

HCAI CEC 2022 Changes

Jamie Schnick
Jamie.Schnick@hcai.ca.gov
 (213) 897-7651

ARTICLE 90 — INTRODUCTION

90.2 Scope.

(A) Covered. This *Code* covers the installation and removal of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables for the following:

.....

(5) Installations supplying shore power to ships and watercraft in marinas and boatyards, including monitoring of leakage current

(6) Installations used to export electric power from vehicles to premises wiring or for bidirectional current flow



CEC 100 - Definitions

Part I. General

Accessible (as applied to equipment) — ~~Admitting close approach; not guarded by locked doors, elevation, or other effective means.~~

Accessible (as applied to equipment) — Capable of being reached for operation, renewal, and inspection.

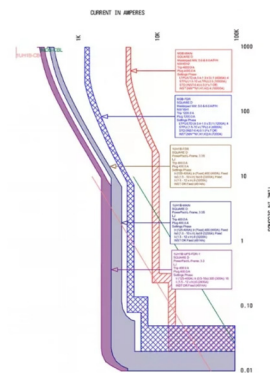
- Ladder access is OK
- Behind locked doors is Accessible
- Adjacent to equipment is acceptable
- Climbing over piping – would still be accessible



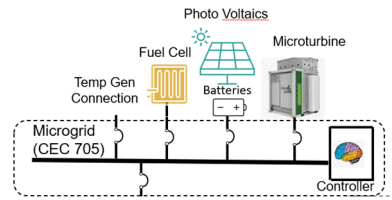
CEC 100 - Definitions

Coordination, Selective (Selective Coordination). Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the selection and installation of overcurrent protective devices and their ratings or settings for the full range of available overcurrents, from overload to the available fault current, and for the full range of overcurrent protective device opening times associated with those overcurrents. (CMP-10)

Coordination. [OSHPD 1, 2, 3, 4 & 5] Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the selection and installation of overcurrent protective devices and their ratings or settings utilizing the 0.10 second level of the overcurrent protective device from the time current curve as the basis for the lower limit of the calculation method.



CEC 100 - General



Part I. General

***Fuel Cell System.** The complete aggregate of equipment used to convert chemical fuel into usable electricity and typically consisting of a reformer, stack, power inverter, and auxiliary equipment.

Generating Capacity, Inverter. The sum of parallel-connected inverter maximum continuous output power at 40°C in watts or kilowatts.

Island Mode. The operational mode for stand-alone power production equipment or an isolated microgrid, or for a multimode inverter or an interconnected microgrid that is disconnected from an electric power production and distribution network or other primary power source.

Photovoltaic (PV) System. The total components, circuits, and equipment up to and including the PV system disconnecting means that, in combination, convert solar energy into electric energy.

Power Production Equipment. Electrical generating equipment supplied by any source other than a utility service, up to the source system disconnecting means.

***Stand-Alone System.** A system that is capable of supplying power independent of an electric power production and distribution network.

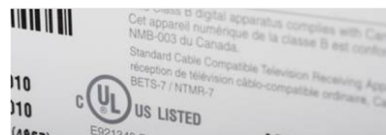
*Revised and moved from article 692 Fuel Cell Systems to article 100



CEC 100 - Definitions

Part I. General

Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction.



Informational Note: If a listed product is of such a size, shape, material, or surface texture that it is not possible to apply legibly the complete label to the product, the complete label may appear on the smallest unit container in which the product is packaged.



ARTICLE 110 — REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

110.2 Approval. The conductors and equipment required or permitted by this *Code* shall be acceptable only if approved.

OSHPD 1, 1R, 2, 3, 4 & 5] Equipment shall be approvable if the equipment meets the following requirements:

- *Equipment is approved, listed, labeled or certified for its use by a Nationally Recognized Testing Laboratory (NRTL) as recognized by the U.S. department of Labor, Occupational Safety and Health Administration.*

- *When field evaluated, equipment is evaluated and labeled by a Field Evaluation Body (FEB) that is accredited by International Accreditation Services (IAS) in accordance with NFPA 790.*

- *Equipment has special seismic certifications when required by Sections 1705.13.3 and 1705A.13.3 of California Building Code*



ARTICLE 110 — REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

110.14 Connections

(D) Terminal Connection Torque. Tightening torque values for terminal connections shall be as indicated on equipment or in installation instructions provided by the manufacturer. An approved means shall be used to achieve the indicated torque value.

- **Informational Note No. 1:** Examples of approved means of achieving the indicated torque values include torque tools or devices such as shear bolts or breakaway-style devices with visual indicators that demonstrate that the proper torque has been applied.
- **Informational Note No. 2:** The equipment manufacturer can be contacted if numeric torque values are not indicated on the equipment or if the installation instructions are not available. Informative Annex I of UL Standard 486A-486B, *Standard for Safety-Wire Connectors*, provides torque values in the absence of manufacturer's recommendations.
- **Informational Note No. 3:** Additional information for torquing threaded connections and terminations can be found in Section 8.11 of NFPA 70B-2019, *Recommended Practice for Electrical Equipment Maintenance*.

ARTICLE 110 — REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

110.14 Connections

...

(D) Terminal Connection Torque

The tightening of conductors is sometimes taken for granted. Many electricians have been taught that their elbow contains this “magical” ability to sense when the appropriate amount of force has been applied to the tool tightening the electrical termination. This was tested a few years ago at a trade show by a wiring manufacturer. The attendees were mostly all seasoned electricians. They were given an opportunity to tighten electrical terminations with a standard wrench to the level they thought it was tightened properly. A staggering 78% of these terminations were under torqued. Now think how many times you have done exactly that same thing. This is why torquing and using the proper tools is important to the electrical safety of the installation.

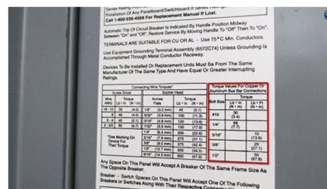
From: The 10 Most Commonly Cited Electrical Code Violations EC&M 2023

110.14(D) Electrical Terminal Connection Torque

An approved means shall be used to achieve the indicated torque value where tightening torque values for terminal connections are indicated on equipment or in installation instructions provided by the manufacturer.



Examples of approved means of achieving the indicated torque values include torque tools or devices such as shear bolts or breakaway-style devices with visual indicators that demonstrate that the proper torque has been applied.



ARTICLE 110 — REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

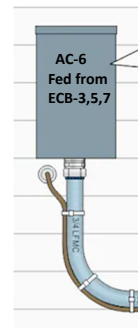
110.22 Identification of Disconnecting Means.

A) General. Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. In other than one- or two-family dwellings, the marking shall include the identification of the circuit source that supplies the disconnecting means. The marking shall be of sufficient durability to withstand the environment involved.

110.24 Available Fault Current.

A) Field Marking. Service equipment at other than dwelling units shall be legibly marked in the field with the available fault current. The field marking(s) shall include the date the fault-current calculation was performed and be of sufficient durability to withstand the environment involved. The calculation shall be documented and made available to those authorized to design, install, inspect, maintain, or operate the system.

B) Modifications. When modifications to the electrical installation occur that affect the available fault current at the service, the available fault current shall be verified or recalculated as necessary to ensure the service equipment ratings are sufficient for the available fault current at the line terminals of the equipment. The required field marking(s) in 110.24(A) shall be adjusted to reflect the new level of available fault current.



Note: alternative energy systems added to existing installations would need to be studied for increases to AIC values



ARTICLE 210 — BRANCH CIRCUITS

210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.

B) Other Than Dwelling Units. All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground fault circuit-interrupter protection for personnel.

- (1) Bathrooms
- (2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking.
- (3) Rooftops Exception: Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.
- (4) Outdoors
- (5) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink.
Exception No. 2 to (5): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.
- (6) Indoor damp and wet locations
- (7) Locker rooms with associated showering facilities
- (8) Garages, accessory buildings, service bays, and similar areas
- (11) Laundry areas
- (12) Bathtubs and shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

ARTICLE 210 — BRANCH CIRCUITS

210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.

(E) Equipment Requiring Servicing. GFCI protection shall be provided for the receptacles required by 210.63.

210.63 Equipment Requiring Servicing.

A) Heating, Air-Conditioning, and Refrigeration Equipment. The required receptacle outlet shall be located on the same level as the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment's branch-circuit disconnecting means.

B) Other Electrical Equipment. In other than one- and two-family dwellings, a receptacle outlet shall be located as specified in 210.63(B)(1) and (B)(2).

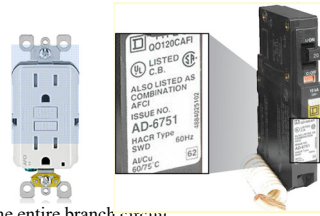
(1) Indoor Service Equipment. The required receptacle outlet shall be located within the same room or area as the service equipment.

(2) Indoor Equipment Requiring Dedicated Equipment Spaces. Where equipment, other than service equipment requires dedicated equipment space as specified in 110.26(E), the required receptacle outlet shall be located within the same room or area as the electrical equipment and shall not be connected to the load side of the equipment's branch-circuit disconnecting means.

ARTICLE 210 — BRANCH CIRCUITS

210.12 Arc-Fault Circuit-Interrupter Protection.

(C) **Guest Rooms, Guest Suites, and Patient Sleeping Rooms in Nursing Homes and Limited-Care Facilities.** All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets and devices installed in guest rooms and guest suites of hotels and motels and patient sleeping rooms in nursing homes and limited-care facilities shall be protected by any of the means described in 210.12(A)(1) through (6).



- (1) A listed combination-type arc-fault circuit interrupter installed to provide protection of the entire branch circuit.
- (2) A listed branch/feeder-type AFCI installed at the origin of the branch-circuit in combination with a listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (3) & (4) A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet box on the branch circuit.
- (5) If metal raceway, metal wireways, metal auxiliary gutters, or Type MC, or Type AC cable with metal boxes, metal conduit bodies, and metal enclosures are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit-type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.
- (6) Where a listed metal or nonmetallic conduit or tubing or Type MC cable is encased in not less than 50 mm (2 in.) of concrete for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Note: SNF's = Intermediate Care (OSHPD 2) subset of Nursing Homes
 Limited Care Facilities = Intermediate Care Facilities

ARTICLE 240 — OVERCURRENT PROTECTION

240.88 Reconditioned Equipment Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed.

(A) Circuit Breakers. The use of reconditioned circuit breakers shall comply with (1) through (3):

- (1) Molded-case circuit breakers shall not be permitted to be reconditioned.
- (2) Low- and medium-voltage power circuit breakers shall be permitted to be reconditioned.
- (3) High-voltage circuit breakers shall be permitted to be reconditioned.

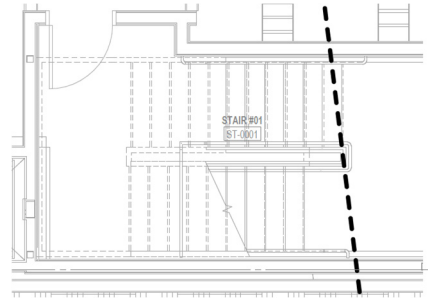
(B) Components. The use of reconditioned trip units, protective relays, and current transformers shall comply with (1) and (2):

- (1) Low-voltage power circuit breaker electronic trip units shall not be permitted to be reconditioned.
- (2) Electromechanical protective relays and current transformers shall be permitted to be reconditioned.

ARTICLE 300 — GENERAL REQUIREMENTS FOR WIRING METHODS AND MATERIALS

300.25 Exit Enclosures (Stair Towers). Where an exit enclosure is required to be separated from the building, only electrical wiring methods serving equipment permitted by the authority having jurisdiction in the exit enclosure shall be installed within the exit enclosure.

Informational Note: For more information, refer to NFPA 101-2018, *Life Safety Code*, 7.1.3.2.1(10)(b).



ARTICLE 310 — CONDUCTORS FOR GENERAL WIRING

Broken into (2) sections:

ARTICLE 310 — CONDUCTORS FOR GENERAL WIRING
- Revised to only cover conductors up to 2000 volts

-and-

New

ARTICLE 311 — MEDIUM VOLTAGE CONDUCTORS AND CABLE
- Covers conductors 2000 volts

Table 310.16 is back (was 310.15(B)(16) in last version of code)

ARTICLE 404 — SWITCHES

404.4 Damp or Wet Locations.

(C) **Switches in Tub or Shower Spaces.** Switches shall not be installed within **tub** or shower spaces unless installed as part of a listed tub or shower assembly.

[OSHPD 1, 2, 4 & 5] Switches that are not part of a listed tub or shower assembly shall not be installed within shower rooms or stalls, or be accessible from within those areas. Switches shall not be installed within ~~(5 ft)~~ (3 ft) of the perimeter of bathtubs or shower stalls.

Exception 1: Bath station devices for Call Systems meeting the requirements of 517.123(C)(4) shall be permitted to be installed outside the perimeter of bathtubs or shower stalls.

Exception 2: Bath station devices for Call Systems meeting the requirements of 517.123(C)(3) shall be permitted to be installed within the tub or shower spaces.



ARTICLE 406 — RECEPTACLES, CORD CONNECTORS, AND ATTACHMENT PLUGS (CAPS)

406.9 Receptacles in Damp or Wet Locations.

(C) **Bathtub and Shower Space.** Receptacles shall not be installed within a zone measured 900 mm (3 ft) horizontally and 2.5 m (8 ft) vertically from the top of the bathtub rim or shower stall threshold. The identified zone is all-encompassing and shall include the space directly over the tub or shower stall.

Exception: In bathrooms with less than the required zone the receptacle(s) shall be permitted to be installed opposite the bathtub rim or shower stall threshold on the farthest wall within the room.

[OSHPD 1, 2, 4 & 5] Exception not adopted.

(1) [OSHPD 1, 1R, 2, 4 & 5] Receptacles shall not be installed within shower rooms or stalls or be accessible from within these areas. Receptacles shall not be installed within 5 feet (1.52 m) of the perimeter of bathtubs or shower stalls

ARTICLE 406 — RECEPTACLES

406.5 Receptacle Mounting.

(G) Receptacle Orientation.

(1) **Countertop and Work Surfaces.** Receptacles shall not be installed in a face-up position in or on countertop surfaces or work surfaces unless listed for countertop or work surface applications.

(2) **Under Sinks.** Receptacles shall not be installed in a faceup position in the area below a sink.

Article 408 – Panelboards

408.43 Panelboard Orientation. Panelboards shall not be installed in the face-up position.



ARTICLE 408 — SWITCHBOARDS, SWITCHGEAR, AND PANELBOARDS

- **408.8 Reconditioning of Equipment.** Reconditioning of equipment within the scope of this article shall be limited as described in 408.8(A) and (B). The reconditioning process shall use design qualified parts verified under applicable standards and be performed in accordance with any instructions provided by the manufacturer. If equipment has been damaged by fire, products of combustion, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service.
- **(A) Panelboards.** Panelboards shall not be permitted to be reconditioned. This shall not prevent the replacement of a panelboard within an enclosure.
- **(B) Switchboards and Switchgear.** Switchboards and switchgear, or sections of switchboards or switchgear, shall be permitted to be reconditioned. Reconditioned switchgear shall be listed or field labeled as *reconditioned*, and previously applied listing marks, if any, within the portions reconditioned shall be removed.



ARTICLE 408 — SWITCHBOARDS, SWITCHGEAR, AND PANELBOARDS

408.6 Short-Circuit Current Rating. Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. In other than one- and two-family dwelling units, the available fault current and the date the calculation was performed shall be field marked on the enclosure at the point of supply. The marking shall comply with 110.21(B)(3).

ARTICLE 422 — APPLIANCES

422.5 Ground-Fault Circuit-Interrupter (GFCI) Protection for Personnel.

(A) **General.** Appliances identified in 422.5(A)(1) through (A)(7) rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase, shall be provided with Class A GFCI protection for personnel.

- (2) Drinking water coolers and bottle fill stations
- (3) Cord-and-plug-connected high-pressure spray washing machines
- (5) Vending machines
- (6) Sump pumps
- (7) Dishwashers

(B) **Type and Location.** The GFCI shall be readily accessible, listed, and located in one or more of the following locations:

- (1) Within the branch-circuit overcurrent device
- (2) A device or outlet within the supply circuit
- (3) An integral part of the attachment plug
- (4) Within the supply cord not more than 300 mm (12 in.) from the attachment plug
- (5) Factory installed within the appliance

ARTICLE 210 — BRANCH CIRCUITS

210.8 Ground-Fault Circuit-Interrupter Protection for Personnel. Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F)... **The ground-fault circuit interrupter shall be installed in a readily accessible location.**

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

Informational Note No. 4: Additional GFCI requirements for specific circuits and equipment are contained in Chapters 4, 5, and 6.

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



ARTICLE 422 — APPLIANCES

GFCI Discussion:

Cord-and plug-connected **vending machines** manufactured or rebuilt on or after January 1, 2005, must have a **GFCI** as an integral part of the attachment plug or be located along the cord, within 12 in. of the attachment plug.
Older **vending machines** manufactured or rebuilt before January 1, 2005, must be connected to a **GFCI-protected** outlet.

Receptacles mounted below sinks (garbage disposal/dish washers) are required to have GFCI protection.

ARTICLE 445 — GENERATORS

445.6 Listing. Stationary generators 600 volts and less shall be listed.

445.18 Disconnecting Means and Emergency Shutdown.

- (A) **Disconnecting Means.** Generators other than cord-and plug-connected portable generators shall have one or more disconnecting means. Each disconnecting means shall simultaneously open all associated ungrounded conductors. Each disconnecting means shall be lockable open in accordance with 110.25.
- (B) **Emergency Shutdown of Prime Mover.** Generators shall have provisions to shut down the prime mover.

ARTICLE 445 — GENERATORS

445.18 Disconnecting Means and Emergency Shutdown.

(C) **Remote Emergency Shutdown.** Generators with greater than 15 kW rating shall be provided with a remote emergency stop switch to shut down the prime mover. The remote emergency stop switch shall be located outside the equipment room or generator enclosure...

445.20 Ground-Fault Circuit-Interrupter Protection for Receptacles on 15-kW or Smaller Portable Generators. Receptacle outlets that are a part of a 15-kW or smaller portable generator shall have listed ground-fault circuit-interrupter protection (GFCI) for personnel integral to the generator or receptacle...



ARTICLE 450 — TRANSFORMERS AND TRANSFORMER VAULTS

450.9 Ventilation. The ventilation shall dispose of the transformer full-load heat losses without creating a temperature rise that is in excess of the transformer rating.

Transformers with ventilating openings shall be installed so that the ventilating openings are not blocked by walls or other obstructions. The required clearances shall be clearly marked on the transformer. Transformer top surfaces that are horizontal and readily accessible shall be marked to prohibit storage.



ARTICLE 480 — STORAGE BATTERIES

480.2 Definitions.

Storage Battery (Battery). A single or group of rechargeable cells connected together electrically in series, in parallel, or a combination of both, and comprised of lead-acid, nickel-cadmium, or other rechargeable electrochemical types.



ARTICLE 480 — STORAGE BATTERIES

480.7 DC Disconnect Methods.

(A) **Disconnecting Means.** A disconnecting means shall be provided for all ungrounded conductors derived from a stationary battery system with a voltage over 60 volts dc. A disconnecting means shall be readily accessible and located within sight of the battery system.

...

(C) **Disconnection of Series Battery Circuits.** Battery circuits exceeding 240 volts dc nominal between conductors or to ground and subject to field servicing shall have provisions to disconnect the series-connected strings into segments not exceeding 240 volts dc nominal for maintenance by qualified persons.

...

(F) **Notification.** The disconnecting means shall be legibly marked in the field. A label with the marking shall be placed in a conspicuous location near the battery if a disconnecting means is not provided. The marking shall be of sufficient durability to withstand the environment involved and shall include the following:

- (1) Nominal battery voltage
- (2) Available fault current derived from the stationary battery system
- (3) An arc flash label in accordance with acceptable industry practice
- (4) Date the calculation was performed

ARTICLE 480 — STORAGE BATTERIES

480.10 Battery Locations. Battery locations shall conform to 480.10(A) through (G).

(A) **Ventilation.**

(B) **Live Parts.** Guarding of live parts shall comply with 110.27.

(C) **Spaces About Battery Systems.** Spaces about battery systems shall comply with 110.26 or 110.34.

(D) **Top Terminal Batteries.** Where top terminal batteries are installed on tiered racks or on shelves of battery cabinets, working space in accordance with the battery manufacturer's instructions shall be provided between the highest point on a cell and the row, shelf, or ceiling above that point.

(E) **Egress.** Personnel doors intended for entrance to, and egress from, rooms designated as battery rooms shall open in the direction of egress and shall be equipped with listed panic or listed fire exit hardware.

(F) **Piping in Battery Rooms.** Not permitted

(G) **Illumination.** Illumination shall be provided for working spaces containing battery systems. The lighting outlets shall not be controlled by automatic means only... The location of luminaires shall not:

- (1) Expose personnel to energized battery components while performing maintenance on the luminaires in the battery space; or
- (2) Create a hazard to the battery upon failure of the luminaire

ARTICLE 517 - HEALTH CARE FACILITIES

Global changes

Category 1 >>> Category 1 (critical care)

Category 2 >>> Category 2 (general care)

Selected receptacles >>> Select receptacles

Area >>> Spaces

Grounding conductor >>> Equipment grounding conductor

In another than hazardous (classified) location >>> in an unclassified location

ARTICLE 517 - HEALTH CARE FACILITIES

517.17 Ground-Fault Protection of Equipment.

(D) Testing. When ground-fault protection of equipment is first installed, each level shall be performance tested to ensure compliance with 517.17(C). This testing shall be conducted by a qualified person(s) using a test process in accordance with the instruction provided with the equipment. A written record of this testing shall be made and shall be available to the authority having jurisdiction.



ARTICLE 517 - HEALTH CARE FACILITIES

517.21 Ground-Fault Circuit-Interrupter Protection for Personnel in Category 2 (General Care) and Category 1 (Critical Care) Spaces.

Receptacles shall not be required in bathrooms or toilet rooms. Receptacles located in patient bathrooms and toilet rooms in Category 2 (general care) spaces shall have ground-fault circuit-interrupter protection in accordance with 210.8(B)(1).

Ground-fault circuit-interrupter protection for personnel shall not be required for receptacles installed in those Category 2 (general care) and Category 1 (critical care) spaces where a basin, sink, or other similar plumbing fixture is installed in the patient bed location.



ARTICLE 517 - HEALTH CARE FACILITIES

517.26 Application of Other Articles. The life safety branch [OSHPD 1, 2, 3, 4 & 5] critical branch, and equipment branch of the essential electrical system shall meet the requirements of Article 700, except as amended by Article 517.

(1) Section 700.4 shall not apply. **(Capacity, Rating and Peak Load Shaving)**

(2) Section 700.10(D) shall not apply. **(Fire Protection)**

(3) Section 700.17 shall be replaced with the following: Branch circuits that supply emergency lighting shall be installed to provide service from a source complying with 700.12 when normal supply for lighting is interrupted or where single circuits supply luminaires containing secondary batteries.

(4) Section 700.32 shall not apply. **(Selective Coordination)**

ARTICLE 517 - HEALTH CARE FACILITIES

517.29 Type 1 Essential Electrical Systems.

517.30 Sources of Power.

(B) Types of Power Sources.

(1.1) [OSHPD 1, 3, 4 and 5] **Generating Units.** The alternate source of power shall be at least one of the following:

- (a) Generator(s) driven by some form of prime mover(s) and located on the premises.
- (b) Another generating unit(s) where the normal source consists of a generating unit(s) located on the premises.
- (c) As provided in paragraph (B)(2) below.
- (d) As provided in paragraph (B)(3) below.

All on-premises sources of power shall meet the on-premises fuel or battery stored energy requirements specified in Article 700.12. [OSHPD 1, 2, & 5].

For facilities subject to Centers for Medicare and Medicaid Services (CMS) regulations, see 42 CFR 482.15(e) and 42 CFR 483.73(e) for emergency generator requirements.

ARTICLE 517 - HEALTH CARE FACILITIES

517.30 Sources of Power.

(B) Types of Power Sources.

(2) **Fuel Cell Systems.** Fuel cell systems shall be permitted to serve as the alternate source for all or part of an essential electrical system, provided the following conditions apply:

- (1) Installation of fuel cells shall comply with the requirements in Parts I through VII of Article 692 for 1000 volts or less and Part VIII for over 1000 volts.

Informational Note: For information on installation of stationary fuel cells, see NFPA 853-2015, *Standard for the Installation of Stationary Fuel Cell Power Systems*.

- (2) $N + 1$ units shall be provided where N units have sufficient capacity to supply the demand load of the portion of the system served.
- (3) Systems shall be able to assume loads within 10 seconds of loss of normal power source.
- (4) Systems shall have a continuing source of fuel supply, together with sufficient on-site fuel storage for the essential system type.
- (5) Where life safety and critical portions of the distribution system are present, a connection shall be provided for a portable diesel generator.
- (6) Fuel cell systems shall be listed for emergency system use



ARTICLE 517 - HEALTH CARE FACILITIES

517.30 Sources of Power.



(B) Types of Power Sources.

(3) Battery Systems. Battery systems shall be permitted to serve as the alternate source for all or part of an essential electrical system. *[OSHPD 1, 3, 4 and 5] Where life safety and critical portions of the distribution system are present, a connection shall be provided for a portable diesel generator.*

Informational Note: For information on installation of battery systems, see NFPA 111-2019, *Standard on Stored Electrical Energy Emergency and Standby Power Systems.*

ARTICLE 517 - HEALTH CARE FACILITIES

517.31 Requirements for the Essential Electrical System.

(C) Wiring Requirements.

(1) Separation from Other Circuits. The life safety branch and critical branch [of the essential electrical system] shall be kept independent of all other wiring and equipment.

(a) Raceways, cables, or enclosures of the life safety and critical branch shall be readily identified as a component of the essential electrical system (EES). Boxes and enclosures (including transfer switches, generators, and power panels) shall be field- or factory-marked and identified as a component of the EES. Raceways and cables shall be field- or factory-marked as a component of the EES at intervals not to exceed 7.6 m (25 ft).

ARTICLE 517 - HEALTH CARE FACILITIES

517.31 Requirements for the Essential Electrical System.

(C) Wiring Requirements.

(3) Mechanical Protection of the Essential Electrical System. The wiring of the life safety and critical branches shall be mechanically protected by raceways. Listed flexible metal raceways and listed metal sheathed cable assemblies in any of the following:

f. Luminaires installed in rigid ceiling structures where there is no access above the ceiling space after the luminaire is installed

f. Luminaires installed in ceiling structures

g. [OSHPD 1, 2, 3 (surgery clinics), 4 & 5] Where necessary to allow relative movement between immediately adjacent buildings



ARTICLE 517 - HEALTH CARE FACILITIES

517.31 Requirements for the Essential Electrical System.

(E) Receptacle [OSHPD 1, 2, 3, 4 & 5] and Switch Identification.

The cover plates for the electrical receptacles [For OSHPD 1, 2, 3, 4 & 5] and light switches or the electrical receptacles and light switches supplied from the life safety and critical branches shall have a distinctive color or marking so as to be readily identifiable.

Old version

The cover plates for the electrical receptacles [For OSHPD 1, 2, 3, 4 & 5] and light switches or the electrical receptacles and light switches supplied from the essential electrical systems shall have a distinctive color or marking so as to be readily identifiable.

ARTICLE 517 - HEALTH CARE FACILITIES

517.34 Critical Branch.

(A) Task Illumination, Fixed Equipment, and Selected Receptacles.

(6) Telecommunications entrance facility, telecommunications equipment rooms, and telecommunications rooms and equipment in these rooms

(7) Task illumination, select receptacles, and select power circuits for the following areas:

- a. Category 1 (critical care) or 2 (general care) spaces with at least one duplex receptacle per patient bed location, and task illumination as required by the governing body of the health care facility



ARTICLE 517 - HEALTH CARE FACILITIES

517.34 Critical Branch.

(A) Task Illumination, Fixed Equipment, and Selected Receptacles.

(7) Task illumination, select receptacles, and select power circuits for the following areas:

1. [OSHPD 1] Imaging room containing imaging equipment approved by Licensing Agency for diagnostic services of emergency/trauma patients found in California Building Code Section 1705A.13.3.1 7. Imaging equipment shall be connected to critical branch or equipment branch.

- (8) Clinical IT-network equipment
- (9) Wireless phone and paging equipment for clinical staff communications

ARTICLE 517 - HEALTH CARE FACILITIES

517.35 Equipment Branch Connection to Alternate Power Source.

(A) **Equipment for Delayed Automatic Connection.** The following equipment shall be permitted to be arranged for delayed automatic connection to the alternate power source:

(10) [OSHPD 1, 2, 3, 4 & 5] Where provided, UPS systems serving telephone, data, technology and telecommunications equipment rooms and closets.



ARTICLE 517 - HEALTH CARE FACILITIES

517.43 Automatic Connection to Life Safety and Equipment Branch. The life safety and equipment branches shall be installed and connected to the alternate source of power specified in 517.41 so that all functions specified herein for the life safety and equipment branches are automatically restored to operation within 10 seconds after interruption of the normal source. No functions other than those listed in 517.43(A) through (G) shall be connected to the life safety branch. The life safety branch shall supply power as follows:

- (A) Illumination of Means of Egress.
- (B) Exit Signs.
- (C) Alarm and Alerting Systems.
- (D) Communications Systems.
- (E) Dining and Recreation Areas**
- (E) Generator Set Location
- (F) Elevators.
- (G) **AC Equipment for Nondelayed Automatic Connection.** Generator accessories, including, but not limited to, the transfer fuel pump, electrically operated louvers, and other generator accessories essential for generator operation shall be arranged for automatic connection to the alternate power source.



ARTICLE 517 - HEALTH CARE FACILITIES

517.44 Connection to Equipment Branch. The equipment branch shall be installed and connected to the alternate power source such that equipment described in 517.35(A)(6) is automatically restored to operation at appropriate time-lag intervals following the energizing of the life safety and critical branches.

B) Delayed Automatic or Manual Connection to the Equipment Branch.

(1.1) [OSHPD 1, 2, 4 & 5] Heating, ventilating, and cooling equipment as required by California Mechanical Code.

...

(3.1) [OSHPD 2, 4 & 5] Optional Connections to the Equipment Branch. Additional illumination, receptacles, and equipment shall be permitted to be connected only to the equipment branch.

(4) Multiple Systems. Where one switch serves multiple systems as permitted in 517.43, transfer for all loads shall be nondelayed automatic.

ARTICLE 517 - HEALTH CARE FACILITIES

517.80 Patient Care Spaces. Equivalent insulation and isolation to that required for the electrical distribution systems in patient care areas shall be provided for communications, signaling systems, data system circuits, fire alarm systems, and systems less than 120 volts, nominal.

Class 2 and Class 3 signaling and communications systems [OSHPD 1, 2, 3, 4 & 5] Class 2 circuits that transmit power and data to a power device, and power-limited fire alarm systems shall not be required to comply with the grounding requirements of 517.13, to comply with the mechanical protection requirements of 517.31(C)(3)(5), or to be enclosed in raceways, unless otherwise specified by Chapter 7 or 8.

Secondary circuits of transformer-powered communications or signaling systems shall not be required to be enclosed in raceways unless otherwise specified by Chapters 7 or 8.

[OSHPD 1, 2, 3, 4 & 5] See ANSI/NEMA C137.3-2017, American National Standard for Lighting Systems — Minimum Requirements for Installation of Energy Efficient Power over Ethernet (PoE) Lighting Systems, for information on installation of cables for PoE lighting systems.

ARTICLE 590 – TEMPORARY INSTALLATIONS

590.4 General.

(G) **Splices.** A box, conduit body, or other enclosure, with a cover installed, shall be required for all splices.

Exception No. 2: On construction sites, branch-circuits that are permanently installed in framed walls and ceilings and are used to supply temporary power or lighting, and that are GFCI protected, the following shall be permitted:

- (1) A box cover shall not be required for splices installed completely inside of junction boxes with plaster rings.
- (2) Listed pigtail-type lampholders shall be permitted to be installed in ceiling-mounted junction boxes with plaster rings.
- (3) Finger safe devices shall be permitted for supplying and connection of devices.



ARTICLE 590 – TEMPORARY INSTALLATIONS

590.6 Ground-Fault Protection for Personnel.

(2) **Assured Equipment Grounding Conductor Program.**

The assured equipment grounding conductor program shall be documented and made available to the authority having jurisdiction.

An assured equipment grounding conductor program is an OSHA and NFPA 70E requirement that ensures the safety of temporary power cord sets (extension cords). The program is designed to prevent shocks or electrocution by ensuring the ground wire is electrically continuous from the equipment being used to the source. Here is a brief overview:



§2360.3. Ground-Fault Circuit Interrupter Protection for Personnel – General Industry.

(D) The following tests shall be performed on all cord sets and receptacles which are not a part of the permanent wiring of the building or structure, and cord- and plug-connected equipment required to be grounded:

1. All equipment grounding conductors shall be tested for continuity and shall be electrically continuous;
2. Each receptacle and attachment cap or plug shall be tested for correct attachment of the equipment grounding conductor. The equipment grounding conductor shall be connected to its proper terminal; and
3. All required tests shall be performed before first use; before equipment is returned to service following any repairs; before equipment is used after any incident which can be reasonably suspected to have caused damage (for example, when a cord set is run over); and at intervals not to exceed 3 months, except that cord sets and receptacles which are fixed and not exposed to damage shall be tested at intervals not exceeding 6 months.

ARTICLE 600 — ELECTRIC SIGNS AND OUTLINE LIGHTING

600.2 Definitions.

New: Host Sign, Retrofit Kit- General, Retrofit Kit – Specific and Sub assembly

600.4 Markings.

A) Signs and Outline Lighting Systems. Signs and outline lighting systems shall be listed and labeled; marked with the manufacturer's name, trademark, or other means of identification; and input voltage and current rating.

(B) Signs with a Retrofitted Illumination System.D) Visibility. The markings required in 600.4(A) and listing labels shall be visible after installation and shall be permanently applied in a location visible prior to servicing. The marking shall be permitted to be installed in a location not viewed by the public.

600.5 Branch Circuits.

(B) Marking. A disconnecting means for a sign, outline lighting system, or controller shall be marked to identify the sign, outline lighting system, or controller it controls.

Exception: An external disconnecting means that is mounted on the sign shall not be required to identify the sign it controls.

ARTICLE 620 — ELEVATORS...

620.6 Ground-Fault Circuit-Interrupter Protection for Personnel.

Each 125-volt, single-phase, 15- and 20-ampere receptacle installed in pits, in hoistways, on the cars of elevators shall be of the ground-fault circuit-interrupter type.

- All 125-volt, single-phase, 15- and 20-ampere receptacles installed in machine rooms, control spaces, machinery spaces, and control rooms shall have ground-fault circuit-interrupter protection for personnel.
- A permanently installed sump pump shall be permanently wired or shall be supplied by a single receptacle that is ground-fault circuit-interrupter protected.

ARTICLE 620 — ELEVATORS...

620.22 Branch Circuits for Car Lighting, Receptacle(s), Ventilation, Heating, and Air-Conditioning.

(A) Car Light Receptacles, Auxiliary Lighting, and Ventilation.

A separate branch circuit shall supply the car lights. The car lights branch circuit shall be permitted to supply receptacles, accessory equipment (alarm devices, alarm bells, monitoring devices not part of the control system), auxiliary lighting power source, and ventilation on each elevator car or inside the operation controller. The overcurrent device protecting the branch circuit shall be located in the elevator machine room, control room, machinery space, or control space. Where there is no machine room, control room, machinery space, or control space outside the hoistway, the overcurrent device shall be located outside the hoistway and accessible to qualified persons only.

*ARTICLE 625 — ELECTRIC VEHICLE POWER TRANSFER SYSTEM

625.1 Scope. This article covers the electrical conductors and equipment connecting an electric vehicle to premises wiring for the purposes of charging, power export, or bidirectional current flow.

Electric Vehicle Connector. A device that, when electrically coupled (conductive or inductive) to an electric vehicle inlet, establishes an electrical connection to the electric vehicle for the purpose of power transfer and information exchange.

Electric Vehicle Power Export Equipment (EVPE). The equipment, including the outlet on the vehicle, that is used to provide electrical power at voltages greater than or equal to 30 Vac or 60 Vdc to loads external to the vehicle, using the vehicle as the source of supply. **E2V**

Electric Vehicle Supply Equipment (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the electric vehicle connectors, attachment plugs, personnel protection system, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle.

E2V is industry adopted lingo for car charging building configuration.

*** Lots of changes in article 625**

ARTICLE 625 — ELECTRIC VEHICLE POWER TRANSFER SYSTEM

625.42 Rating. The power transfer equipment shall have sufficient rating to supply the load served. Electric vehicle charging loads shall be considered to be continuous loads for the purposes of this article. Service and feeder shall be sized in accordance with the product ratings.

- **625.48 Interactive Systems.** EVSE that incorporates a power export function and that is part of an interactive system that serves as an optional standby system, an electric power production source, or a bidirectional power feed shall be listed and marked as suitable for that purpose. When used as an optional standby system, the requirements of Article 702 shall apply; when used as an electric power production source, the requirements of Article 705 shall apply. EVPE that consists of a receptacle outlet only shall be in accordance with 625.60.



ARTICLE 690 — SOLAR PHOTOVOLTAIC (PV) SYSTEMS

690.4 General Requirements.

(A) **Photovoltaic Systems.** Photovoltaic systems shall be permitted to supply a building or other structure in addition to any other electrical supply system(s).

(B) **Equipment.** Inverters, motor generators, PV modules, ac modules and ac module systems, dc combiners, dc-to-dc converters, rapid shutdown equipment, dc circuit controllers, and charge controllers intended for use in PV systems shall be listed or be evaluated for the application and have a field label applied.

ARTICLE 690 — SOLAR PHOTOVOLTAIC (PV) SYSTEMS

690.12 Rapid Shutdown of PV Systems on Buildings. PV system circuits installed on or in buildings shall include a rapid shutdown function to reduce shock hazard for firefighters in accordance with 690.12(A) through (D).

(A) **Controlled Conductors.**

(B) **Controlled Limits.**

(C) **Initiation Device**

(D) **Equipment.** Equipment that performs the rapid shutdown functions, other than initiation devices such as listed disconnect switches, circuit breakers, or control switches, shall be listed for providing rapid shutdown protection.

ARTICLE 690 — SOLAR PHOTOVOLTAIC (PV) SYSTEMS

Part III. Disconnecting Means

690.13 Photovoltaic System Disconnecting Means. Means shall be provided to disconnect the PV system from all wiring systems including power systems, energy storage systems, and utilization equipment and its associated premises wiring.

(A) Location. The PV system disconnecting means shall be installed at a readily accessible location. Where disconnecting means of systems above 30 V are readily accessible to unqualified persons, any enclosure door or hinged cover that exposes live parts when open shall be locked or require a tool to open.

ARTICLE 690 — SOLAR PHOTOVOLTAIC (PV) SYSTEMS

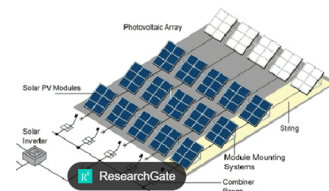
690.56 Identification of Power Sources.

(A) Facilities with Stand-Alone Systems. Plaques or directories shall be installed in accordance with 710.10.

(B) Facilities with Utility Services and Photovoltaic Systems. Plaques or directories shall be installed in accordance with 705.10 and 712.10, as required.

(C) Buildings with Rapid Shutdown. Buildings with PV systems shall have a permanent label located at each service equipment location to which the PV systems are connected or at an approved readily visible location and shall indicate the location of rapid shutdown initiation devices. The label shall include a simple diagram of a building with a roof and shall include the following words:

SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN.
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION
TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD
IN ARRAY.



ARTICLE 692 — FUEL CELL SYSTEMS

692.4 Installation.

(A) Fuel Cell System. A fuel cell system shall be permitted to supply a building or other structure in addition to any service(s) of another electricity supply system(s).

(B) Identification of Power Sources. Fuel cell systems shall be identified according to 692.4(B)(1) through (B)(3).

(1) Interconnected AC Systems. Plaques or directories shall be installed in accordance with 705.10.

(2) DC Microgrid Systems. Plaques or directories shall be installed in accordance with 712.10.

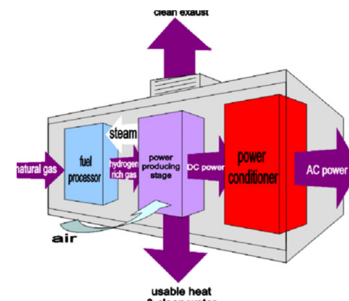
(3) Stand-Alone Systems. Plaques

ARTICLE 692 — FUEL CELL SYSTEMS

692.6 Listing Requirement. The fuel cell system shall be approved for the application in accordance with one of the following:

(1) Be listed for the application

(2) Be evaluated for the application and have a field label applied



ARTICLE 692 — FUEL CELL SYSTEMS

Part III. Disconnecting Means

692.13 All Conductors. Means shall be provided to disconnect all current-carrying conductors of a fuel cell system power source from all other conductors in a building or other structure.

692.17 Switch or Circuit Breaker. The disconnecting means for ungrounded conductors shall consist of readily accessible, manually operable switch(es) or circuit breaker(s). Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means. The sign shall be clearly legible and shall have the following words or equivalent:

DANGER ELECTRIC SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

ARTICLE 695 — FIRE PUMPS

695.6 Power Wiring....

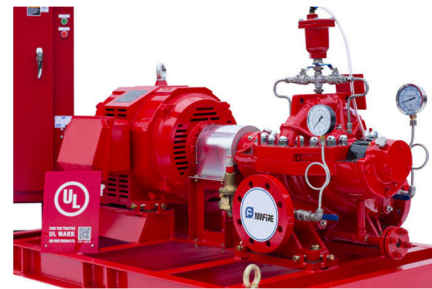
(A) Supply Conductors....

(1) Services and On-Site Power Production Facilities.

...

Exception: The supply conductors within the fire pump room shall not be required to meet 230.6(1) or (2).

Informational Note: See 250.24(C) for routing the grounded conductor to the service equipment.



ARTICLE 700 — EMERGENCY SYSTEMS

700.23 Dimmer and Relay Systems. A dimmer or relay system containing more than one dimmer or relay and listed for use in emergency systems shall be permitted to be used as a control device for energizing emergency lighting circuits. Upon failure of normal power, the dimmer or relay system shall be permitted to selectively energize only those branch circuits required to provide minimum emergency illumination using a control bypass function. Where the dimmer or relay system is fed by a normal/emergency source from an upstream transfer switch, normal power sensing for this function shall be permitted to be from a normal-only power source upstream of the transfer switch. All branch circuits supplied by the dimmer or relay system cabinet shall comply with the wiring methods of Article 700.

ARTICLE 700 — EMERGENCY SYSTEMS

701.12 General Requirements.

C) Storage Battery. Storage batteries shall be of suitable rating and capacity to supply and maintain the total load for a minimum period of 1-1/2 hours without the voltage applied to the load falling below 87 1/2 percent of normal. Automotive-type batteries shall not be used. An automatic battery charging means shall be provided.

Exception: [OSHPD 1, 2, 3, 4 & 5] Battery system used as an alternate power source for Type 1 essential electrical system shall be of suitable rating and capacity to supply and maintain the full demand load for the time durations specified in 700.12(D)(2)(a).



RegsUnit@HCAI.ca.gov
Jamie Schnick

