Instructions: **Fee $50**

1. Print these pages.
2. Circle the correct answers and transfer them to the answer sheet.
3. Page down to the last page for the verification forms and mailing instructions.
4. Use the included information as your reference materials.
5. 60 questions are listed in a straight order mini-section format throughout the complete quiz.

**Course: 18596 2017 NEC Changes Part 2**

**This course is valid for these credentials:**

| Credential Description | Cred Code | Credit Hours |
|---|---|---|
| Registered/Beginner Electrician | BE | 6.0 |
| Commercial Electrical Inspector | CEI | 6.0 |
| Industrial Journeyman Electrician | IJE | 6.0 |
| Journeyman Electrician | JE | 6.0 |
| Master Electrician | ME | 6.0 |
| Residential Journeyman Electrician | RJE | 6.0 |
| Residential Master Electrician | RME | 6.0 |
| UDC-Electrical Inspector | UEI | 6.0 |

## 2017 NEC Changes Part 2

**Chapter Four – Equipment for General Use**
**New: 404.22 – Electronic Lighting Control Switches**

A new provision requiring all electronic lighting control switches to be listed. This new provision goes on to prohibit these electronic lighting control switches from introducing current on the equipment grounding conductor during normal operation. This change would have a future effective date of January 1, 2020. Section 404.2(C) generally requires a grounded (neutral) conductor to be installed at switch locations that control lighting loads. When CMP-9 initiated 404.2(C) in the 2011 *NEC*, it was intended to begin a process that would ultimately result in no current being intentionally introduced onto the equipment grounding system as a result of the installation of electronic switching devices, such as an occupancy sensor. Currently, existing listed products, per the manufacturer's instructions, direct the installer to utilize the "green" or bare equipment-grounding conductor to be connected to the device to act as the grounded conductor to power the electronics with 120 volts. The equipment-grounding conductor should not be used to complete this circuit under any circumstance. This new section would require the insulated grounded conductor to be installed and used with the proper listed electronic device. The future effective date provides the manufacturers a reasonable time frame to produce these switching devices with grounded conductor compatibility while being able to use existing inventory.

1. This new provision goes on to prohibit these electronic lighting control switches from introducing current on the _____ conductor during normal operation.
   a. neutral
   b. current carrying
   c. equipment grounding
   d. grounded
2. This new section would require the insulated grounded conductor to be installed and used with the proper _____ electronic device.
   a. identified
   b. approved
   c. listed
   d. marked

3. Currently, existing listed products, per the manufacturer's instructions, direct the installer to utilize the _____ equipment-grounding conductor to be connected to the device to act as the grounded conductor to power the electronics with 120 volts.

a. covered
b. green
c. bare
d. both b & c

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**New: 406.3(F) – Receptacle with USB Charger**

New provisions for Article 406 pertaining to 125-volt 15- or 20-ampere receptacles that additionally provide Class 2 power in the form of a USB charger. These new provisions require these devices to be listed and constructed such that the Class 2 circuitry is integral with the receptacle. Currently, Article 406 contains requirements for an assortment of different types of receptacles—such as an isolated-ground type receptacle, weather-resistant and tamper-resistant type receptacles—but no provisions exist requiring a receptacle providing power to Class 2 equipment to be listed. Outlet devices consisting of a Class 2 power supply and Class 2 output connector(s) are presently readily available to the public. Some of these assemblies are intended to be secured and directly connected to a duplex receptacle. The combination of the Class 2 assembly and duplex receptacle has not been investigated to national standards. The product standard for receptacles, ANSI/UL 498, *Attachment Plugs and Receptacles*, corresponds to the required construction and to the performance requirements to evaluate the suitability of a receptacle with integral power supply with Class 2 output connectors. Requiring the use of a listed receptacle with an integral power supply with Class 2 output connectors will confirm that the installed device complies with the appropriate product standard.

4. These new provisions require Receptacles with USB Charger devices to be _____ such that the Class 2 circuitry is integral with the receptacle.

a. listed
b. marked
c. constructed
d. both a & c

5. Requiring the use of a listed receptacle with an integral power supply with Class 2 output connectors will confirm that the installed device complies with the appropriate _____.

a. identification
b. marking
c. approval
d. product standard

6. The combination of the Class __ assembly and duplex receptacle has not been investigated to national standards.

a. 1
b. 2
c. 3
d. 4

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**Revision: 406.12 – Tamper-Resistant Receptacles**

The requirements and locations for tamper-resistant receptacles have been expanded. Currently, tamper-resistant receptacles are required at dwelling units, guest rooms and guest suites of hotels and motels, and in child care facilities. The expansion would bring these safety devices to preschools and elementary education facilities; business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities; to assembly occupancies such as places of awaiting transportation, gymnasiums, skating rinks, auditoriums; and to dormitories. These expanded locations are areas that small children frequently occupy. The current exception will also be extended to these new locations. Tamper-resistant (TR) receptacles are currently limited to nonlocking-type 125-volt, 15- and 20-ampere receptacles. In the new text, "125-volt" has been removed to include all non-locking 15- and 20-ampere receptacles (not just 125-volt rated). Another interesting change to the tamper-resistant receptacle requirements is a reference to 550.13, as well as to 210.52 for areas of

the dwelling unit where tamper-resistant receptacles are required. This will clarify that tamper-resistant receptacles are, indeed, required in mobile and manufactured homes.

7. The Tamper-Resistant Receptacles expansion would bring these safety devices to _____.
   a. places of awaiting transportation
   b. gymnasiums
   c. skating rinks
   d. all of the above
8. The Tamper-Resistant Receptacles expansion would bring these safety devices to _____.
   a. auditoriums
   b. dormitories
   c. service garages
   d. both a & b
9. The current Tamper-Resistant Receptacle exception will also be extended to these new locations. Tamper-resistant (TR) receptacles are currently limited to _____ receptacles.
   a. nonlocking-type 125-volt15-ampere
   b. nonlocking-type 125-volt 20-ampere
   c. locking-type 125-volt, 15- and 20-ampere
   d. both a & b
10. Another interesting change to the tamper-resistant receptacle requirements is a reference to _____ for areas of the dwelling unit where tamper-resistant receptacles are required.
   a. 550.13
   b. 210.52
   c. 210.53
   d. both a & b

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**Revision: 408.3(A)(2) – Barriers at Service Panelboards, Switchboards, and Switchgear**

Panelboards have been added to the type of service equipment, along with switchboards and switchgear, that will require barriers to be placed in these service enclosures to prohibit uninsulated, ungrounded service busbars or service terminals from being exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations. Access to uninsulated live parts on the line side of a service disconnect within panelboards has been identified as a safety concern for several *Code* cycles. The addition of panelboards would introduce a level of isolation from service-side uninsulated live parts for service panelboards in a manner similar to that currently afforded service switchboards and switchgear. Providing such protection is more readily achieved for those panelboards designed for a single-service disconnect, but is less practical for panelboards designed for multiple-service disconnects. With this in mind, the exception would exempt this barrier provision for service panelboards with provisions for more than one service disconnect within a single enclosure as permitted by 408.36, Exceptions 1, 2, and 3. This revision is intended to complement the new construction requirement in UL 67, *Panelboards*, and address the safety concern of access to ungrounded, uninsulated live parts. This requirement for barrier-type panelboards has been in place for Canadian service equipment for many years. This will now allow an “electrically safe work condition,” as defined in NFPA 70E, to be established when performing electrical work in service equipment while energized.

11. Panelboards have been added to the type of service equipment, along with switchboards and switchgear, that will require barriers to be placed in these service enclosures to prohibit uninsulated, ungrounded service busbars or service terminals from being exposed to inadvertent contact by _____ while servicing load terminations.
   a. persons
   b. maintenance equipment
   c. both a & b
   d. none of the above
12. The addition of panelboards would introduce a level of isolation from _____-side uninsulated live parts for service panelboards in a manner similar to that currently afforded service switchboards and switchgear.
   a. load
   b. street

c. service
d. all of the above

13. This _____ is intended to complement the new construction requirement in UL 67, *Panelboards*, and address the safety concern of access to ungrounded, uninsulated live parts.
a. relocation
b. deletion
c. revision
d. none of the above

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**406.15**

**2014 *NEC* Requirement**

A new section was added at 406.15 to permit specific receptacles to be controlled by a dimmer under specific conditions. A receptacle supplying lighting loads can be connected to a dimmer if the plug/ receptacle combination is a nonstandard configuration type and specifically listed and identified for each such unique combination.

**2017 *NEC* Change**

The requirements for dimmer-controlled receptacles at 406.15 have been deleted. This section sought to correct incompatibilities between certain types of dimmers and certain cord-and-plug connected loads. Such incompatibilities are currently dealt with in the listing of specific load types and the listing of specific dimmer types.

14. The 2017 NEC requirements for dimmer-controlled receptacles at 406.15 have been _____.
a. revised
b. deleted
c. relocated
d. none of the above

15. This section sought to correct incompatibilities between certain types of _____.
a. dimmers
b. cord-and-plug connected loads
c. both a & b
d. none of the above

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**Revision: 422.16(B)(2) – Built-In Dishwashers**

A built-in dishwasher is allowed to be cord-and plug-connected. revisions would allow only the receptacle outlet for a cord- and plug-connected dishwasher to be located in the space adjacent to the dishwasher. Current provisions will allow this receptacle outlet to be placed in the same space as the dishwasher or in the space adjacent to the dishwasher. UL Product Standard 749, *Household Dishwashers*, was referenced as the main reason for this change. UL 749 requires the receptacle outlet to be installed in a location adjacent to the dishwasher and will not allow this receptacle outlet in the same space as the dishwasher, as the present edition of the *NEC* allows. This product standard also calls for a receptacle outlet to be installed within 1.83 m (6 ft.) of the appliance. With this in mind, the code has lengthened the cord for a built-in dishwasher from 0.9 m to 1.2 m (3 ft. to 4 ft.) to 0.9 m to 2.0 m (3 ft. to 6½ ft.), measured from the face of the attachment plug to the plane of the rear of the appliance. Some will argue that this “adjacent space” requirement will often lead to the cord passing through a cabinet divider or wall and would be in conflict with requirements in 400.8 that will not allow a flexible cord to be run through walls. This one will be interesting to watch throughout the 2017 *NEC* development process.

16. Revisions would allow only the receptacle outlet for a cord- and plug-connected dishwasher to be located in the space _____ to the dishwasher.
a. behind
b. below
c. adjacent
d. all of the above

17. This product standard also calls for a receptacle outlet to be installed within _____ of the appliance.

a. 5’
b. 6’
c. 6’-6”
d. 5’-6”

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**Article 425 – Fixed Resistance and Electrode Industrial Process Heating Equipment**
This new article provides requirements for industrial process heating equipment. At present, the *NEC* does not provide general and specific requirements for this equipment. The new article will apply to boilers, electrode boilers, duct heaters, strip heaters, immersion heaters, process air heaters, or other approved fixed electrical equipment used for commercial and industrial process heating. It will not apply to heating and room air-conditioning for personnel spaces.

18. The new article will apply to boilers, electrode boilers, duct heaters, strip heaters, immersion heaters, process air heaters, or other approved fixed electrical equipment used for _____ process heating.
a. commercial
b. industrial
c. retail
d. both a & b

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**Revision: 445.11 – Marking (Generators)**
In addition to the nameplate information currently required for a generator, the marking and nameplate requirements for all stationary generators and portable generators rated more than 15 kW have been revised to include not only the power factor, the subtransient, and the insulation system class but also the transient reactances, and the maximum short-circuit current. The term *transient reactances* was changed from “transient impedances” to provide the correct industry term. Having the generator marked with the maximum short-circuit current rating will assist the enforcement community as well as the installer when verifying proper overcurrent protection in the field. According to CMP-13, newer generators are being manufactured with inverter-based designs. Determining fault-current ratings for these generators is difficult and is best marked on the generator by the manufacturer. Stationary and portable generators will also be required to be marked to indicate if the generator is protected against overload by inherent design, an overcurrent protective relay, circuit breaker, or fuse. This information will assist the authority having jurisdiction (AHJ) in determining compliance with 445.13 for the ampacity of the conductors.

19. In addition to the nameplate information currently required for a generator, the marking and nameplate requirements for all stationary generators and portable generators rated more than 15 kW have been revised to also include _____.
a. transient impedances
b. transient reactances
c. power factor
d. maximum short-circuit current

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**Chapter Five – Special Occupancies**
**Relocation: 500.2 – Definitions: Hazardous (Classified) Locations**
The existing definitions presently located at 500.2 have been relocated to Article 100 to comply with the *NEC Style Manual*, which states that a definition used in two or more articles is required to be located in Article 100. Some of these definitions are already located in Article 100 and duplicated at 500.2. Other definitions that applied to two or more articles in Articles 501 through 516 were placed at 500.2 for convenience to the users of these hazardous (classified) location articles; this placement also violates the *NEC Style Manual*. Some in the electrical industry will argue that definitions that are only applicable to *NEC* Chapter 5 need to remain within the .2 sections within the articles in Chapter 5 so that the information needed for the hazardous location user is readily available, since these users typically don’t get too far outside of *NEC* Chapter 5. This will be another interesting change to follow during the 2017 *NEC Code* development process.

20. The existing definitions presently located at 500.2 have been relocated to Article 100 to comply with the *NEC Style Manual*, which states that a definition used in _____ articles is required to be located in Article 100.
a. 1
b. 2
c. more than 2
d. both b & c

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**Revision: 501.10(B)(1) – Wiring Methods for Class I, Division 2**

The wiring methods permitted for Class I, Division 2 locations have been expanded to include rigid metal conduit (RMC) and intermediate metal conduit (IMC) with listed threadless fittings. According to CMP-14, these wiring methods provide an appropriate level of safety for a Class I, Division 2 location. There seems to be little validation for currently requiring only threaded couplings and fittings for RMC and IMC in Class I, Division 2 locations since the present *Code* requirements permit cables with threadless fittings to be installed in Class I, Division 2 locations. Sealing with threaded connections at the Class I, Division 2 boundaries is already addressed at 501.15(B)(2). Cablebus was also added as it provides a level of safety equivalent to the other wiring methods permitted for Class I, Division 2 locations. According to the substantiation, cablebus is similar to installed cable tray with spacing on the conductors. Cable tray is already allowed in a Class I, Division 2 location, so cablebus with insulated cables should be an allowed wiring method as well.

21. The wiring methods permitted for Class I, Division 2 locations have been expanded to include rigid metal conduit (RMC) with _____ fittings.
a. marked threadless
b. approved threadless
c. listed threadless
d. identified threadless

22. The wiring methods permitted for Class I, Division 2 locations have been expanded to include the addition of intermediate metal conduit (IMC) with _____ fittings.
a. marked threadless
b. approved threadless
c. listed threadless
d. identified threadless

23. According to CMP-14, these above wiring methods provide an appropriate level of safety for a ___ location.
a. Class I, Division 2
b. Class 2, Division 2
c. Class I, Division 1
d. all of the above

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**New: Tables 511.3(C) and 511.3(D) – Tables for Major and Minor Repair Garages**

Two new tables have been added at 511.3. These tables contain detailed information on the extent of the classified locations for major and minor repair garages with heavier-than-air fuel and the extent of classified locations for major repair garages with lighter-than-air fuel, respectively. In order to align with NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages*, 511.3(C) and 511.3(D) are to be replaced respectively in their entirety with a new 511.3(C) covering both major and minor repair garages where heavier than air gaseous Class I liquids are transferred or dispensed, and a new 511.3(D) covering major repair garages where vehicles using lighter than air gaseous fuels are repaired or stored. These new tables are replicas of the corresponding portions of Table 8.3.2 of NFPA 30A. These tables are similar in structure to the tables in Article 514 and should provide the same "user-friendly" format as their Article 514 counterparts.

24. Two new tables have been added at 511.3. These tables contain detailed information on the extent of the classified locations for _____ repair garages with heavier-than-air fuel.
a. major
b. minor
c. basic
d. both a & b

25. Two new tables have been added at 511.3. These tables contain detailed information on the extent of the classified locations for the extent of classified locations for major repair garages with _____, respectively.
a. heavier-than-air fuel
b. lighter-than-air fuel
c. lighter-than-fuel
d. heavier-than-fuel

26. 511.3(C) and 511.3(D) are to be replaced respectively in their entirety with a new 511.3(C) covering both major and minor repair garages where heavier than air gaseous Class _____ are transferred or dispensed.
a. I liquids
b. I & II liquids
c. I fuels
d. I & II fuels

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**Revisions: 517.2 – Definitions: Health Care Facilities**

Several definitions for health care facilities were updated to match recent changes to definitions in NPFA 99, *Health Care Facilities Code*, and to update extracted material references. One of the more interesting revised definitions was to the term, *Health Care Facilities*. This term now will include buildings, portions of buildings, or "mobile enclosures" in which human medical, dental, psychiatric, nursing, obstetrical, or surgical care are provided. Previously, it was difficult to include a mobile recreational vehicle (RV) or a mobile home being used on a temporary basis as a medical health care facility because "mobile enclosures" were not in the definition of a health care facility. For the 2015 edition of NFPA 99, the list of examples of occupancies that may qualify as a health care facility was removed, resulting in the same change in *NEC* Article 517. A new informational note has been changed to follow the definition of "Health Care Facilities" as this list is valuable to installers and inspectors in identifying certain types of occupancies that may qualify and require compliance with Article 517.

27. *Health Care Facilities*. This term now will include buildings, portions of buildings, or "mobile enclosures" in which human _____ care are provided.
a. medical or dental
b. psychiatric or nursing
c. obstetrical or surgical
d. all of the above

28. Previously, it was difficult to include a _____ being used on a temporary basis as a medical health care facility because "mobile enclosures" were not in the definition of a health care facility.
a. recreational vehicle
b. RV
c. mobile home
d. all of the above

29. A new informational note has been changed to follow the definition of "Health Care Facilities" as this list is valuable to installers and inspectors in identifying certain types of occupancies that may qualify and require compliance with Article _____.
a. 516
b. 517
c. 518
d. 519

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517.16 Use of Isolated Ground Receptacles. (Health Care Facilities)

2014 *NEC* Requirement

Isolated ground receptacles were not permitted to be installed within a patient care vicinity of a health care facility by the provisions of 517.16. Provisions for installing an isolated ground receptacle outside of a patient care vicinity were not addressed in Article 517.

2017 *NEC* Change

New provisions were added to 517.16 pertaining to the proper installation of isolated ground receptacles located outside of a patient care vicinity. The prohibition of isolated ground receptacle inside a patient care vicinity

are addressed at 517.16(A) and isolated ground receptacles installed outside a patient care vicinity are addressed at 517.16(B).

30. New 2017 NEC provisions were _____ 517.16 pertaining to the proper installation of isolated ground receptacles located outside of a patient care vicinity.
    a. revised in
    b. added to
    c. removed from
    d. none of the above
31. The prohibition of isolated ground receptacle installed outside a patient care vicinity are addressed at _____.
    a. 517.16(C)
    b. 517.16(A)
    c. 517.16(B)
    d. none of the above

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**Chapter Six – Special Equipment**

**New: 600.34 – Photovoltaic (PV) Powered Signs**

A new section and a new definition have been added to Article 600 to cover signs that are powered by a solar photovoltaic (PV) system. These types of signs are defined as a complete sign powered by solar energy consisting of all components and subassemblies for installation either as an off-grid stand-alone, on-grid interactive or non-grid interactive system. The installation rules for the PV system are found in Article 690. Signs are a special application of PV equipment requiring special installation instructions. These PV-powered signs are described and covered by UL Standard 48, *Electric Signs*, Section 4.4.4.12. This new section of *NEC* Article 600 will provide rules for field wiring and the installation and safe usage of PV-powered signs. This section is also intended to harmonize Article 600 with Article 690 and the end use of PV signs constructed per UL 48.

32. Photovoltaic (PV) Powered Signs are defined as a complete sign powered by solar energy consisting of all components and subassemblies for installation either as an _____ system.
    a. off-grid stand-alone
    b. on-grid interactive
    c. non-grid interactive
    d. all of the above
33. This new section of *NEC* Article 600 will provide rules for _____ of PV-powered signs.
    a. field wiring
    b. the installation
    c. safe usage
    d. all of the above

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**Deletion: Table 680.10 – Minimum Cover Depths – Swimming Pools**

Do the requirements for underground wiring related to swimming pools located in 680.10 apply outside the 1.5 m (5 ft) radius of a swimming pool? These and other questions have been answered as Section 680.10 (now to be 680.11) has been revised to clarify which underground wiring can or cannot be installed under and around swimming pools. This also clarifies that the wiring methods underground near swimming pools must be installed in a manner to withstand the conditions unique to the pool environment, and that only wiring related to swimming pools may be run under the pool to feed such things as underwater wet-niche luminaires, etc. The revised text resolves some possibly conflicting language stating that only swimming pool-related wiring may be installed underground within 1.5 m (5 ft.); and then in the next sentence, 680.10 permits other wiring within the 1.5 m (5 ft.) zone limited to pool-related wiring. CMP-17 determined that all underground wiring should be installed per the burial depths of Table 300.5, thus eliminating the requirement for Table 680.10.

34. These and other questions have been answered as Section 680.10 (now to be ____) has been revised to clarify which underground wiring can or cannot be installed under and around swimming pools.
    a. 680.10

b. 680.11
c. 680.12
d. none of the above

35. This also clarifies that the wiring methods underground near swimming pools must be installed in a manner to withstand the conditions unique to the pool environment, and that only wiring related to swimming pools may be run _____ the pool to feed such things as underwater wet-niche luminaires, etc.
a. along side
b. near
c. under
d. over

36. CMP-17 determined that all underground wiring should be installed per the burial depths of Table 300.5, thus _____ the requirement for Table 680.10.
a. eliminating
b. reducing
c. confirming
d. none of the above

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**New: Article 680 Part VIII – Electrically Powered Pool Lifts**

A new Part VIII and a new definition have been address an ever growing concern for safety involving electrically powered pool lifts being installed all across the country around swimming pools, spas, and hot tubs. The changed definition is: **Electrically powered pool lifts are a**n electrically powered lift that provides accessibility to and from a pool or spa for people having disabilities. Installation of these pool lifts has been occurring, and continues to occur, all across the country for compliance with Department of Justice and Building Code requirements. These lifts allow persons with disabilities to have access to public pools, spas, and hot tubs. This equipment is currently being installed without compliance to current *NEC* requirements, such as equipotential bonding. This new part to Article 680 attempts to permit a compliant installation with adequate safety requirements for all swimming pool users, and **would cover such things as** listing and labeling requirements, GFCI protection for personnel, bonding requirements, switching devices, and nameplate information and requirements.

37. A _____ have been changed to address an ever growing concern for safety involving electrically powered pool lifts being installed all across the country around swimming pools, spas, and hot tubs.
a. new Part VIII
b. new definition
c. both a & b
d. none of the above

38. These lifts allow persons with disabilities to have access to public pools, spas, and hot tubs. This equipment is currently being installed without compliance to current *NEC* requirements, such as _____.
a. limiting to 120 volt 15 or 20 amp
b. AFCI protection
c. equipotential bonding
d. all of the above

39. This new part to Article 680 attempts to permit a compliant installation with adequate safety requirements for all swimming pool users, and would cover such things as _____ requirements.
a. marking
b. listing
c. identifying
d. all of the above

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**Revision: 690.8(A)(1) – Calculation of Maximum PV Source Circuit Current**

Revisions to the calculation methods for photovoltaic (PV) systems would allow engineering supervision to be used in calculating maximum source circuit current for PV systems with a generating capacity of 100 kilowatts

or greater. Current provisions only allow this current to be calculated by the sum of parallel PV module rated short-circuit currents multiplied by 125 percent. The substantiation of this revision points out that an engineer qualified to design PV systems is capable of making the necessary calculations or running the necessary simulations to develop accurate maximum circuit currents of PV source circuits based on the specifics of an installation location. While the use of short-circuit current method as the maximum current is still allowed, recent improvements in ground-fault protection could make the use of short-circuit current as the maximum current an obsolete concept. The new text allowing the calculated maximum current value using the engineering supervision method is not permitted to be less than 70 percent of the value calculated using rated short-circuit currents methods.

40. The new text allowing the calculated maximum current value using the engineering supervision method is not permitted to be less than ____ percent of the value calculated using rated short-circuit currents methods.

a. 70
b. 80
c. 125
d. 100

41. Revisions to the calculation methods for photovoltaic (PV) systems would allow engineering supervision to be used in calculating maximum source circuit current for PV systems with a generating capacity of ____ kilowatts or greater

a. 70
b. 80
c. 125
d. 100

42. Current provisions only allow this current to be calculated by the sum of parallel PV module rated short-circuit currents multiplied by _____ percent.

a. 70
b. 80
c. 125
d. 100

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**Article 691 – Large-Scale Photovoltaic (PV) Electric Supply Stations**

Large-scale photovoltaic (PV) stations are designed for the supply of merchant power into the electricity grid. These stations are differentiated from most building-mounted and other decentralized solar power applications in that they supply power at the utility level, rather than to local users. They are sometimes referred to as *solar farms*, especially when located in agricultural areas. A *utility-scale solar system* is sometimes used to describe this type of large-scale project. The rapid increase in the number of large-scale PV electric supply stations presents new challenges to authorities having jurisdiction (AHJs). Due to the complexity of these systems, it is unlikely that the AHJ will have expertise in the design and construction of multi-megawatt PV power plants. Many of the components of a large-scale PV electric supply station do not and cannot comply with the current requirements of Article 690 of the *NEC*. According to the substantiation, the two main drivers for this new article are: 1) elimination of AHJ professional risk when assessing compliance of large-scale PV electric supply stations, and 2) enabling system engineers to use engineering best practices in the design of large-scale PV electric supply stations.

43. Large-Scale Photovoltaic (PV) Electric Supply Stations are differentiated from most building-mounted and other decentralized solar power applications in that they supply power at the _____ level.

a. user
b. local
c. business
d. utility

44. Large-Scale Photovoltaic (PV) Electric Supply Stations are sometimes referred to as _____, especially when located in agricultural areas.

a. solar farms
b. utility-scale solar system

c. both a & b
d. none of the above

45. Many of the components of a large-scale PV electric supply station do not and cannot comply with the current requirements of Article ____ of the *NEC*.
a. 689
b. 690
c. 691
d. 692

---

**New: 695.15 – Surge Protection for Fire Pumps**

A new provision for fire pumps that would require a listed surge protection device to be installed in or on the fire pump controller. A surge protection device (SPD) is necessary to provide protection for the fire pump controller. According to the substantiation for this new SPD requirement, a study titled, "Data Assessment for Electrical Surge Protective Devices" commissioned by the NFPA Fire Protection Research Foundation, showed that 12% of the fire pumps tested had damage due to voltage surges. Much of this damage could have been prevented with properly sized surge protective devices. With fire pumps being so critical for life-safety, SPDs are a small price to pay to ensure these precarious devices remain in good working condition.

46. According to the substantiation for this new SPD requirement, a study titled, "Data Assessment for Electrical Surge Protective Devices" commissioned by the NFPA Fire Protection Research Foundation, showed that ____% of the fire pumps tested had damage due to voltage surges.
a. 10
b. 12
c. 15
d. 20

47. A new provision for fire pumps that would require a _____ surge protection device to be installed in or on the fire pump controller
a. marked
b. approved
c. listed
d. identified

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**Chapter Seven – Special Conditions**

**New: 700.3(F) – Temporary Source of Power for Maintenance or Repair of the Alternate Source of Power for Emergency Systems**

New prescriptive language was added to 700.3 detailing requirements, along with an exception, that recognizes whether a permanent switching means to connect temporarily an alternate source of power (such as a generator) is or is not required. If the emergency system relies on a single alternate source of power and this system must be disabled for maintenance or repair, the emergency system must include permanent switching means to connect a temporary alternate source of power for the duration of the maintenance or repair. The existing last paragraph in 700.4(B) provides a performance-based requirement for a portable or temporary alternate source to be available whenever the emergency generator is out of service for "major" maintenance or repair. The term *major* is very subjective, and no prescriptive requirements currently exist for this situation. Minor maintenance such as an oil change would not be considered major maintenance but could disable a generator source for several hours.

48. If the emergency system relies on a single alternate source of power and this system must be disabled for maintenance or repair, the emergency system must include permanent switching means to connect a temporary alternate source of power for the duration of the _____.
a. maintenance
b. repair
c. replacement
d. both a & b

49. Maintenance such as an oil change that could disable a generator source for several hours defines:

a. major
b. minor
c. both a & b
d. none of the above

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**New: 700.25 – Branch Circuit Emergency Lighting Transfer Switch**

A new section was added to Article 700. This would permit emergency lighting loads supplied by branch circuits, rated at not greater than 20 amperes, to be transferred from the *normal* branch circuit to an *emergency* branch circuit using a listed branch-circuit emergency-lighting transfer switch. This provision goes on to clarify that the mechanically held requirements of 700.5(C) are not to apply to listed branch-circuit emergency-lighting transfer switches. This addition is intended to accommodate a new class of transfer switching devices intended for operation of individual branch circuits in an emergency lighting system.

During the 2011 *Code* cycle, 700.24 (now 700.25) was added to the *NEC*. This section covers the requirements for automatic load control relays (ALCR). The section specifically states: "The load control relay shall not be used as transfer equipment." These devices are evaluated in accordance with UL 924, *Standard for Emergency Lighting and Power Equipment*. These ALCRs were never intended for use as general-purpose transfer equipment, even though these devices fall within the *NEC* definition of *transfer equipment*.

Currently, listed ACLRs with transfer features are being installed in the field in violation of current *NEC* 700.25. Most of these devices have undergone no evaluation as emergency transfer switches. These devices, along with transfer-capable ALCRs, are now being listed and evaluated under UL Product Standard 1008, *Transfer Switch Equipment* as "Branch Circuit Emergency Lighting Transfer Switches" (BCELTS).

BCELTS devices will now be evaluated for comparable performance and construction requirements as those applied to traditional emergency-transfer switches when used on branch circuits rated up to 20 amperes.

50. A new section was added to Article 700 would permit emergency lighting loads supplied by branch circuits, rated at not greater than ___ amperes, to be transferred from the *normal* branch circuit to an *emergency* branch circuit.
a. 15
b. 20
c. 30
d. 40

51. A new section was added to Article 700 would permit emergency lighting loads supplied by branch circuits, rated at not greater than (reference above question) amperes, to be transferred from the *normal* branch circuit to an *emergency* branch circuit using a _____ branch-circuit emergency-lighting transfer switch.
a. marked
b. approved
c. listed
d. identified

52. This addition is intended to accommodate a new class of transfer switching devices intended for operation of _____ branch circuits in an emergency lighting system.
a. multi
b. individual
c. several
d. none of the above

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**Article 706 – Energy Storage Systems**

This article is to apply to all permanently installed *energy storage systems* (ESS) that may be stand-alone or interactive with other electric power production sources. An energy storage system is a device, or more than one device assembled together, capable of storing energy for use at a future time. ESS(s) include but are not limited to electrochemical storage devices (e.g., batteries), flow batteries, capacitors, and kinetic energy devices (e.g., flywheels and compressed air). These systems can have ac or dc output for utilization and can include inverters and converters to change stored energy into electrical energy. Currently, batteries are addressed in numerous places in the *NEC* — such as Articles 480 (historically covering lead-acid batteries) and 690 (batteries in general, not just lead acid) to PV systems, which have been appropriate over time. The current state of energy

storage technology, which includes batteries, and the anticipated evolution of energy storage support the need for a singular set of requirements in the *NEC* covering such systems.

53. ESS(s) include but are not limited to _____.
    a. electrochemical storage devices (e.g., batteries)
    b. flow batteries & capacitors
    c. kinetic energy devices (e.g., flywheels and compressed air)
    d. all of the above

54. ESS(s). This article is to apply to all permanently installed *energy storage systems* (ESS) that may be _____ with other electric power production sources.
    a. stand-alone
    b. interactive
    c. retroactive
    d. both a & b

55. ESS(s) systems can have ____ output for utilization and can include inverters and converters to change stored energy into electrical energy.
    a. ac
    b. dc
    c. both a & b
    d. none of the above

---

**Article 712 – Direct-Current Microgrids**

A *direct-current microgrid* (dc microgrid) is defined as a power distribution system consisting of one or more interconnected dc power sources, dc–dc converters, dc loads, and ac loads powered by dc–ac inverters. A dc microgrid is typically not directly connected to an ac primary source of electricity, but some dc microgrids interconnect via one or more dc–ac bi-directional converters or dc–ac inverters. DC microgrids are related to the direct utilization of power from dc sources to direct-current loads—such as LED lighting, communications equipment, computers and servers, variable-speed motor drives, HVAC equipment, etc. Direct utilization of dc—whether generated by PV systems, fuel cells or other means, without intervening dc–ac and ac–dc conversion steps—leads to higher efficiencies and potentially smaller and lower-cost equipment than AC–coupled methods. The need for higher efficiency in telecom and data centers has driven these industries to implement dc microgrids in hundreds of data centers around the world. It is a trend that will likely continue as worldwide data centers use about 30 GW of electrical power, with the USA using about 10 GW.

56. A dc microgrid is typically directly connected to an ac primary source of electricity, but some dc microgrids interconnect via one or more dc–ac bi-directional converters or dc–ac inverters.
    a. true
    b. false

57. A *direct-current microgrid* (dc microgrid) is defined as a power distribution system consisting of _____ interconnected dc power sources, dc–dc converters, dc loads, and ac loads powered by dc–ac inverters.
    a. one
    b. two
    c. more than one
    d. all of the above

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**725.135(K){6), (L)(6) and (M)(6) Installation of Class 2, Class 3, and PLTC Cables**

2014 *NEC* Requirement

Type CMUC undercarpet communications wires and cables were permitted to be installed under carpet.

2017 *NEC* Change

New *Code* language was introduced at 725.135(K), (L), and (M) to clearly indicate that Type CMUC undercarpet communications wires and cables can be installed under modular flooring and planks, as well as under carpet.

58. 2017 NEC allows type CMUC undercarpet communications wires and cables installed under _____.

a. modular flooring
b. planks
c. carpet
d. all of the above

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770.44 Overhead (Aerial) Optical Fiber Cables
2014 *NEC* Requirement
Part II of Article 770 did not contain information pertaining to optical fiber cables installed overhead to a building or structure. Section 840-44 for premises-powered optical fiber-based broadband communications systems contained information applying to overhead outside plant optical fiber cables, but there was no such information in Article 770.
2017 *NEC* Change
A new 770-44 was added under Part II of Article 770 titled, "Overhead (Aerial) Optical Fiber Cables." This section contains needed information for the installation of overhead (aerial) optical fiber cables to buildings directly for Article 770.

59. A new 770-44 was added under Part II of Article 770 titled, "Overhead (Aerial) Optical Fiber Cables." This section contains needed information for the installation of _____ optical fiber cables to buildings directly for Article 770.
a. underground
b. overhead
c. surface
d. all of the above

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**Chapter Eight – Communication Systems**
**Revision: 840.48 – Unlisted Wires and Cables Entering Buildings for Premises-Powered Broadband Communications Systems**
In order to expand the coverage of Article 840, there is a change to recognize both twisted pair and coaxial cable-based systems in addition to optical fiber-based systems. In addition to the current reference to 770.48 for installations of unlisted optical fiber cables entering buildings, new references have been added for 800.48 unlisted communications wires and unlisted multi-paired communications cables entering buildings, and 820.48 for unlisted coaxial cables entering buildings.
The term *optical network terminal (ONT)* at 840.2 was revised to *network terminal,* and the definition was revised to accommodate twisted pair-based and coaxial cable-based systems in addition to optical fiber-based systems.
**Informative Annex D – Examples**
**Revision/New: Example D7 – Sizing of Service Conductors for Dwelling(s)**
The example for sizing of service conductor for dwelling units at Example D7 was revised to clarify the use of correction and adjustment factors. The example would now include provisions for sizing dwelling unit service conductors with no required adjustment or correction factors, and provisions with required temperature correction factors such as ambient temperature correction factors at Table 310.15(B)(2)(a). The previous table information that was located in Table 310.15(B)(7) prior to the 2014 NEC was re-inserted at Example D7. This table was added to show the dwelling-unit service conductor sizes required if there were no adjustment or correction factors to be applied.
This article is an effort to provide readers with current information about revisions that have been approved thus far in the 2017 *NEC Code* development process. Part 1 of these revisions covering key changes located in *NEC* Chapters 1 through 3 was published in the May-June 2015 issue of IAEI magazine. These changes are not set in stone as we are still in the middle of the 2017 *NEC* development process and are subject to changes based on Public Comments, etc. The final version of the 2017 *NEC* is scheduled be published in September 2016. These changes and many others will be featured in IAEI's *Analysis of Changes*, 2017 *NEC* scheduled to be published during the same time frame as the 2017 *NEC*.

60. The term *optical network terminal (ONT)* at 840.2 was revised to *network terminal,* and the definition was revised to accommodate _____ systems in addition to optical fiber-based systems.

a. twisted pair-based
b. coaxial cable-based
c. both a & b
d. none of the above

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## 2017 NEC Changes Part 2-Quiz Answer Sheet

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | a | b | c | d | 21 | a | b | c | d | 41 | a | b | c | d |
| 2 | a | b | c | d | 22 | a | b | c | d | 42 | a | b | c | d |
| 3 | a | b | c | d | 23 | a | b | c | d | 43 | a | b | c | d |
| 4 | a | b | c | d | 24 | a | b | c | d | 44 | a | b | c | d |
| 5 | a | b | c | d | 25 | a | b | c | d | 45 | a | b | c | d |
| 6 | a | b | c | d | 26 | a | b | c | d | 46 | a | b | c | d |
| 7 | a | b | c | d | 27 | a | b | c | d | 47 | a | b | c | d |
| 8 | a | b | c | d | 28 | a | b | c | d | 48 | a | b | c | d |
| 9 | a | b | c | d | 29 | a | b | c | d | 49 | a | b | c | d |
| 10 | a | b | c | d | 30 | a | b | c | d | 50 | a | b | c | d |
| 11 | a | b | c | d | 31 | a | b | c | d | 51 | a | b | c | d |
| 12 | a | b | c | d | 32 | a | b | c | d | 52 | a | b | c | d |
| 13 | a | b | c | d | 33 | a | b | c | d | 53 | a | b | c | d |
| 14 | a | b | c | d | 34 | a | b | c | d | 54 | a | b | c | d |
| 15 | a | b | c | d | 35 | a | b | c | d | 55 | a | b | c | d |
| 16 | a | b | c | d | 36 | a | b | c | d | 56 | a | b | c | d |
| 17 | a | b | c | d | 37 | a | b | c | d | 57 | a | b | c | d |
| 18 | a | b | c | d | 38 | a | b | c | d | 58 | a | b | c | d |
| 19 | a | b | c | d | 39 | a | b | c | d | 59 | a | b | c | d |
| 20 | a | b | c | d | 40 | a | b | c | d | 60 | a | b | c | d |

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