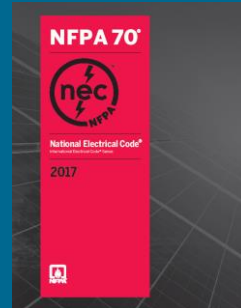




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# Overview of Significant 2017 NEC® Changes



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# Five New NEC® Articles

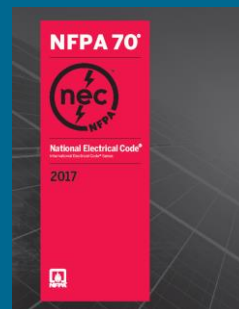
Article 426 – Fixed Resistance and  
Electrode Industrial Heating Equipment

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

Article 708 – Energy Storage Systems (ESS)

Article 710 – Stand-Alone Systems

Article 712 – Direct Current Microgrids

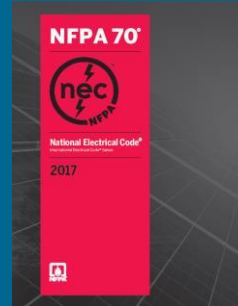


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# Changes Impacting all Installations



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## Article 100 – Structure

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- 2014 NEC:
  - That which is built or constructed
- 2017 NEC:
  - That which is built or constructed, other than equipment (electrical).
- Electrical equipment may be mounted on or supported by a structure such as a concrete pad for outdoor equipment
- Clarifies pedestals such as RV power supply units do not require grounding electrode system



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## 110.14 (D) – Tightening Torque

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- Added as new requirement to general rules for terminations
- Requires adherence to numeric torque markings on equipment or installation instructions
- Use of a calibrated torque tool specified unless manufacturer provides alternative method to accomplish proper connection
- Use of general listing instruction requirement in 110.3 (B) to require compliance with torque markings is no longer necessary



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## 110.21 (A) (2) – Reconditioned Equipment

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- Equipment to be marked with name, trademark or other descriptive marking that identifies the organization responsible for reconditioning or refurbishing the equipment.
- Marking to indicate equipment is reconditioned and the date of the reconditioning.
- Original listing of the equipment cannot be the sole basis for equipment approval.
- Normal servicing of equipment is not considered to be reconditioning or refurbishing.
- Exception to this marking requirement for industrial occupancies.



## 338.10 (B) (4) (a) – SE Cable in Thermal Insulation

---

- Revised requirement on temperature rating of cables installed in thermal insulation
- Only cables with 10 AWG and smaller conductors shall be required to default to 60 degree C ampacity
- Maximum temperature rating of conductor insulation is permitted to be used for ampacity correction or adjustment



## 404.22 – Connection of Switches w/Power Supplies

---

- New requirement for construction of electronic lighting control switches
- Increased use of devices like motion and occupancy sensors per energy conservation codes
- Devices required to be listed
- Devices cannot introduce current on the neutral conductor as of January 1, 2020
- Exception to allow electronic lighting control devices that connect to EGC for existing installations



## 406.12 – Tamper-Resistant Expansion

- Expansion of requirement for tamper-resistance protection of nonlocking, 125 volt and 250 volt 15- and 20-ampere receptacles in:
  - Preschools and elementary educational facilities
  - Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities
  - Subset of assembly occupancies described in 518.2 to include places of waiting transportation, gymnasiums, skating rinks, and auditoriums
  - Dormitories



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## 422.6 – Listing of Appliances

- New requirement for appliances operating at over 50 volts to be listed



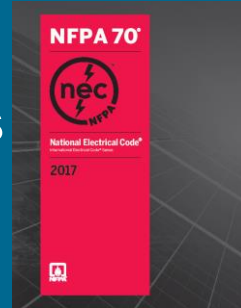
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# Changes Impacting Residential Installations



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## 210.8 & 210.8 (A) (7)

- Revised language to clarify how to establish measurement from a kitchen sink.
- The 6 ft. measurement is made from the **top** inside edge of the sink bowl
- Measurement is based on “**shortest path**” a cord would take from specified object to receptacle.
- Cord length is **not measured** through doors, doorways, or windows and **is not considered to “pierce”** floors, walls, ceilings, or other fixed barrier (such as refrigerator enclosure)
- Receptacle(s) in cabinet below the sink will now be excluded unless it is for the dishwasher (210.8 (D))



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## 210.11 (C) (4) – Garage Branch Circuit

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- New requirement for branch circuit dedicated to receptacles installed in dwelling unit garages
- At least one, 120 volt 20 ampere branch circuit
- Applies to attached garages and to detached garages supplied with power
- Circuit cannot supply lighting outlet inside or outside of garage
- Exception permits this circuit to supply readily accessible outdoor receptacle outlets



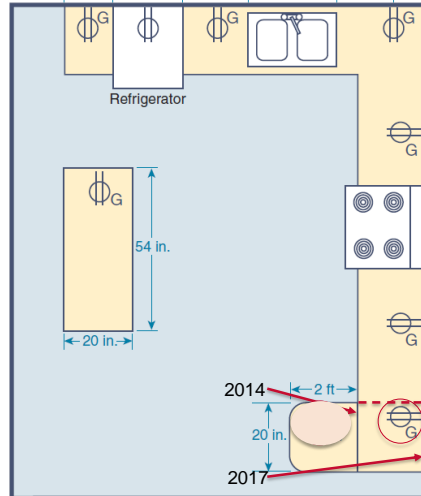
## 210.52 (C) (3) Peninsula Countertop Spaces

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- Revised requirement on how to measure peninsula countertops for purposes of determining receptacle outlet location
- Peninsula is measured from the “connected perpendicular wall”
- One outlet minimum if peninsula countertop meets qualifying long (24”) and short (12”) dimensions.
- Sinks or countertop ranges may create separate peninsula spaces per 210.52 (C) (4)



## 210.52 (C) (3) Peninsula Countertop Spaces



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## 310.15 (B) (7) – Residential Service and Feeder Ampacity

- 3-conductor (2 hots and a neutral) feeders can now be derived from either single or three phase supplies.
- Any necessary correction or adjustment factors can be applied to the ampacity based on a conductor's insulation temperature rating.
- Service or feeder ratings are based on the standard ratings from 240.6.



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## 336.10 (9) – Uses Permitted for Tray Cable

- Type TC-ER cable permitted to be installed through structural members of one- and two-family dwellings
- Must be identified for this use – TC-ER-JP
- Installation rules for this application follow those for Type NM cable
- Exception to use other than 60 degree C ampacity for generator connections with 75 degree C terminations



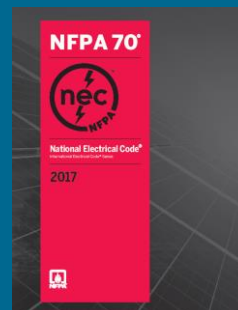
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# Changes Impacting Commercial, Institutional and Industrial Installations



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## 210.8 (B) – Other than Dwelling Units

- Expansion of receptacle configurations requiring GFCI protection in occupancies other than dwelling units
- Applies to single-phase receptacles installed in locations specified in 210.8 (B) (1) – (10) rated:
  - 150 volts to ground or less
  - 50 amperes or less
- Applies to three-phase receptacles installed in locations specified in 210.8 (B) (1) – (10) rated:
  - 150 volts to ground or less
  - 100 amperes or less



## 210.12 (C) & (D) AFCI Protection

- New requirement covering hotel and motel guest rooms and guest suites
- Applies to all 120 volt, single-phase, 15- and 20-ampere branch circuits supplying outlets in guest rooms and guest suites
- Requirement for AFCI protection of branch circuit extensions or modifications now includes dormitory units and has been relocated as new 210.12 (D)



## 210.71 Meeting Room Receptacle Outlets

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- New requirement for meeting rooms not exceeding 1000 ft<sup>2</sup>
- Receptacles provided are non-locking, 125-volt, 15- and 20-ampere types
- If room can be divided with movable partitions room size is based on smallest room size with partitions closed
- Spacing of wall receptacles outlets is determined using 210.52 (A) (1) through (4)
- Location of required receptacles outlets can be determined by building owner or by a designer



## 220.12 Exception No. 2 – Load Calculation for Office and Bank Occupancies

---

- New permissive exception for calculating general lighting loads in office and bank occupancies
- Based on requirements limiting lighting density contained in locally adopted energy code
- Permits reduction of 1 volt-ampere/ft<sup>2</sup> where energy code lighting density is less than 1.2 volt-amperes/ft<sup>2</sup>



## 310.15 (B) (3) (c) – Rooftop Ampacities

- Temperature “adder” table deleted.
- Further research indicated that heat internal to the raceway acted to insulate the conductors from solar radiation therefore concluding that the I<sup>2</sup>R losses and solar radiation did not create an additive heating effect.
- Raceways and cables must have air circulation around the raceway for proper heat dissipation.
- Raceways and cables that do not maintain 7/8 in. clearance from roof surface are subject to 60 degree temperature adder.
- XHHW-2 exception retained.



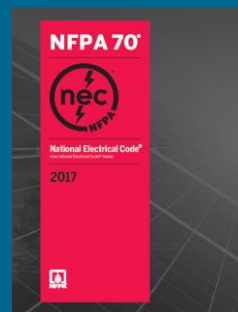
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# Changes Impacting Safe Work Practices and NFPA 70E Compliance



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## 110.16 (B) – Arc Flash Marking of Service Equipment

- Service equipment rated 1200 A or more
- Installed in other than dwelling units
- In addition to general warning required by 110.16 (A), a permanent label shall be field or factory applied
- The label shall meet the requirements of 110.21(B) and contain the following information:
  - (1) Nominal system voltage
  - (2) Available fault current at the service overcurrent protective devices
  - (3) The clearing time of service overcurrent protective devices based on the available fault current at the service equipment
  - (4) The date the label was applied
- *Exception: Service equipment labeling shall not be required if an arc flash label is applied in accordance with acceptable industry practice.*



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## 110.26 (A) (4) – Limited Access

- Equipment operating at 1000 volts, nominal, or less to ground that is likely to require examination, adjustment, servicing, or maintenance while energized.
- If equipment is required by installation instructions or function to be located in a space with limited access, all of the following shall apply:
  - 22 in. × 22 in. minimum access above ceiling
  - 22 in. × 30 in. minimum access for crawl spaces
  - Minimum width is 30 in. or the width of the equipment, whichever is greater
  - Enclosure doors or hinged panels must open not less than 90 degrees.
  - Front work space to comply with Table 110.26(A)(1).
  - Height of the working space is that necessary to install the equipment
  - Horizontal ceiling structural member or access panel shall be permitted in this space.



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## 240.67 Arc Energy Reduction for Fusible Equipment

- New requirement for equipment containing fuses rated 1200 amperes or higher
- Requires additional arc-energy mitigation features where fuse clearing time is greater 0.07 seconds
- Documentation of location of fuses rated 1200 A or higher must be made available to designers, installers and maintainers
- Requirement has effective date of January 1, 2020



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## 408.3 (A) (2) – Panelboard Barriers

- Revision to require barriers for line terminals of service panelboards
- Exception exempts line terminals of panelboard having more than a single service disconnecting means



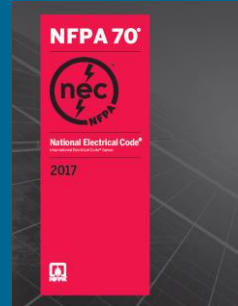
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# Changes Impacting Special Occupancies, Equipment and Conditions Chapters 5, 6 & 7



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## 511.8 – Wiring Under Commercial Garages

- Addition of requirement for underground wiring.
  - Requires use of RMC or IMC
  - Nonmetallic conduit types permitted with 24" of cover
  - RMC or IMC required for the 2 foot length from below grade to point of emergence above grade
  - Raceway must contain EGC
  - No concrete encasement required



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## 555.3 – GF Protection at Marinas, Boatyards & Commercial & Noncommercial DF

---

- Revised from 100 mA to 30 mA trip level
- Applies to circuits supplying docking facilities
- Reduction of trip level was based on recommendation contained in FPRF study report – Assessment of Hazardous Voltages/Current in Marinas, Boatyards and Floating Buildings
- Section 553.4 received no public input to make the same change – remains at 100 mA level



## 590.4 (B) and (C) – SE Cable for Temporary Installations

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- Revised to permit Type SE (includes SER) cable to be used as a temporary wiring method for branch circuits and feeders in exposed locations above ground and in raceways installed underground
  - Substantiation indicated that this is necessary on construction sites where temporary power is run to job trailers and from building to building and overhead wiring is impractical due to cranes and other heavy equipment
  - Temporary wiring is required to be removed from construction sites upon completion of project





## 620.51 (D) (2) – Short-Circuit Current Marking

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- New requirement to field mark elevator control panels with the maximum available short circuit current available at line terminals.
  - Marking must include date SCC was determined
  - Shall be of sufficient durability to withstand environment
  - Update and verify continued suitability of the control panel when modifications are made that change the available SCC
  - Similar to 110.24 marking



## 680.14 – Corrosive Environment

---

- New requirement on suitable wiring method for locations determined to be corrosive (acid, chlorine & bromine vapors)
- Corrosive locations include:
  - Storage areas for pool chemicals (chlorine, bromine)
  - Areas with circulating pumps, automatic chlorinators, filters, open areas under decks adjacent to or abutting pools
- Wiring methods – Listed and identified for use, or
  - RMC
  - IMC
  - PVC
  - RTRC



## 680.25 – Feeders Supplying Pool Equipment

- Use 680.14 (B) wiring method for that **portion of a feeder** installed in corrosive environments described in 680.14 (A)
- Liquidtight flexible nonmetallic conduit also permitted
- Wiring methods in corrosive environments described in 680.14 (A) must contain insulated copper equipment grounding conductor sized per Table 250.122, but not smaller than 12 AWG
- Feeders installed in noncorrosive environments can be wired using any appropriate Chapter 3 wiring method

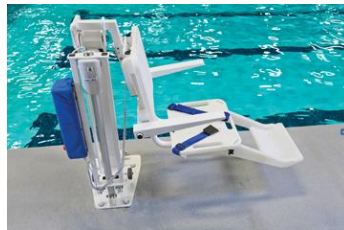


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## Article 680 Part VIII – Electrically Powered Pool Lifts

- New Part VIII with requirements for EPPL
- Lifts shall be listed and labeled
- Exceptions to listing and labeling where:
  - Battery operated and battery is equal or less than low-voltage contact limit
  - Solar operated or recharged lifts w/battery voltage of 24 volts or less
  - Source is equal or less the LVCL and transformers or power supply is listed or labeled and meet 680.23 (A) (2)



*A permanent pool chair lift.*



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## 695.15 – Surge Protection

- Listed surge protection device (**SPD**) required in or on the **fire pump** controller.



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## 700.3 (F) – Permanent Provision for Temporary Connection

- New requirement for permanent means to connect portable generator when normal EPS is out of service
- Applies only where the EPS consists of a single alternate source



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## 700.12 (D) – Protection of Feeders, Supply Equipment, and Generator Control Wiring

- Revised to add new occupancies requiring 2-hour equipment protection:
  - Health care occupancies where patients are incapable of self-preservation
  - Educational occupancies with more than 300 occupants



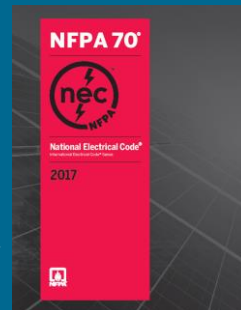
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## Changes Impacting Alternative Energy Technologies and Electric Vehicle Supply Equipment (EVSE)



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## 225.30 (A) (7) Number of Supplies – EV Charging Equipment

- New condition permitting multiple feeders or branch circuits to EV charging equipment that is listed, labeled and identified for supply by multiple circuits.
- Corresponding requirement added to 625.47



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## 625.1 – Wireless Power Transfer

- Wireless Power Transfer (WPT). The transfer of electrical energy from a power source to an electrical load via electric and magnetic fields or waves by a contactless inductive means between a primary and a secondary device.
- Wireless Power Transfer Equipment (WPTE). Equipment consisting of a charger power converter and a primary pad. The two devices are either of the following: (1) Interconnected by an output cable or suitable conduit system (2) Contained within a single enclosure without an output cable or other suitable wiring means.



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## 690.2 – Functional Grounded PV System

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- New definition describing grounding arrangement most commonly found in DC side of PV systems
- DC side of PV systems are generally not solidly grounded systems
- Grounding connections through protective devices, resistors or similar apparatus provide a reference point but may open under a fault condition such as PV GF protective devices
- Clarifies that there is not an intentionally grounded circuit conductor on the dc side of the system



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## 690.12 (B) – PV Rapid Shutdown

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- Purpose of rapid shutdown systems are to protect emergency responders
- Concept of *array boundary* introduced
- Defined as area 1 foot in all directions from the array
- Conductors outside the *array boundary* or more than 1 ft. from the point of entry shall be reduced to 30 volts maximum within 30 seconds of RS initiation



## 690.12 (B) – PV Rapid Shutdown Controlled Limits

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- Conductors inside the *array boundary* must be protected by:
  - Array being listed or field labeled as a rapid shutdown array, or
  - Conductors shall be reduced to 80 volts with 30 seconds of RS initiation
  - PV arrays with no exposed conductors or live parts and located not more than 8 ft. from ground or grounded surface not required to comply with 690.12 (B) (2)
  - Requirement of 690.12 (B) becomes effective on January 1, 2019



## 690.47 – Auxiliary Electrode for Array

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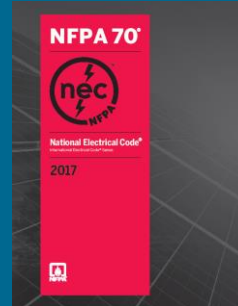
- Revised to permit auxiliary electrodes
- GEC sized per 250.66
- Ground-mounted support structures and metal frames of building or structure that qualify as a grounding electrode can be used as auxiliary electrode





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# Changes Impacting Limited Energy and Communications Systems



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## 725.144 (C) – Transmission of Power and Data (POI)

- New requirement covering “power over the internet” types of Class 2 and Class 3 circuits where data and power are provided to connected devices
- Provides rules on maximum conductor ampacities based on 86 degree F. Ampacity correction necessary at higher ambient temperatures
- Provides new table for maximum conductor ampacities where in bundled cables



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# Thank you



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