Fault

93) A 15amp receptacle is installed in a commercial automotive repair shop, would this receptacle be required to be GFCI protected or not protected?

- A) Protected
- B) Not protected

94) A new _____ receptacle should be coming out this cycle and will provide the same circuit protection as the breaker does.

- A) EFIC
- B) LMAO
- C) LOL
- D) AFCI

95) Would Romex be considered acceptable or a violation to provide the branch circuit power from the electrical panel to the first AFCI Receptacle?

- A) Acceptable
- B) Violation

96) A listed non-metallic or metallic raceway can be used to provide the branch circuit power from the electrical panel to the first AFCI receptacle provided at least _____ inches of concrete encase the raceway.

- A) 2
- B) 1 1/4
- C) 3/4
- D) 5/8

97) The branch circuit conductors feeding an AFCI receptacle must be _____ to prevent staples, screws, or nails from damaging the conductors feeding this receptacle .

- A) Allowed
- B) Used
- C) Protected
- D) Attached

98) True or False, If an existing branch circuit is modified and the 2011 code requires that circuit to be AFCI protected, but the code at which the circuit was originally installed did not, the 2011 Code now requires you to make that circuit AFCI protected.

- A) True
- B) False

99) If an existing branch circuit now needs to be upgraded to an AFCI outlet, the branch circuit conductors from the panel to the first AFCI outlet now need to be protected in EMT, IMC, MC, RMC, or steel type AC.

- A) True
- B) False

Article 210.52(A)(4). Dwelling Unit Receptacle Outlets. General Provisions. Counter top Receptacles.

Receptacles installed at countertop locations that have Fixed Cabinets cannot be counted as the receptacles required at the floor line. All wall spaces that are 2ft. or more in width and unbroken at the floor line by fireplaces, doorways, and fixed cabinets require a receptacle. If measured along a floor line, a receptacle cannot be more than 6ft. from a receptacle outlet.

Article 210.52(C)(5). Dwelling Unit Receptacle Outlets. Counter Tops. Receptacle Outlet Locations.

This section was revised in the 2011 Code to now include pop up type receptacles that can be installed in counter tops. The section still does not allow a standard receptacle to be installed in a countertop face up. The locations permitted for this new listed pop up style receptacle are kitchens and bathrooms. When these pop up receptacles are closed, they become de-energized and only become energized when in the fully extended position.

Article 210.52(E)(3). Dwelling Unit Receptacle Outlets. Outdoor Outlets. Porches, Balconies, and Decks

In the 2008 Code, Porches, Balconies, and Decks that were less than 20 square feet were not required to have a receptacle installed.

The 2011 Code deleted this provision as it recognized people would run extension cords from inside their dwellings to add holiday lights. The general receptacles inside dwelling are not GFCI protected so the 2008 provision was creating unintended hazards. Now all Porches, Balconies, and Decks regardless of size that are accessible from inside the dwelling require a GFCI protected outlet.

Article 210.52(G)(3). Dwelling Unit Receptacle Outlets. Basements, Garages, and Accessory Buildings.

The 2011 Code has now recognized that accessory buildings usually serve the same function as garages attached and detached, basements, and now accessory buildings that have electric power require at least one 120v 15 or 20 amp GFCI protected outlet. This provision only applies to single family dwellings.

Test Questions:

100) A countertop receptacle counts towards the floor line receptacle requirement.

- A) True
- B) False

101) Wall spaces that are _____ ft. or more in width and unbroken at the floor line require a receptacle.

- A) 1
- B) 2
- C) 5
- D) 12

102) When measured along a floor line of a wall, no point can be more than _____ ft. from a receptacle outlet.

- A) 3
- B) 4
- C) 5
- D) 6

103) Would it be considered acceptable or a violation to install a standard receptacle face up in a kitchen or bathroom countertop?

- A) Acceptable
- B) Violation

104) The 2011 Code now allows a new listed rated receptacle assembly to be installed in counter tops.

- A) True
- B) False

105) When a listed countertop receptacle is installed and in the closed position, the design is such that the receptacle assembly is _____.

- A) Energized
- B) De-energized
- C) Hot
- D) Ready

106) The 2008 code used to allow a Porch, Balcony, and Deck that was less than _____ square feet to not require a receptacle outlet.

- A) 20
- B) 25
- C) 30
- D) 35

107) A receptacle outlet is required for _____ decks, porches, and balconies regardless of size.

- A) Some
- B) Most
- C) All
- D) Listed

108) The receptacle now required on all porches, balconies, and decks shall be _____ protected.

- A) AFCI
- B) GFCI
- C) Used
- D) White

109) At least _____ receptacle outlet is required to be installed in accessory buildings.

- A) Zero
- B) One
- C) Two
- D) Three

110) The receptacle now required for accessory buildings shall be _____ protected.

- A) AFCI
- B) OCI
- C) GCFI
- D) GFCI

Article 210.52(G)(3). Dwelling Unit Receptacle Outlets. Basements, Garages, and Accessory Buildings

The 2011 Code has now recognized that accessory buildings usually serve the same function as garages attached and detached, basements, and now accessory buildings that have electric power require at least one 120v 15 or 20 amp GFCI protected outlet. This provision only applies to single family dwellings.

Article 210.52(I). Dwelling Unit Receptacle Outlets. Foyers

If a foyer is not part of a hallway and has an area that is greater than 60 square feet, it shall have receptacles installed at each wall space that is 3 feet or more in width.

Article 220.43(B) Track Lighting

The previous versions of this code required that track lighting calculations would be based on 150 volt amps for every 2 ft. of track lighting to be installed. The 2011 Code now allows track lighting calculations to be based on the requirements of the actual lighting track to be installed instead of some over engineered number.

Article 225(7) Lighting Equipment Installed Outdoors 277v to Ground

Prior to the 2011 Code, luminaires over 120v, 208v, 240v but not exceeding 277v to ground were required to be a minimum of 3 ft. away from platforms, windows, and fire escapes for industrial and commercial facilities. The 2011 Code has changed this requirement and now no longer requires this 3 ft. rule. In short, luminaires not exceeding 277v to ground can be installed at any distance from any opening in stores, schools, platforms, windows, and fire escapes for industrial and commercial facilities.

Article 225.18(5) Clearance for Overhead Conductors and Cables, Overtrack Rails of Rail Roads

For the 2011 Code, a new outside feeder and branch circuit clearance requirement was added with regards to these conductor types crossing rail road tracks. This new rule requires a minimum distance of 24.5 ft must be maintained when crossing railroad tracks. This requirement pertains to the lowest point in the run.

Article 225.27 Raceway Seals

A new section was added for this code cycle which requires all underground raceways entering a building or structure to be sealed. This section applies to conduits that have conductors as well as spare empty conduits. This applies to both ends of the raceway system.

Test Questions:

111) The new provision regarding accessory buildings only applies to multifamily dwellings.

- A) True
- B) False

112) A foyer that is _____ square feet or larger shall fall under the provisions of this code.

- A) 22
- B) 39
- C) 55
- D) 60

113) An area that is classified as a foyer according to this code shall have a receptacle installed at all wall spaces _____ feet or more in width.

- A) 1
- B) 2
- C) 3
- D) 4

114) The previous version of this code required all track lighting to be installed at 150 volt amps for every _____ ft. of lighting track.

Value

- A) 2
- B) 4
- C) 5
- D) 6

115) If installing a track light system that required the system to be calculated at 75 volt amps for every 5 feet of track, would calculating the load based on the actual track light requirement be considered acceptable or a violation under the 2011 Code?

- A) Acceptable
- B) Violation

116) The maximum voltage a luminaire can be to ground within 3 feet of any platform, window, or fire escape for industrial and commercial facilities is?

- A) 277
- B) 480
- C) 600
- D) 4160

117) Would it be considered acceptable or a violation for a luminaire operating at 277v to ground to be installed within 1 ft. of a main entrance of a grocery store with heavy public foot traffic?

- A) Acceptable
- B) Violation

118) When overhead conductors cross a railroad track, a minimum distance of _____ ft. must be maintained.

- A) 18
- B) 24
- C) 24.5
- D) 25

119) Is it suggested or required that conduits entering from underground be sealed?

- A) Required
- B) Suggested

120) This section requires conduits that have conductors installed to be sealed, but it also requires that _____ conduits be sealed as well. This requirement extends to both ends of the raceways.

- A) RMC
 - B) PVC
 - C) EMT
 - D) Spare
-

Article 225.30 Number of Supplies

New requirements for a second building being supplied by a feeder or branch circuit from a different building have been added. This section now requires that when you supply a feeder or branch circuit to a second building, the second building can only supply one feeder or branch circuit back to that first building. This new change allows a multiwire branch circuit to be counted as a single circuit.

Article 225.52 (C) and (D) Locking-Indicating

This section of the code with regards to disconnects of over 600 volts has been extensively changed.

Section (C) has been added to indicate that a disconnect shall be capable of being locked in the open position without any type of a special lock, even if no lock is installed, the disconnect shall remain in the open position. Section (D) tells us that all disconnects shall clearly be able to indicate whether they are in the open or closed (on or off) position.

Article 225.52 Disconnecting means over 600v (E) & (F) Uniform Position-Identification

These new sections were added for the 2011 Code Cycle for disconnects operating at over 600V.

Section (E) Uniform Position: All disconnects that are single pole are now required to be designed in such a way that when operated vertically, the up position when throwing the handle is the ON position.

An Exception was added to this section which indicates a double throw or a disconnect with more than one ON position does not need to comply with section (E) of this Code.

Section (F) Identification: This section requires a permanent plaque or directory be installed at every branch circuit or feeder location disconnecting means which indicates what source and area is being disconnected.

Article 225.56 Inspections and Tests

All new distribution systems 600v and over are now required to be tested on site before they become energized. A test report which includes all tests that were performed and their outcome shall be given to the Authority Having Jurisdiction. The AHJ must approve that all systems have been tested to their satisfaction before allowing the system that was tested to become energized.

Test Questions:

121) If building 1 supplies power to building 2, building 2 at that point can only send _____ branch circuit or feeder back to building 1.

- A) One
- B) Two
- C) Three
- D) Four

122) Would it be acceptable or a violation to supply more than one circuit back to a building that it was being fed from provided these circuits were considered a multiwire branch circuit?.

- A) Acceptable
- B) Violation

123) Once a disconnect is in the _____ position, no lock will be required to hold it in that position.

- A) Tripped
- B) Used
- C) Open
- D) Neutral

124) All disconnects shall clearly state whether they are in the open or closed (on or off) position.

- A) True
- B) False

125) When a single pole disconnect is operated vertically, the up position shall indicate the circuit or feeder is _____.

- A) Off
- B) Open
- C) Tripped
- D) On

126) If a disconnect has more than one ON position, the up position will always indicate the ON position.

- A) True
- B) False

127) A _____ plaque or directory is now required at every disconnect or switch to indicate source and area to which it serves.

- A) Permanent
- B) Temporary
- C) White
- D) Yellow

128) A distribution system operating at _____ volts or greater must have all its components tested before it can be energized.

- A) 240
- B) 300
- C) 480
- D) 600

129) When a test report is completed, the report shall be given to the _____ for their approval.

- A) AHJ
- B) CPA
- C) Engineer
- D) Owner

130) Would it be considered acceptable or a violation to energize a distribution system operating at 600v or greater before the Authority Having Jurisdiction approves such a system?

- A) Acceptable
- B) Violation

Article 225.70(A)(1) Substations-Warning Signs.

This section applies to customer owned substations with regards to signs that are now required at points of access to conductors and raceways, entrances to electrical equipment, and cable tray systems that have High Voltage cable installed in them. Cable tray signs with High Voltage cables installed will have signs spaced no more than 3 ft. apart warning of the hazard. The signs that shall be located at these areas shall read "DANGER-HIGH VOLTAGE"

Article 230.6(5) Conductors Considered Outside Buildings.

This new addition to the 2011 Code now recognizes that a service mast that passes through an eave of a building has its raceway and conductors considered outside the building. The section also points us to 230.24 which describe clearances required above roofs driveways and the like.

Article 230.24 Ex No (5) Clearance above Roofs

The requirements of this new exception allow conductors not more than 300v between conductors to pass over a roof area not less than 3 ft. if the roof area is guarded or isolated and there is no readily accessible access to where the conductors pass. This would mean the roof for which the conductors pass do not have ladders, steps, or stairs that lead to the roof; additionally, if the area was fenced off or enclosed where the conductors pass, this would be considered acceptable as well.

Article 230.40 Ex. No. 1 Number of Service Entrance Conductor Sets

The 2011 Code has added language requiring the posting of signs at each service disconnect location for a multi-occupancy building. If not more than 6 service disconnects are installed, a permanent plaque will be installed on each disconnect which will state the location of the other service disconnects. If more than 6 service disconnects are installed, then one or more plaques will be installed in a readily accessible location as close to the attachment point of each set of service entrance conductors. These plaques will describe the locations of all service disconnects when there are more than 6.

Test Questions:

131) The section, substation-warning signs, applies to _____ owned substations.

- A) Utility
- B) Private
- C) Customer
- D) Public

132) A cable tray system has high voltage cables running its full length, the signage requirement is such that every _____ ft. of cable tray shall have a sign warning of the hazard.

- A) 3
- B) 4
- C) 5
- D) 6

133) At points of access to conductors, raceways, and entrances to electrical equipment in substations, they shall have signs in obvious locations that read " _____ ".

- A) Energized
- B) Live Equipment
- C) Hot Conductors
- D) Danger High Voltage

134) If conductors in a raceway pass through an eave of a building, would they be considered inside or outside the building?

- A) Inside
- B) Outside

135) Conductors and raceways that pass through eaves on the outside of a building still need to follow the clearances portion of this code.

- A) True
- B) False

136) Conductors that pass over a roof at exactly 3 ft would be allowed if the conductors were not over _____ volts between conductor and not readily accessible.

- A) 300
- B) 480
- C) 575
- D) 600

137) Would it be considered acceptable or a violation if a roof access ladder system was installed where conductors pass over a roof area at 3 ft.

- A) Acceptable
- B) Violation

138) An approved method for Conductors that pass over a roof at exactly 3 ft shall also be allowed to do so if the area is _____ off.

- A) Tore
- B) Taken
- C) Fenced
- D) Rolled

139) A permanent plaque is required to be installed at every disconnect when there are _____ or less installed in a multi-occupancy building.

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

140) A plaque that indicates the _____ of each service disconnect will be placed on every disconnect when there are 6 or less.

- A) Color
- B) Location
- C) Direction
- D) None of the above

141) When more than _____ service disconnects are installed in a multi occupancy building, one or more plaques must be installed in a readily accessible location that describe the location of all service disconnects.

- A) 3
- B) 4
- C) 5
- D) 6

142) When more than six service disconnects occupy a multi- occupancy building, a common plaque needs to be installed as close to the point of attachment for each of the service disconnects indicating their locations.

- A) True
- B) False

Article 230.40 Ex. No. 4 Number of Service Entrance Conductor sets.

This exception has added language including Multi-occupancy buildings.

This now allows a separate set of service entrance conductors to power a common area house panel to feed areas like hallways, storage facilities, parking garages, and the like. Common areas like the ones described are now allowed to be fed by common panel board supplied by a separate set of service entrance conductors.

Article 230.42(A)(1) Exception: Minimum Size and rating.

This new exception allows the grounded conductor to be sized at 100% of the continuous load if is not connected to the overcurrent device.

Ungrounded service entrance conductors are required to be sized at 125% of the continuous loads. This is done to prevent heat buildup and prevent nuisance tripping. Since the grounded conductor is rarely connected to the overcurrent device, there is no need to size it to prevent nuisance tripping.

Article 230.44 Cable Trays

This new revision requires cable trays containing only service conductors to be labeled with the wording Service Entrance Conductors. The labels must be installed the entire length the service cables travel so the conductors can be traced. Service entrance conductors shall be limited to the following methods:

- (1) Type SE Cable
- (2) Type MC Cable
- (3) Type MI Cable
- (4) Type IGS Cable
- (5) Single thermoplastic-insulated conductors 1/0 and larger with a CT rating.

Section 230.66 Marking

The revision to this section now requires that all service equipment shall now be listed and service equipment 600 volts or less shall also be marked to identify that it can be used as service equipment. An individual meter socket enclosure shall not be considered as service equipment according to the NEC.

Test Questions:

143) Would it be considered acceptable or a violation for a separate set of service conductors to feed a common load house panel in a multi-occupancy building.

- A) Acceptable
- B) Violation

144) If the _____ conductor does not connect to an overcurrent device, it can be sized at 100% of the continuous load.

- A) Phase
- B) Green
- C) Grounded
- D) High leg

145) The reason behind sizing the ungrounded service entrance conductors at 125% for continuous loads when connected to the overcurrent device is to prevent _____ tripping.

- A) Probable
- B) Serious
- C) Multiple
- D) Nuisance

146) The grounded conductor can be sized at _____ of the continuous load if not connected to the overcurrent device.

- A) 80%
- B) 90%
- C) 95%
- D) 100%

147) Cable trays that contain only service entrance conductors shall be labeled with the wording _____.

- A) Service Cables
- B) Service Entrance Conductors
- C) Cables Service
- D) Entrance Conductors

148) The service entrance cable installed in a cable tray shall be marked its entire length so the conductors can be _____.

- A) Traced
- B) Colored
- C) Meggared
- D) Supported

149) Type IGS cable is permitted to be used for _____.

- A) Direct burial
- B) Messenger wire
- C) Spas
- D) Service Entrance Conductor

150) Single thermoplastic-insulated conductors _____ and larger with a CT rating can be used for service entrance conductors.

- A) 1/0
- B) # 4
- C) # 1
- D) # 3

151) Individual meter sockets _____ be considered service equipment.

- A) Will
- B) Shall
- C) Shall not
- D) Can

152) All service equipment is now required to be _____.

- A) Rated
- B) Listed
- C) Designed
- D) Natural gray

153) All service equipment _____ volts or less shall also be marked to identify that it can be used as service equipment.

- A) 600
 - B) 675
 - C) 780
 - D) 1000
-

Article 230.72(A) Exception. Grouping of Disconnects.

Service disconnects are required to be grouped, but this new marking requirement allows a fire pump disconnect to be mounted remotely away from the other service disconnects. What this code revision does require is a plaque to be posted with the other service disconnects that describes where the fire pump disconnect is located.

Article 230.82(9) Equipment Installed to the Supply Side of Service Disconnect.

This revision pertains to new smart grid systems that are being installed throughout the country. Connections for listed communications equipment under the control of the utility is now able to be connected to the supply side of the service disconnect, or meter socket disconnecting means. This communication equipment can tell the serving utility if customers lose power, monitor power consumption, and even de-energize power to a location if in an emergency situation. This technology will allow the utility to control all power remotely to a single point of connection without having to manually send people to the specific locations.

Article 230.205(A) Services Exceeding 600 Volts. Disconnecting Means. Location.

A disconnecting means for services 600v or greater does not have to be in a readily accessible location when located on private property. However, a readily accessible method to disconnect the service will be provided either through mechanical or an electronic means.

Article 240.4 Protection of Conductors. Informational note.

A new informational note was added which points to the use of Insulated Cable Engineers Association standards formula (ICEA) when determining the allowable short circuit currents for insulated copper and aluminum conductors. This formula is used to determine if a conductors insulation would be damaged in a short circuit condition.

Test Questions:

154) A firepump disconnect is allowed to be installed _____ from the other service disconnects.

- A) In a vault
- B) Remotely
- C) In a gated area
- D) In a locked room

155) A plaque will be located with the other service disconnects that describes the _____ of the fire pump disconnect.

- A) Street
- B) Combination
- C) Location
- D) Address

156) New utility controlled communications equipment connects to the _____ side of the service disconnect.

- A) Load
- B) Fuse
- C) Supply
- D) Breaker

157) Listed communications equipment connected to the supply side of a service disconnect will be under the control of the serving _____.

- A) Utility
- B) AHJ
- C) City
- D) Corps of engineers

158) The serving utility could remotely disconnect all power to a location if required using their new smart grid communications equipment.

- A) True
- B) False

159) A service disconnecting means does not have to be readily accessible for systems over _____ volts if located on private property.

- A) 300
- B) 480
- C) 575
- D) 600

160) A disconnect that services a system 600v or greater does not have to be readily _____ if located on private property.

- A) Located
- B) Accessible
- C) Used
- D) Listed

161) Would it be considered acceptable or a violation to have no readily available method to disconnect a service operating at 600 volts or greater.

- A) Acceptable
- B) Violation

162) A service disconnect that operates at 600 volts or greater is required to have a readily accessible method to be disconnected either through a mechanical or _____ linkage if located on private property.

- A) Electronic
- B) Crank
- C) Spindle
- D) Flat

163) The ICEA formula is used to determine the allowable _____ currents for copper and aluminum conductors.

- A) Eddy
- B) Hysteresis
- C) Copper loss
- D) Short circuit

164) The main function of the ICEA formula is to determine if a conductors _____ would be damaged in a short circuit condition.

- A) Electrons
 - B) Strands
 - C) Insulation
 - D) Valance band
-

Article 240.15(B)(1) Ungrounded Conductors. Circuit Breaker

Individual single pole circuit breakers can be used for multiwire branch circuits provided that identified handle ties are used and they only serve single phase loads.

Article 240.21(B)(1) Location in Circuit. Feeder Taps Not over 10 feet long.

The 2011 Code has simplified how to determine the size of tap conductors that are 10 feet or less when the conductors leave the enclosure where the tap has been made. The section tells us that we can size the tap conductors at one tenth of the overcurrent device protecting the feeder conductors. Simple division allows us to determine the size of the tap conductors. For example: A 600 amp feeder, a 10 ft tap must be rated at 60amps. ($600/10 = 60$)

Article 240.24(E) Location in or on Premises. Not located in bathrooms.

Locating a subpanel in a dormitory bathroom has been added to a location where a subpanel cannot be installed. A dormitory bathroom is used in a similar fashion as a dwelling unit bathroom.

Article 240.87 Non-instantaneous Trip

This new section requires that when not using instantaneous trip circuit breakers documentation shall be available to qualified personnel who work on such breakers as to the breakers location. When a breaker is used without an instantaneous trip 3 equivalent methods shall be used:

- (1) Zone selective interlocking: This method allows an upstream, and a downstream breaker to talk with one another which allows a faster clearing time when needed.
 - (2) Differential relaying: This method monitors the upstream and downstream breakers current.
 - (3) An energy reducing maintenance switch: this type of switch allows the qualified individual to set the breaker to an instantaneous trip position.
-

Test Questions:

165) Single pole circuit breakers can be used for multiwire branch circuits provided they only use _____ handle ties.

- A) New
- B) Greenlee
- C) Klein
- D) Identified

166) Would it be considered acceptable or a violation if 3 single pole circuit breakers were tied together with a piece of number 14 copper for use on a multiwire branch circuit.

- A) Acceptable
- B) Violation

167) When tap conductors are _____ ft or less, they can be sized at 1/10 of the feeder conductor OCPD when leaving the enclosure where the tap is made.

- A) 10
- B) 11
- C) 15
- D) 25

168) Tap conductors that are 10 ft. or less leaving an enclosure that has a 400 amp OCPD for the feeders can be sized at _____ of the 400 amps.

- A) 1/10
- B) 1/15
- C) 1/17
- D) 1/20

169) Would it be considered acceptable or a violation to use the one tenth rule to size tap conductors if the tap length is 20 ft.

- A) Acceptable
- B) Violation

170) A feeders OCPD is 200 amps. What is the minimum size tap conductors rating required if the tap conductors leave the enclosure and are not over 10ft?

- A) 10 amps
- B) 15 amps
- C) 16 amps
- D) 20 amps

171) Would it be considered acceptable or a violation to install a subpanel in dormitory bathroom.

- A) Acceptable
- B) Violation

172) As described in 240.87, how many equivalent methods are listed to limit the energy potential when not using an instantaneous trip breaker?

- A) 3
- B) 4
- C) 6
- D) 9

173) A method that allows an upstream and a downstream breaker to talk with one another which allows a faster clearing time when needed is?

- A) Energy reducing maintenance switch
- B) Differential relaying
- C) Zone selective interlocking

174) A method that monitors the upstream and downstream breakers current is?

- A) Energy reducing switch
- B) Differential relaying
- C) Zone selective interlocking

175) A type of switch that allows a qualified individual to set the breaker to an instantaneous trip position.

- A) Energy reducing maintenance switch
 - B) Differential relaying
 - C) Zone selective interlocking
-

Article 240.91(B) protection of Conductors in Supervised Industrial Locations

This new addition to the code permits circuits rated over 800 amps to use the next standard size overcurrent device in supervised industrial locations. If using this rule, the conductor's ampacity rating shall be equal to or 95% of the overcurrent protective device. Additionally, all the equipment where the conductors terminate shall be listed and marked for the application.

Article 250.2 Supply Side Bonding Jumper

This new definition was added for this code cycle and states: A conductor installed on the supply side of a service or within a service equipment enclosure(s), or for a separately derived system, that ensures the required electrical conductivity between metal parts required to be electrically connected.

Article 250.21(C) Ground Detectors. Marking

Subsection (C) was added in the 2011 Code. This section requires ungrounded systems to be marked at the source of the first disconnecting means. The marking at this location shall read "Ungrounded System " and the marking must be legible and able to withstand the environment where it is located.

Article 250.24(C)(1)&(2) Grounded Conductor Brought to Service Equipment.

Some verbiage changes have taken place with regards to this article concerning the grounded conductor. When installed in a single raceway, the grounded conductor cannot be smaller than the grounding electrode conductor selected from 250.66; furthermore, the grounded conductor is not required to be larger than the ungrounded conductors.

If the ungrounded service conductors are installed in parallel in more than one raceway, then the grounded conductor must be installed in parallel as well. Table 250.66 will be used to select the grounded conductor based on the size of the largest service entrance conductors and shall not be smaller than 1/0 when run in parallel.

Test Questions:

176) Would it be considered acceptable or a violation to use the next standard size circuit breaker over 800 amps in a commercial setting.

- A) Acceptable
- B) Violation

177) Using the next standard size overcurrent protective device over 800 amps is acceptable only in supervised _____ locations.

- A) Residential
- B) Commercial
- C) Industrial
- D) Aquatic

178) If sizing conductors to the next standard size OCPD over 800 amps in industrial locations, the conductors need to be sized equal to or _____% of the rating of the OCPD.

- A) 80
- B) 85
- C) 90
- D) 95

179) Equipment used for conductors that terminate when using the next standard size OCPD over 800 amps in industrial locations must be _____ or marked for the application.

- A) Listed
- B) Purchased
- C) Made
- D) Designed

180) In an industrial supervised location where a 1000 amp OCPD is used, what would be the minimum ampacity of the conductors using article 240.91(B)?

- A) 730
- B) 800
- C) 900
- D) 950

181) The supply side bonding jumper ensures electrical _____ between metal parts.

- A) Current
- B) Voltage
- C) Conductivity
- D) Power

182) Ungrounded systems are required to be marked at the _____ disconnecting means.

- A) First
- B) New
- C) Second
- D) Last

183) When marking ungrounded systems, the marking shall legibly read " _____ ".

- A) Open system
- B) Do not touch
- C) Look out
- D) Ungrounded system

184) Would it be considered acceptable or a violation to mark an ungrounded system located in a wet corrosive environment with un-protected normal paper?

- A) Acceptable
- B) Violation

185) In a single raceway, the grounded conductor cannot be sized smaller than the_____.

- A) Equipment ground
- B) Ungrounded conductor
- C) Grounding electrode conductor
- D) Equipment grounding conductor

186) The grounded conductor is required to be larger than the ungrounded conductors.

- A) True
- B) False

187) The grounding electrode conductor is sized using table _____.

- A) 250.66
- B) 250.122
- C) 310.16
- D) 430.166

188) Is it required or suggested that when the ungrounded conductors are run in parallel, the grounded conductor will also be run in parallel.

- A) Required
- B) Suggested

189) What is the smallest size conductor that can be used for the grounded conductor when it is run in parallel?

- A) # 1
- B) # 2
- C) # 3
- D) 1/0

Article 250.30 Grounding Separately Derived Alternating Current Systems. Informational Note 1

A new informational note has been added which states on site generators are not considered a separately derived system if the grounded conductor (neutral) is solidly connected to the service supplied grounded conductor. What would make a generator a separately derived system is if a transfer switch also switched the grounded conductor (neutral). A transformer is always considered a separately derived system.

Article 250.30(C) Grounding Separately Derived Alternating Current Systems. Outdoor Source

If a separately derived system is located outside, a connection to one or more grounding electrodes is required at the source to comply with 250.50. The reason for connecting grounding electrodes to separately derived systems at the source is to protect them from lightning strikes and other voltage spikes that could cause damage to such sources like transformers and generators. By connecting grounding electrodes to sources in this manner, we can limit possible damage from these voltage spikes.

Article 250.32(B)(1) Buildings or Structure supplied by a feeder or branch circuit.

This section requires that when a branch circuit or feeder is run to a building to supply power, a separate equipment grounding conductor is required to be run with that circuit or feeder. The equipment grounding conductor can be sized using table 250.122. The grounded conductor cannot be used for this purpose in new construction.

Article 250.52(A)(1) Grounding Electrodes. Electrodes permitted for Grounding. Metal Underground Water Pipe.

A metal water pipe is considered a grounding electrode if it is in contact with the earth for a minimum of 10ft. Additionally, the grounding electrode conductor is still required to connect to the metal water pipe within 5 ft of where it enters the building. The 5 ft connection rule has been moved to 250.68(C) since the 5 ft of water pipe extending out of the building is considered more of a grounding electrode conductor since it is no longer in direct contact with the earth and that portion is not considered a grounding electrode. Only the actual buried water pipe in direct connection with the earth is considered the grounding electrode.

Article 250.52(A)(2) Metal frame of The Building or Structure.

Metal frames of buildings and structures can be used as a grounding electrode if at least one structural member is in direct contact with the earth for a minimum of 10 ft. encased or not in concrete and the hold down bolts for a column directly connect to a concrete encased electrode.

Test Questions:

190) To make a generator considered a separately derived system, a transfer switch needs to switch the _____ conductor.

- A) Ungrounded
- B) Grounding
- C) Grounded
- D) Phase

191) A transformer is always considered a _____.

- A) Generator
- B) Branch circuit
- C) Utility operated device
- D) Separately derived system

192) The grounding electrode connections need to be made at the _____ location.

- A) Last
- B) Source
- C) Property
- D) Pole

193) Grounding electrode systems help protect source equipment like transformers and generators from voltage _____.

- A) Spikes
- B) Lags
- C) Drains
- D) Systems

194) Would it be considered acceptable or a violation to run an equipment grounding conductor with a circuit that is feeding a detached garage.

- A) Acceptable
- B) Violation

195) An equipment grounding conductor shall be sized using table _____.

- A) 250.66
- B) 250.122
- C) 310.15a
- D) 310.16

196) The grounded conductor can be used to ground a building in a new construction situation.

- A) True
- B) False

197) A metal water pipe that has a minimum of _____ ft in direct contact with the earth is considered grounding electrode.

- A) 5
- B) 7
- C) 8
- D) 10

198) The grounding electrode conductor is required to connect to a buried metal water pipe within _____ ft of where it enters a building barring the use of any exceptions.

- A) 5
- B) 6
- C) 8
- D) 10

199) The part of a metal water pipe that extends into a building could now be considered a _____.

- A) Grounding electrode
- B) Grounding electrode conductor
- C) Electrode
- D) Bonding jumper

200) Building steel can be used as a grounding electrode if at least _____ ft. of the structure is in direct contact with the earth.

- A) 6
- B) 8
- C) 9 ½
- D) 10

Article 250.52(A)(2) Metal frame of The Building or Structure.

Metal frames of buildings and structures can be used as a grounding electrode if at least one structural member is in direct contact with the earth for a minimum of 10 ft. encased or not in concrete and the hold down bolts for a column directly connect to a concrete encased electrode.

Article 250.52(A)(3) Concrete-Encased Electrode.

This section concerning concrete encased electrodes has been revised. A 1/2 in diameter 20 ft. long bare or galvanized steel reinforced bar is considered a concrete encased electrode. Separate pieces of rebar tied together that equal 20 ft. would also meet the requirements of a concrete encased electrode. If rebar is not available, a bare #4 copper conductor at least 20 ft long can also be used as a grounding electrode if it is encased in a minimum of 2 inches of concrete laying vertically or horizontally in a footing or column as long as the footing is in direct contact with the earth.

A new informational note has been added that indicates concrete with a vapor barrier or other film that separates the concrete from the earth is not considered in direct contact with the earth.

Article 250.53(A)(3) Grounding Electrode Installation. Rod, Pipe and Plate electrodes. Supplemental Electrode Required

This general rule requires when a plate electrode, pipe, or driven rod is used as an electrode, a supplemental electrode is required. The electrodes listed in 250.52(A)(2) through (A)(8) can be used as a supplemental electrode. When using a ground rod or pipe as the supplemental electrode, it shall be spaced a minimum of 6 ft. away from the first electrode.

Exception: If using a single electrode and the resistance is 25 ohms or less, then a supplemental electrode will not be required.

Article 250.64(B) Grounding Electrode Conductor Installation. Securing and protection against Physical Damage

Grounding Electrode Conductors are now permitted to be installed through framing members. This revision takes into consideration that the framing members adequately protect the grounding electrode conductor from physical damage.

Article 250.64(D)(1) grounding Electrode Installation. Service with Multiple Disconnecting means Enclosures. Common Grounding Electrode Conductor and taps

A service that has multiple grounding electrode taps due to multiple disconnects shall connect to a common grounding electrode conductor that is connected to a common busbar for these connections. The busbar shall be at least 1/4 in. x 2 in. aluminum or copper and shall be securely fastened in an accessible location. The connections to this busbar shall be made by a listed connector or by exothermic welding.

Article 250.68(C) Conductor and Bonding Jumper Connection to Grounding Electrodes. Metallic Water Pipe and Structural Metal

This Code cycle has added a new section allowing a buried metal water pipe that enters a building within 5 ft. to bond directly to building steel that is above ground. This provides a path to the grounding electrode and provides a way to tie everything into the grounding electrode system.

The metal water pipe within 5 ft of entering the building is now permitted to be used as a conductor path to connect all electrodes together that are part of the grounding electrode system. The buried metal water pipe that is in contact with the earth can only be considered an electrode if it is in direct contact with the earth for a minimum of 10 ft.

Test Questions:

201) Metal frames of buildings and structures can be used as a grounding electrode if at least one structural member is in direct contact with the earth for a minimum of _____ ft. encased.

- A) 5
- B) 6
- C) 10
- D) 15

202) Hold down bolts used to secure a building column can be used as a grounding electrode if the bolts are connected to the _____.

- A) Earth
- B) Concrete
- C) A PVC pipe
- D) Concrete encased electrode

203) A piece of rebar 20 ft. long meets the requirement for a concrete encased electrode provided the rebar is a minimum _____ in diameter.

- A) 3/8 in
- B) 1/2 in
- C) 1/4 in
- D) 3/16 in

204) A concrete encased electrode must be a minimum of _____ ft. long.

- A) 16
- B) 17
- C) 18
- D) 20

205) Would it be considered acceptable or a violation to tie 2 11' pieces of rebar together with tie wire and use that as a concrete encased electrode provided the 2 pieces of rebar tied together were over 20' and the rebar was 1/2 inches in diameter.

- A) Acceptable
- B) Violation

206) A piece of # _____ bare copper conductor could be used as a concrete encased electrode provided it was encased in the minimum amount of concrete required.

- A) 4
- B) 6
- C) 8
- D) 10

207) If a continuous piece of number 4 bare copper conductor was used instead of a piece of rebar for a concrete encased electrode, the number 4 wire needs to be encased in a minimum of _____ inches of concrete.

- A) 1/2
- B) 1
- C) 1 1/2
- D) 2

208) When referring a concrete encased electrode, the concrete in which an electrode is encased does not have to be in direct contact with the earth.

- A) True
- B) False

209) When using a plate, pipe, or driven rod as an electrode, a supplemental electrode is _____.

- A) Required
- B) Suggested
- C) Promoted
- D) Purchased

210) When using a rod or pipe supplemental electrode, it shall be spaced a minimum of _____ ft. from the first electrode.

- A) 2
- B) 4
- C) 5
- D) 6

211) The electrodes listed in _____ can be used as a supplemental electrode.

- A) 250.52(A)(2) through (A)(8)
- B) 210.42(A)(2) through (A)(8)
- C) 250.53(A)(3) though (A)(9)
- D) None of the above

212) If a single electrode has a resistance of _____ ohms or less, than a supplemental electrode is not required.

- A) 25
- B) 27
- C) 30
- D) 43

213) Would it be acceptable or a violation to run the grounding electrode conductor for a 400 amp service through metal stud framing members?

- A) Acceptable
- B) Violation

214) If a service has multiple disconnecting enclosures, then all the grounding electrode taps need to connect to a common _____.

- A) Equipment grounding conductor
- B) Grounded conductor
- C) Grounding electrode conductor
- D) Phase conductor

215) When multiple electrode taps connect to a common busbar where the grounding electrode conductor is also connected, the busbar shall be a minimum of _____.

- A) 1/4 in. x 2 in.
- B) 1/2 in. x 2 in.
- C) 1 in. x 3 in.
- D) 2 in. x 2 in.

216) When connecting grounding electrode taps to a common busbar where the common grounding electrode conductor is also connected, the approved method for attachment to the common busbar is by a _____ connector or exothermic welding.

- A) Designed
- B) Listed
- C) Copper
- D) CO/AL

217) When using a common busbar for multiple grounding electrode taps connected to a common grounding electrode conductor, the busbar shall be located in an _____ location.

- A) Open
- B) Guarded
- C) Accessible
- D) Shielded

218) The code allows a buried metal water pipe entering a building within _____ ft. to tie directly to building steel as to provide a path to the grounding electrode.

- A) 5
- B) 6
- C) 7
- D) 10

219) For a metal water pipe to be considered a grounding electrode, it must be in direct contact with the earth for a minimum of _____ ft.

- A) 2
 - B) 5
 - C) 9
 - D) 10
-

250.92(B) Method of Bonding at the service. This section now requires bonding jumpers to be used around reducing washers, oversized eccentric and concentric knockouts for conduits that contain service conductors. The code calls this an “impaired connection” and the use of bonding jumpers is required around such connections. Service conductors do not have overcurrent protection ahead of them so it is extremely important to ensure a low impedance path for any fault currents that may occur. This section now clarifies that bonding around reducing washers, oversized eccentric, and concentric knockouts are now required when raceways contain service conductors.

250.94 Bonding for other systems. An intersystem bonding termination point is required to be accessible to bond systems covered in 770 and Chapter 8. This point shall be installed external to enclosures at the service equipment or metering equipment enclosures as well as at the disconnecting means for other buildings and structures. Intersystem Bonding terminations are required to comply with 6 different provisions as listed in 250.94 of this code.

250.102(C) Size Supply-side Bonding Jumper. The supply side bonding jumper is installed before the service equipment overcurrent protective device and provides electrical conductivity between the metal parts of the service equipment. The supply side Bonding jumper is required to be sized using table 250.66. If the ungrounded supply conductors are larger than 1100 kcmil copper or 1750 kcmil aluminum, then as required by this code, the supply side bonding jumper shall be no less than 12 ½ percent of the area of the largest ungrounded supply conductor set.

250.104(C) Structural steel. Bonding of piping systems and exposed structural steel. Interconnected structural steel that is likely to become energized is required by this code to be bonded to the service equipment enclosure, grounding electrode, grounding electrode conductor (if of sufficient size), and the grounded conductor at the service. This bonding jumper is required to be sized using table 250.66 and is based on the largest ungrounded branch circuit or feeder. Bonding jumper points of attachment are required to be accessible unless allowed by 250.68(A) Exception No. 2 to be covered by fireproofing material.

250.120 (C) Equipment grounding conductors smaller than 6 AWG. Equipment grounding conductors are required to be sized using table 250.122. 250.120 (C) requires equipment grounding conductors that are smaller than 6 AWG to be protected from physical damage by an identified raceway, cable armor, or hollow spaces in the framing that is not subject to physical damage.

250.121 Use of Equipment Grounding Conductors. An Equipment Grounding Conductor shall not be used as a Grounding Electrode Conductor. This new section was added to the 2011 Code to clarify that the Equipment Grounding Conductor and Grounding Electrode Conductors serve 2 different purposes. The grounding electrode conductor is sized using table 250.66 and connects to the grounding electrode. This conductor is often installed in parallel with the grounded conductor (Neutral) and possibly carries current under

normal operation. The equipment grounding conductor is sized using table 250.122 and connects to a device or piece of equipment and provides a low impedance path for any fault current back to its source.

220) If installing a conduit that has service conductors inside using reducing washers, the use of a _____ is now required to ensure a low impedance path for any fault currents.

- A) Lock nut
- B) Meyer's hub
- C) Bonding jumper
- D) All listed answers

221) Using reducing washers, oversized concentric or eccentric knockouts without any bonding jumpers for conduits that contain service conductors is known as an _____ connection.

- A) Solid
- B) Impaired
- C) Grounded
- D) Bonding

222) An intersystem bonding point is required to be _____ to the metering and service equipment.

- A) Internal
- B) External
- C) Integral
- D) All of the above

223) This code has _____ different requirements for inter system bonding.

- A) 3
- B) 5
- C) 6
- D) 7

224) Table _____ is used to size the supply side bonding jumper.

- A) 250.66
- B) 250.122
- C) 250.104
- D) 250.121

225) If you are installing 2000 Kcmil aluminum ungrounded supply conductors for a service, the supply side bonding jumper needs to be sized not less than _____ % of the largest supply conductor set.

- A) 10
- B) 12 ¼
- C) 12 ½
- D) 13

226) A set of 1250 kcmil copper ungrounded service entrance conductors in a single raceway would require a _____ copper supply side bonding jumper.

- A) 4/0
- B) 3/0
- C) 1/0
- D) # 2

227) True or False, The points of attachment for bonding jumpers are always required to accessible.

- A) True
- B) False

228) The steel of a structure that is likely to become energized is required by this code to be _____.

- A) Bonded
- B) Welded
- C) Plated
- D) Coated

229) Would it be considered acceptable or a violation of this code to pull a single 10 AWG solid copper EGC conductor through bored holes in wood framing members to a hot water heater?

- A) Acceptable
- B) Violation

230) Any equipment grounding conductor sized in table 250.122 is required to be protected from physical damage if it is smaller than _____ AWG

- A) 6
- B) 8
- C) 10
- D) All listed answers

231) A grounding electrode conductor and an equipment grounding conductor are _____ the same conductor.

- A) Essentially
- B) Not
- C) Traditionally
- D) Always

232) The grounding electrode conductor is sized using table _____.

- A) 250.122
- B) 110.14
- C) 250.66
- D) 250.104

233) An equipment grounding conductor is usually installed with _____.

- A) Feeders
- B) Branch circuits
- C) Motor feeders
- D) All listed answers

234) What is the minimum size copper equipment grounding conductor required for a 400 amp subpanel in a cheese processing facility?

- A) # 1
- B) # 2
- C) # 3
- D) # 6

250.122(F) Size of Equipment grounding Conductors. The 2011 Code has clarified this section to indicate that one equipment grounding conductor is all that is required for each parallel set of ungrounded conductors in

a cable tray system. Equipment grounding conductors that are installed in cable trays are required to meet the standards as listed in 392.10(B)(1)(c). Despite this revision, equipment grounding conductors are still required to be sized using table 250.122.

300.4(E) Cables, Raceways, or boxes Installed in or Under Roof Decking. The 2011 Code requires boxes installed under metal corrugated roof decking systems at its lowest point to be a minimum of 1 1/2 inches to the top of any box. The 2008 code addressed just cables and raceways realizing that roof decking screws are typically 1 1/4 inches long and could damage these systems. This revision makes it clear that boxes are now also included in this 1 1/2 rule.

300.4 (H) Structural Joints. If raceways cross a structural joint intended to expand or contract due to physical conditions, listed expansion joints are required to be used for raceways crossing these sections. An expansion joint allows raceways to expand and contract with any movement without damaging the conductors inside. It is critical for conduits to be able to expand and contract with any structural movement as a raceway system could pull apart and expose the conductors inside to physical damage.

235) A parallel set of ungrounded conductors that is pulled in a cable tray system require _____ equipment grounding conductor(s).

- A) Multiple
- B) One
- C) Two
- D) None of the above

236) Equipment grounding conductors that are installed in cable trays are required to meet the provisions of _____.

- A) 392.10(B)(1)(c)
- B) 391.20(B)(1)(c)
- C) 392.10(D)(1)(c)
- D) 391.10(D)(1)(c)

237) If installing a 12 x 12 pull box for three 1 1/4 EMT conduits under a metal corrugated roof, the box is required to be installed at least _____ from the lowest point of the corrugation.

- A) 1 1/4 inches
- B) 1 3/8 inches
- C) 1 1/2 inches
- D) All of the above

238) Any area identified by architectural plans to contain a structural expansion zone that has raceways crossing this point is required to have _____ installed in such raceways as required by this code.

- A) Seal tight
- B) Flex
- C) Car flex
- D) Expansion joints

239) Would it be considered acceptable or a violation of this code to install FMC in an expansion zone instead of a listed expansion fitting if approved by the AHJ.

- A) Acceptable
- B) Violation

240) True or False, Cables and boxes are permitted to be installed closer than 1 ½ inches to corrugated roof decking so long as the roofing contractor agrees to use smaller screws.

- A) True
- B) False