

...2017 NEC: Significant Changes

By Michael Johnston | May 15, 2017



As the 2017 National Electrical Code (NEC) development cycle came to a close, we embarked on a ten-part series of articles and a two-part webinar detailing the most significant changes in the 2017 NEC. With the series concluded, this article collects each entry and both webinars into a single location.

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The NFPA received 4,012 public inputs (PIs) recommending *Code* changes, and 1,235 first revisions (FRs) resulted. There were 1,513 public comments submitted, yielding 559 second revisions (SRs). Nine new articles were proposed, and five new articles emerged in the 2017 *NEC*. Many of the changes and new rules in this edition specifically address new technologies, such as expanded use of energy-storage systems and equipment; microgrid installations; and large-scale, photovoltaic (PV) system installations, but in total, the changes are as diverse as the *Code* itself.

The following is a list of the most significant changes in the *Code* from beginning to end, organized by article and section.

Article 90—Introduction

Section 90.2(A) Covered

The words “and removal” have been added in the first sentence of 90.2(A). This addition expands the *NEC*’s scope beyond installation requirements to include requirements addressing equipment removal. Current *NEC* rules require removal of equipment such as those for temporary power wiring removal and those for abandoned communications cables removal.

Section 90.3 Arrangement and Figure 90.3

Section 90.3 and associated Figure 90.3 have been revised. The revision clarifies that chapters 5–7 may modify or supplement requirements in chapters 1 through 7. The rules in chapters 5–7 can supplement or modify each other in addition to the provisions in chapters 1–4.

For example, Article 770 contains requirements for optical fiber cables, and Section 770.3(A) indicates listed optical fiber cables shall be permitted in hazardous (classified) locations, and the cables shall be sealed in accordance with the requirements of 501.15, 502.15, 505.16 or 506.16, as applicable.

Article 100—Definitions

Multiple definitions of words and terms pertaining to hazardous (classified) locations previously located in 500.2 have been relocated to Article 100. The words “as applied to

Hazardous (Classified) Locations” have been added in brackets following each relocated term.

Article 100—Readily Accessible

The definition of “readily accessible” has been revised. The definition maintains most of its existing text and now includes “other than keys.” A new informational note addresses the common practice and use of keys in gaining accessibility under controlled conditions.

Article 100—Field Evaluation Body and Field Labeled

New definitions of “field evaluation body” and “field labeled” have been incorporated into Article 100. These definitions have been developed from concepts derived from terms in NFPA 790, Standard for Competency of Third-Party Field Evaluation Bodies.

Article 100—Structure

The definition of “structure” has been revised by adding “other than equipment.” The revision provides a clear differentiation between what constitutes electrical equipment as compared to structures.

Article 100—Substation

The title of Part II of Article 100 has been changed from “Over 600 Volts, Nominal” to “Over 1000 Volts, Nominal.” The previous definition of “Substation” has been relocated from Part I to Part II.

The definition has been revised to clarify its physical characteristics and how it is usually intended to perform. A substation is defined as an assemblage of equipment (e.g., switches, interrupting devices, circuit breakers, buses and transformers) through which electrical energy is passed for the purpose of distribution, switching or modifying its characteristics. A substation can be an outdoor substation in an enclosure such as a fence, or it can be a unit substation.

2017 NEC Changes Webinar Parts 1 and 2



In 2016, ELECTRICAL CONTRACTOR and NECA hosted a two-part webinar on the significant changes for the 2017 National Electrical Code. We now present both parts in their entirety combined into a single video.

Article 110—Requirements for Electrical Installations

110.3(A) Examination

A new informational note No. 1 has been added to 110.3(A)(1). Previous Informational Note No. 1 has been renumbered as Informational Note No. 2. The new note clarifies that the term “equipment” used in this section can apply to new, reconditioned, refurbished or remanufactured equipment.

110.3(C) Listing

The title of 110.3 has been revised to include the words “(product certification).” A new Subdivision (C) and associated informational note have been added to Section 110.3.

The revision clarifies that listing (product certification) must be performed by recognized, qualified electrical testing laboratories, and the new informational note indicates that the Occupational Safety and Health Administration (OSHA) provides a list of such qualified laboratories.

110.14(D) Installation

A new subdivision (D), “Installation,” has been added following 110.14(C). This subdivision incorporates mandatory torque tightening requirements for electrical terminations in accordance with the manufacturer’s instructions. It also allows for alternative methods as provided in the instructions. The informational note to 110.14 has been deleted because it is no longer necessary.

110.16(B) Service Equipment

A new (B), “Service Equipment,” and informational note have been added to 110.16. The provisions in 110.16 now require more installation-related detail and information for determining arc-flash energy levels and required PPE. The nominal system voltage, available fault current, the service overcurrent protective device clearing time, and the label date must now be included in the arc-flash warning label. The informational note references NFPA 70E for specific criteria related to arc-flash labels and determining appropriate PPE.

110.21(A) Equipment Markings

The title of subdivision (A) has been changed to “Equipment Markings” from “Manufacturer’s Markings.” Section 110.21(A) has been renumbered as list items (1) and a new list item (2) with a new exception and informational note. New list item (2) provides marking requirements for reconditioned equipment including the responsible organization and date of reconditioning.

110.24(A) Field Marking

A new last sentence has been added to 110.24(A) addressing calculations. The additional requirements are intended to document the calculation and make it available to those authorized to design, install, inspect, maintain or operate the system. The maximum level of available fault current can be obtained from published utility data or by use of calculation methods.

Article 210—Branch Circuits

210.8(B) GFCI Protection in Other than Dwelling Units

Section 210.8(B) now applies to all single-phase receptacles rated 150 volts (V) to ground or less and 50 amperes (A) or less as well as three-phase receptacles rated 150V to ground or less and 100A or less. The list of locations is expanded to include receptacle outlets in crawl spaces and receptacles in unfinished basements in 210.8(B)(10).

210.12(B) Branch Circuit Extensions or Modifications—Dwelling Units and Dormitory Units

The existing requirements for arc-fault circuit-interrupter (AFCI) protection of branch-circuit extensions or modifications in dwelling units have been expanded to include dormitories. The same hazards exist in dormitories. AFCI protection in dormitories is expanded to include all outlets and devices in dormitory bathrooms.

210.12(C) Guest Rooms and Guest Suites

New subdivision (C), Guest Rooms and Guest Suites, has been added to Section 210.12. All 120V, single-phase, 15A and 20A branch circuits supplying outlets and devices installed in guest rooms and suites of hotels and motels must be protected by any of the AFCI methods listed in 210.12(A)(1) through (6). This new AFCI requirement applies to all guest rooms and suites without regard to cooking provisions.

210.52(B)(1) Receptacle Outlets Served

Exception No. 2 to 210.52(B)(1) previously permitted only refrigeration equipment to be supplied by an individual branch circuit 15A or greater. This revision eliminates the potential conflict with 210.22, which provides general permission for individual branch circuits. This expands this permissive exception to other appliances, such as dishwashers, garbage disposals and microwaves, that may be supplied from a receptacle outlet.

210.71 Meeting Rooms

A new Section 210.71, Meeting Rooms, has been added to Article 210. This rule provides minimum requirements for installing receptacles in meeting rooms. All meeting rooms of not more than 1,000 square feet in other than dwelling units are now required to have receptacle outlets installed. Where movable partitions exist, room size is determined with partitions resulting in the smallest size meeting room(s). A minimum number of receptacle outlets is required and location are permitted to be determined by the owner or designer.

As an aside, the National Electrical Contractors Association still believes this is a design issue, and the new requirement will result in inconsistent application in the field. However, it is a good start to address an identified need for required receptacles to minimize misuse of cords and power strips.

Article 240—Overcurrent Protection

240.67 Arc Energy Reduction

Section 240.67, Arc Energy Reduction, has been added to Article 240. A means of “arc energy reduction” applies to all fuses rated 1,200A or higher. This requirement has a delayed implementation of Jan. 1, 2020, to permit the industry to develop feasible solutions. The methods to reduce arc energy in 240.67 are similar to those in 240.87 with an additional provision permitting a fuse that would open the circuit in 0.07 seconds or less at or below the available arcing current.

Article 250—Grounding and Bonding

250.30(A)(4) Electrode

Section 250.30(A)(4) has been revised and simplified, and Exception No. 1 was deleted. There is no longer a hierarchy of electrodes that must be used for grounding separately derived systems. The revision clarifies that the building grounding electrode system must be used when establishing a grounding electrode for a separately derived system. If installed outdoors, the grounding electrode for the separately derived system must comply with 250.30(C).

250.104(A) Metal Water Piping

Section 250.104(A) has been revised by adding “if or sufficient size” to (A)(3) and (A)(4). The wording “that is interconnected to form a building frame” has been added to subdivisions (C) and (D). The minimum bonding conductor or jumper sizes must be in accordance with Table 250.102(C)(1) rather than 250.66.

250.122(F)(2) Multi-conductor Cables

Section 250.122(F)(2) has been revised and arranged in a list format. The revisions address minimum sizes for equipment grounding conductors (EGCs) in multiconductor cables in parallel arrangements. A single EGC in each cable can be connected in parallel at each

end and connected to a full-size EGC sized based on the overcurrent protection device for the entire circuit.

Article 300—General Requirements for Wiring Methods and Materials

300.5(D) Protection From Damage

Electrical metallic tubing (EMT) has been added to the list of raceways permitted to provide physical protection for direct-buried conductors and cables emerging from grade EMT, and associated elbows, couplings and fittings are permitted to be installed in concrete, in direct contact with the earth, approved as suitable for the condition. Section 358.10(B) requires that, where EMT is used in this manner, it must be where protected by corrosion protection and approved as suitable for the condition.

300.5(G) Raceway Seals

The general requirements of first-level subdivision 300.5(G) are now correlated with sections 225.27 and 230.8. Where necessary, spare or unused raceways shall also be sealed. The type of sealants applied must be identified for use with the cable insulation, conductor insulation, bare conductor, shield or other components.

300.22(B) Ducts Specifically Fabricated for Environmental Air

[SB]A new exception in 300.22(B) correlates requirements for wiring in ducts specifically fabricated for environmental air between the *NEC* and *NFPA 90A*. *NFPA 90A* permits cables that are “directly associated with the air distribution system” and not to “exceed four feet.” This revision correlates existing requirements within the *NEC*. For example, in Chapter 8, first-level subdivision 800.113(B) contains the same permission.

Table 310.15(B)(3)(c)

Table 310.15(B)(3)(c), containing rooftop temperature correction factors, has been deleted. Raceways or cables must be installed a minimum distance of $\frac{7}{8}$ -inch above the roof. Where installed less than $\frac{7}{8}$ -inch above the roof to the bottom of the raceway or cable, use a temperature adder of 60°F.

314.27(E) Separable Attachment Fittings

New subdivision (E) permits a new product referred to as a “separable attachment fitting.” This product is a listed locking support and mounting receptacle used in combination with compatible attachment fittings designed for the support of luminaires, paddle fans and so forth. These devices are designed to facilitate quick and easy interchange of luminaires or other equipment.

328.14 Installation

Section 328.14 requires type MV cable to be installed, terminated and tested by qualified people. NECA 600 2014, Standard for Installing and Maintaining Medium-Voltage Cable, has been added to the Informational Note. It provides valuable information on installation requirements, guidelines for qualified installers, cable splicing and more.

336.10 Uses Permitted

New list item (9) in 336.10 permits type TC-ER cable containing both power and control conductors to be used in one- and two-family dwelling units. In these installations, type TC-ER cable must be additionally marked “JP” to identify it as suitable for pulling through structural members. An exception permits the use of TC-ER cable for generators and associated equipment without the need to apply ampacity correction factors in accordance with 334.80 or 340.80.

338.10(B) Branch Circuits and Feeders

Type SE cable with ungrounded conductor sizes 10 AWG and smaller, installed in thermal insulation, is limited to ampacity rating at 60°C. Larger SE cable installed in thermal insulation is no longer limited to an ampacity in the 60°C and can be applied at 75°C rating.

358.10 Uses Permitted

Section 358.10 has been revised for clarity and consistency with other .10 sections covering uses permitted for raceways. Permissive applications for EMT in 358.12 are relocated in 358.10 for clarity. Section 358.10(B) now addresses stainless steel EMT for corrosive environments.

366.20, 368.20, 376.20 and 378.20 Conductors Connected in Parallel

New requirements for conductors connected in parallel are added in the .20 section of articles 366, 368, 376 and 378. Alternating current (AC) circuits connected in parallel must have conductors installed in groups consisting of not more than one conductor per phase, neutral or grounded conductor. The intention is to prevent current imbalance that can create heat and subsequent failure in the paralleled conductors due to inductive reactance.

392.22(A) Number of Multiconductor Cables, Rated 2,000 Volts or Less, in Cable Trays

Each section of cable tray containing dividers must be treated individually with respect to fill calculations. A ladder-type tray that is divided with power on one side and control on the other side may now have the fill calculated by both 392.22(A)(1) and (A)(2) permitting a 50 percent fill calculation on the signal side of the tray.

Article 400—Flexible Cords and Cables

404.2(C) Switches Controlling Lighting Loads

The reference to “habitable room” has been deleted. Bathrooms, hallways, stairways and rooms suitable for human habitation require the grounded conductor to be installed. A reference to the applicable building code has been included. The section parent text has been modified for clarity, for multiple switch locations. New text requires connection to switch devices (where required) beginning Jan. 1, 2020. New Section 404.22 has been added and correlates with this section.

404.22 Electronic Lighting Control Switches

All electronic lighting control switches are required to be listed. As of Jan. 1, 2020, electronic lighting control switches (with exceptions) will not be permitted to introduce current on the equipment-grounding conductor during normal operation. Manufacturers will only make devices that place current on the equipment-grounding conductor during normal operation for replacement/retrofit.

406.2 Outlet Box Hood

Section 406.2 now contains a definition for “Outlet Box Hood” that applies where the term

is used within Article 406. The hood does not serve to complete the electrical enclosure; it reduces the risk of water coming in contact with electrical components. Outlet box hoods are commonly known as a “bubble cover” or “in-use cover.”

406.3(F) Receptacles with USB Charger

New 406.3(F), Receptacles with USB Charger, permits these devices to be installed if they are listed and constructed so the Class 2 circuitry is integral with the receptacle. These devices are listed to ANSI/UL 498.

406.12 Tamper-Resistant Receptacles

Section 406.12 now addresses all 125- and 250V, nonlocking-type, 15- and 20-ampere receptacles. New occupancies have been added to the receptacle tamper-resistant requirements: Preschools and elementary education; business offices; corridors; waiting rooms and the like in clinics, medical and dental offices and outpatient facilities; assembly occupancies described in Section 518.2; and dormitories.

422.16(B)(2) Built-in Dishwashers and Trash Compactors

Flexible cords supplying trash compactors are permitted to be between 3–4 feet long. A longer, flexible cord to facilitate connection for dishwashers in an adjacent space is permitted to be between 3–6½ feet long. The receptacle for a trash compactor must be located in the space occupied by the appliance or adjacent, and the receptacle for a built-in dishwasher must be located in the space adjacent to the space occupied by the dishwasher.

422.31(A) and (B) Appliance Disconnects

Permanently connected appliances rated at not over 300 volt-amperes or 1/8 horsepower (hp) and motor operated appliances over 1/8 hp now require disconnects within sight or lockable in accordance with 110.25. The provisions for locking shall remain in place with or without the lock installed. This will require an identified accessory for circuit breakers.

424.99(C) Installation Under Floor Covering

A grounding braid or sheath is required for all heating panels and heating panel sets installed under floor covering. Ground-fault circuit interrupter (GFCI) protection is required

for all heating panels and heating panel sets installed under floor covering. The combination of a grounding braid or sheath and GFCI increases protection from shock.

Article 425—Industrial Process Heating Equipment

Article 425 is added to cover fixed industrial process heating employing electric resistance or electrode heating technology. Article 425's requirements are similar to those in existing Article 424. It does not apply to heating and room air conditioning for personnel spaces, fixed heating equipment for pipelines/vessels, and induction and dielectric heating equipment and other special applications.

430.99 CC Available Fault Current Documentation

Section 430.99 is new and requires documentation of the amount of available short-circuit current at a motor control center and the date the calculation was made. This information must be documented and available for the authority having jurisdiction to ensure compliance with 430.98(A). While a label or marking of available short-circuit current is not required on the motor control center, it may be the most feasible method of complying with this new requirement.

430.130(A)(4) Circuits Containing Power Conversion Equipment

New Section 430.130(A)(4) replaces the previous informational note to address the type of protective device for circuits containing power conversion equipment.

Where an instantaneous trip circuit breaker or semiconductor fuses are used, they must be an integral part of a single listed assembly. This revision aligns the *NEC* with the applicable product standard, UL 508C.

440.9 Grounding and Bonding

Section 440.9 now requires a "wire-type" equipment grounding conductor (EGC) for outdoor portions of metallic raceway systems that use nonthreaded fittings installed on a roof. Physical damage caused by activities on a roof combined with the weather can cause nonthreaded connectors and couplings to open, eliminating the fault return path on the metal raceway.

While this is a significant revision, there will be little impact on the industry because the

vast majority of EMT installations include a “wire-type” EGC by specification without regard to where the EMT is installed.

440.65 Protection Devices for Room Air Conditioners

Section 440.65 was retitled “Protection Devices.” The permitted protective devices are a leakage-current detection interrupter (LCDI), an arc-fault circuit interrupter (AFCI) or a heat-detecting circuit interrupter (HDCI). An HDCI incorporates all of the protection functions of an LCDI and includes a thermal detecting function to the air conditioner’s compressor against overheating.

445.13(B) Ampacity of Conductors

New Section 445.13(B) clarifies that generator-supplied conductors on the load side of an overcurrent protective device are not required to be sized at 115 percent of the generator nameplate current. Generator-supplied conductors on the load side of an overcurrent protective device (OCPD) may be applied in accordance with 240.21(B). The 115 percent rule applies only to conductors from the generator output terminals to an OCPD.

445.18 Disconnecting Means and Shutdown or Prime Mover

Section 445.18 has been separated into three first-level subdivisions to provide a more logical layout. Section 445.18(A) requires one or more disconnecting means (110.25) that simultaneously open all ungrounded conductors for all generators other than cord- and plug-connected portable generators. Section 445.18(B) requires a means to shut down the prime mover, disabling all prime mover start control circuits, rendering the prime mover incapable of starting. Section 445.18(C) provides clarity for required disconnects where generators are installed in parallel.

480.3 Listing of Batteries and Management Equipment

Section 480.3 is new and requires all batteries and their associated battery management equipment to be listed. The listing requirement excludes lead-acid-type batteries. Catastrophic failures in new battery technology systems mandate rigorous testing for safety.

500.2 Definitions

Multiple definitions previously located in 500.2 have been relocated to Article 100.

Section 2.2.2.1 of the *NEC Style Manual* requires that, if a term appears in more than two articles, it shall be included in Article 100. The words “as applied to Hazardous (Classified) Locations” have been added in brackets following each relocated defined term.

500.5(A) Ammonia Areas are permitted to be Unclassified

The title of Subdivision (A) has been changed from “Classifications of Locations” to “General.” Classification of ammonia system refrigerant machinery rooms has been revised and clarified based on provided ventilation. Ammonia areas provided with adequate, continuous mechanical ventilation or initiation by a detection system at concentrations not exceeding 150 parts per million shall be permitted to be as unclassified locations. Section 505.5(A), covering the hazardous location classification zone system, includes a similar revision.

505.15(A) New Limits for Protection Techniques in Zone 0 Locations

Section 505.15(A) provides requirements for allowable wiring methods in Class I, Zone 0 locations. The previous allowance for all intrinsically safe wiring methods in accordance with Article 504 has been reduced. Type “ia” intrinsically safe circuits and type “ma” encapsulation are suitable protection techniques for installations in Zone 0 hazardous locations.

511.3(D) Classification of Locations in Commercial Repair Garages

Section 511.3(D) has been revised and titled “Repair Garages, Major.” This subdivision and new associated Table 511.3(D) provide area classification for major repair garages that use lighter-than-air gaseous fuels. The new informational note provides a reference to NFPA 30A and Table 8.3.2, the origin of these area classification requirements.

511.8 Underground Wiring

A new Section 511.8, Underground Wiring, and an exception have been added. The driving text requires either threaded rigid metal conduit or intermediate metal conduit. The exception permits nonmetallic wiring methods under restrictive conditions dealing with depth, transitions to metallic conduit methods and installing an equipment grounding

conductor.

514.3(B)(3) Storage Tank Area Classifications

A list item (3) in Section 514.3(B) is new and addresses liquefied natural gas (LNG), compressed natural gas (CNG), and liquefied petroleum gas (LPG) storage tank areas and locations. The new requirements provide separation distances from property lines and from other gas storage tanks. Table 514.3(B)(2) is referenced from this new list item for establishing classification of areas containing CNG, LNG or LPG storage or dispensing operations.

514.11 Emergency Disconnects for Motor Fuel Dispensing Equipment

Section 514.11 has been revised to align with the requirements in NFPA 30A 2015. Subdivision (A) now addresses only emergency disconnects for dispensing equipment and no longer addresses circuit maintenance disconnects and breaking all conductors of the circuit(s). Section 514.13 still provides these requirements. Subdivisions (B) and (C) address locations of disconnects for attended and unattended dispensing facilities, respectively.

Article 516 Rewritten

Article 516, Spray Application, Dipping, Coating, and Printing Processes Using Flammable or Combustible Materials, has been rewritten to align more closely with NFPA 33 and 34 including extracted material. The rewrite includes organizing the previous requirements into separately titled parts of Article 516. The revisions provide a more logical layout, which enhances usability, and more consistency with *NEC* Style Manual requirements.

517.2 Governing Body of Health Care Facilities

The term “governing body” appears in multiple sections in *NEC* Article 517. A new definition of the term has been added to Section 517.2 to meet *NEC* Style Manual requirements. The new definition correlates between NFPA 99, Health Care Code, and NFPA 70, *National Electrical Code*, as it is an extracted definition. This definition is important because it directly relates to the governing body that makes decisions about the level of patient care in all facility spaces. A critical aspect of the new definition is that this body has the overall legal responsibility for the operation of the healthcare facility.

517.2 Invasive Procedure

A new definition of the term “invasive procedure” has been added to 517.2 and includes any procedure that penetrates the protective surfaces of a patient’s body (i.e., skin, mucous membrane, cornea) and that is performed with an aseptic field. Note that not included in this category are placement of peripheral intravenous needles or catheters used to administer fluids or medications, gastrointestinal endoscopies, insertion of urethral catheters and other similar procedures. This revision aligns *NEC* Article 517 with the term defined and used in NFPA 99, Health Care Facilities Code.

517.2 Patient Care Spaces

The defined terms under the main definition of “patient care space” have been revised, and descriptive informational notes follow each term. The revisions incorporate numerical categories (1 through 4) following each definition, and the bracketed information contains the location of the extract. The care locations within a healthcare facility are now defined as “spaces” and are each provided with a specific category that indicates the level of care under that designation. The revision aligns Article 517 with terms defined and used within NFPA 99.

517.16 Use of Isolated Grounding Receptacles

This section has been expanded into two subdivisions. Subdivision (A) provides a clear prohibition of isolated grounding (IG) receptacles within any patient-care vicinity and is extracted from NFPA 99. Subdivision (B) provides allowable installations of IG receptacles that are outside of a defined patient-care vicinity. IG receptacles must be wired to meet the requirements in 517.13(A) and (B) and include an insulated copper equipment grounding conductor for the IG receptacle in accordance with 250.146(D). The wire-type insulated equipment grounding conductors are required, and the conductor installed for the IG receptacle must be identified with green insulation that includes one or more yellow stripes.

517.29 Essential Electrical Systems for Hospitals and Other Health Care Facilities

A new Section 517.29 has been added in Part III of Article 517. This provides information relative to types of essential electrical systems (EESs) required for Category 1 and Category

2 care locations. Subdivision (B) clarifies that critical care (Category 1) spaces shall be served only by a Type 1 EES. The type designations for the essential electrical systems in healthcare facilities are new to Article 517, and they align with the “Type 1” and “Type 2” designations included in NFPA 110, Standard for Emergency and Standby Power Systems.

517.30 Sources of Power Expanded

The required sources of power have been relocated from Section 517.35 to 517.30 for usability. Fuel cells are now included as a source of power for the essential electrical system, and it must be listed for that use. Subdivision (C) has been revised to remove the subjective phrase “careful consideration” and now clearly includes mandatory requirements for location of EES components and services.

517.40 Essential Electrical System for Nursing Homes and Limited Care Facilities

The words “Type 2” have been added to the title of 517.40. The revision clarifies the type of EES required for nursing homes and limited-care facilities. The informational note assigns categories to the types of care in these facilities and provides the trigger for application of 517.29 through 30.

600.2 Definitions and 600.34 PV Powered Signs

Photovoltaic (PV) powered signs are now defined in 600.2 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. New Section 600.34 provides installation requirements for PV-powered signs.

625.2 Definitions

Article 625 covers electric vehicle supply equipment (EVSE) and specifically addresses conductive charging and inductive (wireless) charging. Eight definitions are added to support new requirements for electric vehicle charging.

Multiple new definitions are added to address wireless power transfer. These definitions mirror terminology used in SAE J2954, a standard that covers wireless charging of electric and plug-in hybrid vehicles. A new Part IV of Article 625 provides rules for wireless power transfer equipment.

680.2 Electrically Powered Pool Lifts

An electrically powered pool lift is now defined in 680.2 as a lift that provides accessibility to and from a pool or spa for people with disabilities. New Article 680 Part VIII provides requirements for electrically powered pool lifts. Only the requirements in Part VIII of Article 680 apply to pool lifts. This equipment is required to be listed.

680.7 Grounding and Bonding Terminals

New Section 680.7, Grounding and Bonding Terminals, has been added and provides specific requirements for all grounding and bonding terminals. All must be identified for use in wet and corrosive environments and listed for direct burial use. Where field-installed in a damp, wet or corrosive environment, all must be composed of copper, copper alloy or stainless steel.

680.11 Location of Underground Pool Wiring

Requirements from 680.10 for location of underground wiring have been relocated to 680.11. The prohibition of wiring within 5 feet of the pool is removed; all permitted wiring methods are listed. Former Table 680.10 for minimum cover depths has been deleted. Now, all underground wiring cover depths in the pool area must be in accordance with Table 300.5.

690.12 Rapid Shutdown of PV Systems

Section 690.12 was significantly revised and separated into parent text and four first-level subdivisions. An array boundary is established with requirements for circuits outside and inside the array boundary. Three rapid-shutdown methods are provided for circuits inside the array boundary with an effective date of Jan. 1, 2019. The requirements for rapid shutdown of PV systems and equipment installed on buildings are in direct response to concerns expressed by first responders. Rapid shutdown provides responders with a method to reduce the output of PV systems to 30 volts within 30 seconds to allow for safe firefighting operations.

690.56(C) Marking Requirements for Buildings With PV Systems

Marking requirements for rapid shutdown were significantly revised to warn emergency

responders of hazards presented by a PV system and associated conductors. Two specific types of markings now address the type of rapid shutdown of the PV system and conductors in 690.12. Two new figures provide prescriptive and consistent detail in the required markings.

691 Large-Scale PV Systems

Large-scale PV electric power production facilities are covered by new Article 691. The number of large-scale PV systems is relatively small, but they generate more power than the combined output of all residential and commercial PV. To qualify for applying Article 691, all provisions in 691.4 must be met.

A system is considered large-scale PV if it has a capacity of 5,000 kilowatts and is not under exclusive utility control. Only qualified personnel are permitted to maintain and operate these systems.

695.3 Power Sources for Electric-Driven Fire Pumps

A new informational note in 695.3 provides Code users with useful guidance for determination of reliability. NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, has purview over fire pump performance and the reliability of the power source. Shutdowns, routine loss of power and overhead service conductors are identified as factors that would cause consideration that the source as unreliable.

700.2 Definitions

A new definition of “directly controlled luminaires” was added to 700.2. Article 700.24 was added during the 2014 revision cycle. It permits directly controlled luminaires as emergency lighting, but the term was not defined. These luminaires may be dimmed but must be driven to full illumination upon loss of normal power.

700.3(C) and 701.3(C) Maintenance

Sections 700.3(C) and 701.3(C) have been revised to require maintenance on all emergency and legally required system equipment. Electrical equipment in these emergency and legally required standby systems must be maintained in accordance with the manufacturer’s instructions and NFPA 70B, Standard for Electrical Equipment Maintenance.

700.10(A) Identification of Emergency System Wiring

Where boxes or enclosures are not encountered, exposed cable or raceway systems must be marked as a component of an emergency circuit or system at intervals not to exceed 25 feet. Receptacles supplied from the emergency system must have a distinctive color or marking on the cover plates or the receptacles themselves. The *NEC* does not specify a color, but red is often used.

702.12(C) Power Inlets Rated 100 Amperes or Greater

A new Section 702.12(C) requires power inlets rated 100 amperes (A) or greater for portable generators in optional standby systems to be listed for the intended use. Power inlets must be equipped with an interlocked disconnecting means. Exceptions are included for inlet devices that are rated as a disconnecting means and for supervised industrial installations.

Article 706 Energy Storage Systems

Energy storage is becoming essential to meeting load-leveling capabilities along with demand response as it relates to smart grid initiatives and Department of Energy mandates on energy use. Associated and emerging technology coupled with the need for energy storage systems (ESSs) is growing rapidly, and new Article 706 provides requirements for ESSs in the *NEC*. Article 706's scope specifically limits application to permanently installed ESSs over 50 volts (V) AC or 60V DC to correlate with existing requirements. This article correlates multiple other energy storage requirements in the *NEC*.

708.10(A)(2) COPS Receptacle Identification

Nonlocking-type, 125V, 15- and 20A receptacles in buildings with critical operations power systems (COPS) and other power systems must have an illuminated face or an indicator light to signal there is power to the receptacle. All COPS-supplied receptacles installed where other power systems are present must have a distinctive color or marking on the cover plates or receptacles themselves so as to be readily identifiable.

Article 712 DC Microgrids

New Article 712 provides installation requirements for DC microgrids. DC microgrids

eliminate power conversion resulting in more efficient use of renewable energy sources. DC power sources include AC-DC converters (rectifiers), bidirectional DC-AC inverters/converters, photovoltaic systems, wind generators, ESSs (including batteries) and fuel cells.

725.144 Transmission of Power Over Limited Energy Cables

A new Section 725.144 was added to address requirements for Class 2 and Class 3 circuits that transmit power and data to a powered device. Table 725.144 is new and lists permitted ampacities based on conductor types, sizes, number of cables bundled and ambient temperatures. Conductors that supply power for data circuits must be copper.

728.5(C) Fire-Resistive Cable Installation

Section 728.5(C) has been modified to mandate that raceway fill for each system comply with the listing requirements for the system and not be greater than the fill permitted in Table 1, Chapter 9.

Article 840 Part VI and 840.160

A new Part VI in Article 840 addresses power over ethernet (PoE). Section 840.160 requires compliance with section 725.144 for PoE installations. A new Section 840.170 provides listing requirements for PoE power sources.

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