



*San Diego Area Chapter  
International Code Council*

Carlsbad, Chula Vista, Coronado, Del Mar, El Cajon, El Centro, Encinitas, Escondido, Imperial Beach, La Mesa, Lemon Grove, National City, Oceanside, Poway, San Diego City, San Diego County, San Marcos, Santee, Solana Beach, Vista

San Diego Area  
**Electrical  
Newsletters**

January 2020  
Based on the  
2019 edition of  
the California Electrical Code  
(2017 National Electrical Code)

## About the San Diego Area Electrical Newsletters

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The San Diego Area Electrical Newsletters are developed through a cooperative effort of the San Diego Area Inspection Jurisdictions and are approved by the San Diego Area Chapter of the International Code Council.

The newsletters provide the local jurisdictions a resource for interpretation and enforcement of the 2019 California Electrical Code (CEC) based on the 2017 edition of the National Electrical Code (NEC) in compliance with Article 90.4 that reads in part: "The authority having jurisdiction [(AHJ)] for enforcement of the *Code* has the responsibility for making interpretations of the rules, for deciding on the approval of equipment and materials, and for granting the special permission contemplated in a number of the rules."

Examples of specific installations that are generally acceptable in the San Diego Area are included. Check with the local inspection jurisdiction before beginning any installation based on these newsletters.

The 2020 Service Standards & Guide manual published by San Diego Gas & Electric Company (Utility) is referenced to provide the Utility's electrical serving requirements as a courtesy to the electrical industry. These references are shown in boxed text.

Additional California code requirements are found in the following:

- California Green Code
- The California Energy Codes

### Participating San Diego Area Inspection Jurisdictions

City of Carlsbad  
City of Chula Vista  
City of Coronado  
City of Del Mar  
City of El Cajon  
City of El Centro  
City of Encinitas  
City of Escondido  
City of Imperial Beach  
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City of Lemon Grove  
City of National City  
City of Oceanside  
City of Poway  
City of San Diego  
City of San Marcos  
City of Santee  
City of Solana Beach  
City of Vista  
County of San Diego

<b>Boxed language refers to the Utility.</b>
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# *San Diego Area Chapter International Code Council*

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# Approval of Electrical Equipment

Code Reference: 2019 California Electrical Code Article 90.7, 110

Published: January 2008

Revised: January 2020

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The authority having jurisdiction (AHJ) has the responsibility for making interpretations of the requirements of the California Electrical Code. It is the intent of this newsletter to address the locally accepted requirements for the listing and labeling of electrical equipment.

Listing and labeling provides prima facie evidence that the electrical equipment is approvable by the jurisdiction. Equipment shall be listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) that is recognized by the Federal Occupational Safety and Health Administration (OSHA), Department of Labor under 29 CFR 1910.7 for electrical equipment.

<https://www.osha.gov/dts/otpc/nrtl/>

Equipment shall be installed per the manufacturer's installation instructions. Switchgear shall be installed per NEMA (National Electrical Manufacturer's Association) Standards. The equipment shall be approved by the jurisdiction for the location of the installation.

Electrical equipment installed without the required label is then required to be evaluated and labeled per this newsletter and per NFPA 790 and 791.

The AHJ may request an evaluation by an approved evaluator for equipment that does not have an acceptable testing agency label.

The following procedure is requested to be followed when a field evaluation is to be done:

1. Field evaluator shall notify the AHJ that they have been contracted to examine equipment.
2. Initial letter shall include the name of the tenant/owner, the address of the location of the equipment, the type of equipment, and the standards to which the equipment will be evaluated. The letter should also indicate if a preliminary evaluation was undertaken and the results of that preliminary evaluation.
3. Upon completion of the evaluation, the evaluator shall notify the AHJ in writing of the results of test, provide a copy of the report, and identify that their evaluation approval label has been affixed to the equipment.

It shall be understood that a completed Field Evaluation report and affixed label to any piece of equipment may only be considered approved for that exact location/environment where it was evaluated. Henceforth, if the piece of equipment is moved to another location, then an additional Field Evaluation shall be required.

## Torque Requirements

Code Reference: 2019 California Electrical Code Article 110.3 (B) and 110.14 (A) & (D)

Published: October 1987

Revised: January 2020

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Standards such as NEMA, ASTM, ANSI, and UL require all terminals and lugs to pass stringent tests as a part of the listing process. The listings for terminals and lugs include specific torquing requirements. All manufacturers are required to identify appropriate torque numeric values for each type of termination as part of their installation instructions. Calibrated torque tools shall be used to achieve the indicated torque. The contractor is responsible to ensure that all terminations are properly torqued.

The local authority having jurisdiction (AHJ) has established the following inspection requirements:

1. The AHJ may require that torquing tools and manufacturer's torquing instructions be on the job site at the time of inspection; or
2. The AHJ may accept a letter from the contractor certifying that all terminations have been torqued in accordance with the manufacturer's instructions; or
3. The AHJ may require that the contractor obtain an approved third-party testing agency to certify the proper torquing of all terminations.

Notes:

- When equipment torque labels cannot be read, or the label is missing, it is acceptable to use values found in NFPA 70 Informative Annex I.
- If terminals have been over-torqued, then damaged equipment must be replaced.

# Electrical Equipment Rooms

Code Reference: 2019 California Electrical Code Article 110.26

Published: October 1987

Revised: January 2020

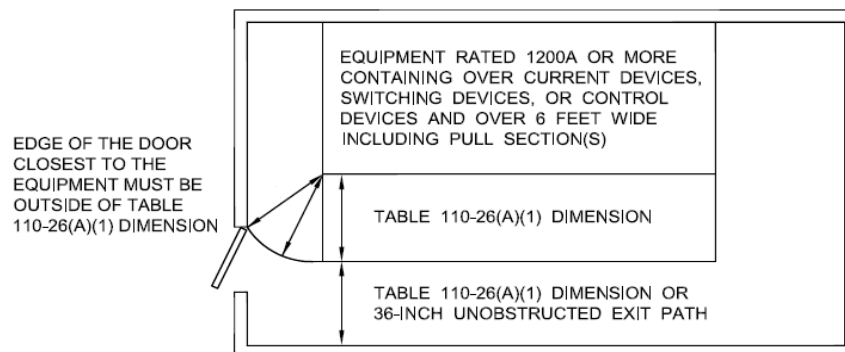
Section 110.26 uses the term "equipment" instead of "switchboards and panelboards". The intent is to include any type of equipment that contains overcurrent, switching, or control devices. The local authority having jurisdiction (AHJ) has made the following interpretations regarding this section:

1. Section 110.26 (C)(2) applies to equipment individually listed and marked with a rating of 1200A or more and over 6 feet wide.
2. The nameplate rating of the pull section shall determine the rating of the equipment and be included in determining the width of the equipment. Future expansion shall be included in the design of the work space and equipment layout when pull sections are rated 1200A or larger. Consult the Utility for their requirements relating to pull sections.
3. There shall be one entrance to and egress from the required working space not less than 24 inches wide and 6½ feet high at each end of the working space. A single entrance to and egress from the required working space shall be permitted if either a. *unobstructed egress* or b. *extra working space* is provided.
  - a. *Unobstructed egress* is defined as an egress path located entirely outside the minimum required working space area, a minimum of 36 inches in width, and is clear of any obstructions, from the equipment to a safe location outside the room or area.
  - b. *Extra working space* is where the depth of the working space is twice that required by 110.26 (A)(1). A single entrance is permitted provided it is located so that the distance from the equipment to the nearest edge of the entrance is not less than the minimum clear distance specified in Table 110.26 (A)(1). This is a radial measurement from the equipment. (See drawing below.)
4. For electrical rooms containing equipment rated 800 amperes or more, with the access door located within 25 feet of the equipment, the door shall open out (in the direction of egress) and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.
5. Where Personnel Doors are installed, the minimum clear width shall be 32" (See CBC 1010.1.1)

The Utility requires all doors in an electric meter room to be a minimum of 36 inches in width or the width of the pull section, whichever is greater, open in the direction of egress, and be equipped with "lever-operated" hardware. Lever-operated hardware is a type that permits the door to be opened from inside the room without the use of hands.

Consult with the Utility for door dimensions not covered by item 4 above.

Note: 5" conduit requires 6' of working clearance in front of the pull section.



## **Dedicated Equipment Space – Outdoor**

Code Reference: 2019 California Electrical Code Article 110.26 (A) and (E)

Published: August 2005

Revised: January 2020

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The intent of this newsletter is to address installations existing gas meters are located within the dedicated equipment space of electrical service equipment.

Effective January 1, 2017, it is no longer acceptable for the gas meter to be located within the dedicated equipment space or the working space of the electrical service equipment.

Where an existing gas meter is located below the electrical service equipment, you must consult the local Utility before starting any work to confirm the new installation meets current standards.
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## Identifying Conductors

Code Reference: 2019 California Electrical Code Article 200.6, 210.5(C), 215.12

Published: January 2008

Revised: January 2020

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The objective of this newsletter is to clarify when the identification and posting of the identification means are required for neutrals, branch circuit conductors, and feeder conductors when more than one nominal voltage supplies a premise.

For existing buildings:

- When new branch circuit wiring is extended from an existing panelboard, those new circuits shall not be required to comply with Section 210.5 (C).



## **Unconditioned Enclosed Patio**

Code Reference: 2019 California Electrical Code Article 210.52 (E)

Published: April 1985

Revised: January 2020

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Enclosed patios are not considered to be habitable rooms and need not meet the outlet spacing requirements of Sections 210.52 (A) and 210.52 (E)(3) applies and a receptacle outlet shall be required. Receptacles installed will require ground fault circuit interrupter (GFCI) protection. If the existing outdoor receptacle is enclosed by the construction, an additional receptacle must be provided on the building exterior wall per Section 210.52 (E)(1). If adding an additional entrance or exit with grade level access, an additional switched lighting outlet shall be installed as per Section 210.70 (A)(2)(b).

A suitably located single lighting outlet is allowed to serve more than one door.

**ALL LIGHTING SYSTEMS MUST COMPLY WITH CALIFORNIA TITLE 24 ENERGY EFFICIENCY REQUIREMENTS.**

# Electrical Service Plan Check Requirements

Code Reference: 2019 California Electrical Code Article 220

Published: April 1985

Revised: January 2020

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The intent of this newsletter is to clarify the general requirements for electrical plans for installations in the San Diego area.

For new, single-family residential services, an approved plot plan showing the size and location of the service equipment is required.\* When the service is rated over 200 amperes, additional information may be required by the authority having jurisdiction (AHJ).

All commercial services require complete electrical plans. These plans shall include, but not limited to:

- a description of all loads to be served and location
- service description: voltage, amperage rating, and number of phases
- feeder and branch circuit overcurrent devices
- the size and type of conductors
- Fault Current Calculations
- The Short Circuit Current Rating (SCCR) of equipment
- grounding and bonding details
- the wiring methods to be utilized

Calculations to justify the proposed installation must be provided. Generally, power, lighting and single-line diagrams will be required as well as plans showing the location of all proposed electrical equipment to be installed.

All electrical plans shall be signed as required by the State of California Business and Professions Code and, where applicable, shall contain the Statement of Compliance required by Title 24.

The San Diego Chapter of ICC also recommends that each AHJ require meter locations be shown on all building plans (site) prior to permit issuance and that each AHJ verify these locations in the field prior to its final approval of the gas and electric systems.

Note: These general plan requirements are based on typical installations. An AHJ may find it necessary to require additional plans or calculations at any stage of design or construction.

\* Consult with an AHJ for specific requirements based on size of service.

## Number of Supplies (Feeders)

Code Reference: 2019 California Electrical Code Article 225.30

Published: May 2000

Revised: January 2020

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The intent of this newsletter is to provide clarification for conditions under which multiple supplies and branch circuits for Special Occupancies per Section 225.30 (B) will be accepted.

(B) Special Occupancies. By special permission, additional feeders or branch circuits shall be permitted for the following:

(2) A single building or other structure sufficiently large to make two or more supplies necessary:

- The building is of such size that the separate feeders or branch circuits would be a minimum of 150 feet apart, in a straight line, and
- For existing electrical systems where the service and metering equipment are grouped at one location on a premise serving multiple buildings, each building with multiple tenants can continue to have 6 or less feeders provided the supply (feeder) disconnects are grouped at one location.

### PLACARDING REQUIREMENTS

Where a building or structure is supplied by more than one feeder or branch circuit or by any combination of branch circuits and feeders, NEC Section 225.37 requires a permanent plaque or directory to be installed at each feeder and branch circuit disconnect location denoting all other feeders and branch circuits supplying that building or structure and the area served by each.

The plaque or directory required by Section 225.37 shall be manufactured in metal or plastic, suitable for the environment, with engraved or machine-printed lettering or electro-photo-plating in a contrasting color. The plaque shall include a footprint of the entire building, properly oriented, with the area served by each service clearly delineated. The plaques shall be located at the service disconnect and securely fastened by permanent means acceptable to the AHJ. (see sample in the 230.2 Newsletter)

## Number of Services

(Page 1 of 4)

Code Reference: 2019 California Electrical Code Article 230.2

Published: December 1981

Revised: January 2020

Some of the multiple services permitted as exceptions to Section 230.2 conflict with other provisions of Section 230, with SDG&E policy, and with established wiring methods in the San Diego area. Such services can present a hazard in certain normal and emergency situations.

The intent of this newsletter is to establish conditions regarding the installation of multiple services that resolve such conflicts and provide for safety in both normal and emergency situations. Contact the authority having jurisdiction (AHJ) for zoning requirements that will determine whether more than one service will be allowed to a premise.

Section 230.2. Number of Services: The basic requirement of 230.2 is that a building or other structure shall be supplied by only one service. However, the use of additional services is permitted by 230.2 (A) through (D). 230.2 (A) through (D) describe those conditions under which more than one service is permitted. If more than one service is installed, 230.2 (E) requires that a permanent plaque or directory be installed at each feeder a disconnect location denoting all other feeders and branch circuits supplying that building or structure and the area served by each.

(B) Special Occupancies. By special permission, additional services shall be permitted for [either of] the following:

(1) Multiple-occupancy buildings where there is no available space for service equipment accessible to all occupants ("Multiple-occupancy" is interpreted to mean "multiple-tenant")

(2) A single building or other structure sufficiently large\* to make two or more services necessary

\* Structures Sufficiently Large: See SDG&E Service Standards & Guide, page SG 012.1-012.3, for dimensions.

Special permission for (B)(1) will not normally be granted unless the building is sufficiently large enough to qualify for a second service as outlined in (B)(2). For existing buildings, special permission will be considered on a case-by-case basis. Generally, conditions (1) and (2) above will be required as well as a plaque on each sub-panel to identify which service supplies the panel.

The Utility agrees to provide an additional service. Consult the Utility for their requirements.

## Number of Services

(Page 2 of 4)

Code Reference: 2019 California Electrical Code Article 230.2

Published: December 1981

Revised: January 2020

(C) Capacity Requirements - Additional services shall be permitted under any of the following:

- (1) Where the capacity requirements are in excess of 2,000 amperes at a supply voltage of 1,000 volts or less

For multiple services, consult utility or reference SDG&E Service Standards & Guide pages SG 012.1-012.3.

- (2) Where the load requirements of a single-phase installation are greater than the serving agency [local utility] normally supplies through one service, or

- (3) By special permission.

Note: The disconnects for such separate services shall be grouped.

(D) Different Characteristics - Additional services shall be permitted for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules.

Note: The disconnects for such separate services shall be grouped. A service of a different class is not required to be grouped with another service of a different class serving the building or structure.

SDG&E will not grant a second service unless the phase-to-neutral voltage is different than that of the existing service, regardless of the number of phases, except for capacity requirements as noted in (C) above.

(E) Identification - Where a building or structure is supplied by more than one service, or any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. See Section 230.2 (E)

Note 1: The plaque or directory required by Section 230.2 shall be manufactured in metal or plastic, suitable for the environment, with engraved or machine-printed lettering or electro-photo-plating in a contrasting color. The plaque shall include a footprint of the entire building, properly oriented, with the area served by each service clearly delineated. The plaques shall be located at the service disconnect and securely fastened by permanent means acceptable to the AHJ.

Note 2: Doors into electrical meter rooms shall be marked with a plainly visible and legible sign stating, "Electric Meter Room", "Electric Room", or " Meter Room". If there are multiple electric meter rooms, the doors must be marked "Electric Meter Room #\_\_\_ of \_\_\_", as appropriate. Reference 2013 California Fire Code, Chapter 6, Section 605.3.1 Labeling.

In addition to the above requirements, when a building has more than one electric meter room, SDG&E requires that a plaque is secured to the exterior door of each electric meter room identifying the suites served by the meters in that room. Reference Service Standards & Guide, pages SG 017.1-017.3

## Number of Services

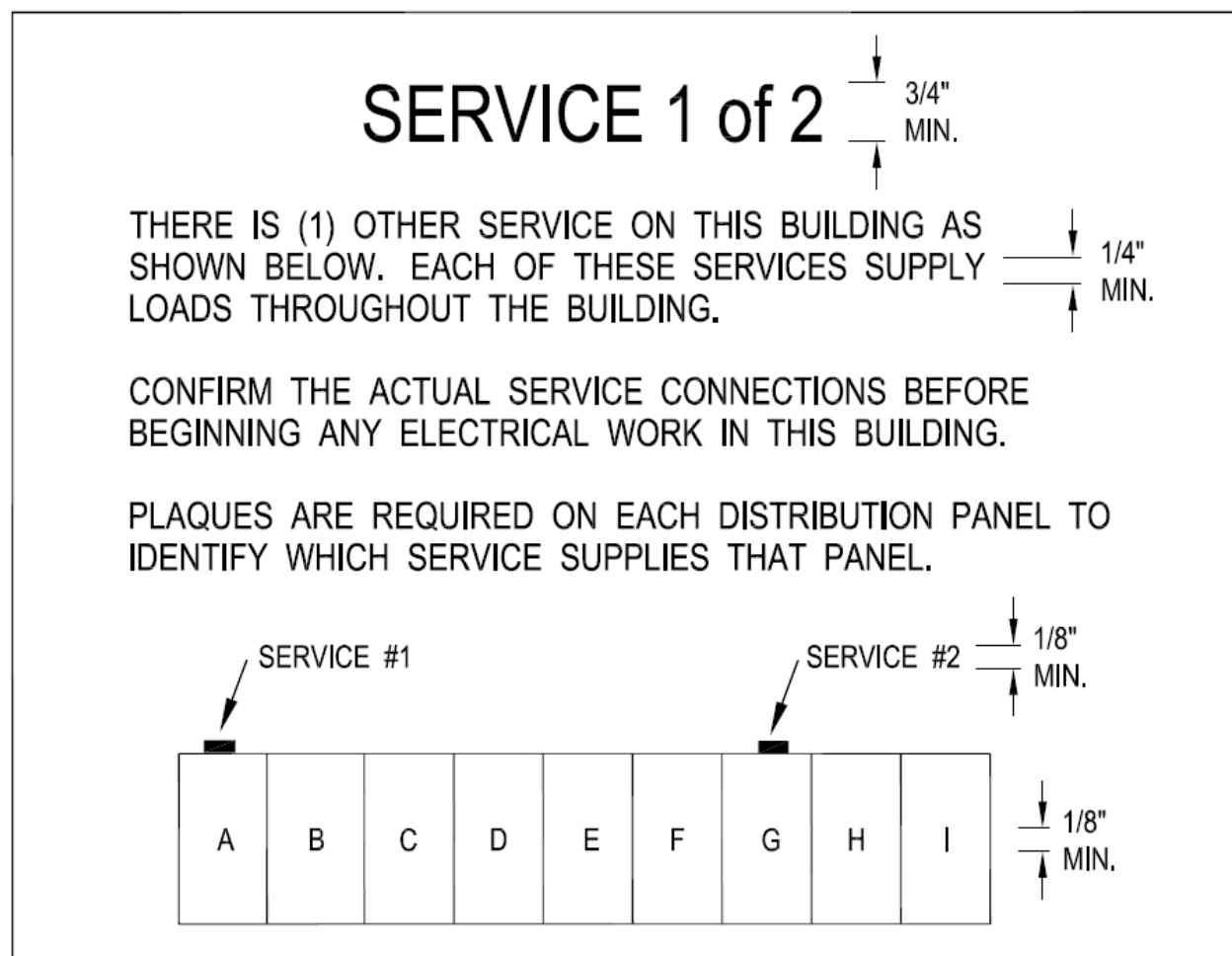
(Page 4 of 4)

Code Reference: 2019 California Electrical Code Article 230.2

Published: December 1981

Revised: January 2020

### TYPICAL PLAQUE FOR EXISTING BUILDINGS WITH INTERMIXED SERVICES



The plaque or directory shall be manufactured in metal or plastic, suitable for the environment, with engraved or machine-printed lettering or electro-photo-plating in a contrasting color. The plaque shall include a properly oriented footprint of the entire building, properly oriented, with the area served by each service clearly delineated. The plaques shall be located at the service disconnect and securely fastened by permanent means acceptable to the AHJ.

## **Service Equipment – Disconnecting Means**

Code Reference: 2019 California Electrical Code Article 230.70

Published: August 2005

Revised: January 2020

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The intent of this newsletter is to provide a guideline for the location of a building's service disconnecting means.

Section 230.70 (A)(1) requires that the service disconnecting means be installed in a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the service conductors.

An uncontrolled length of unfused conductor or bus in other than the Utility vault room or the service equipment room represents a hazard to the structure. Some buildings, due to design restrictions cannot have the service disconnecting means immediately adjacent to the service point.

A maximum of 10 feet of unfused conductor or bus from the service point to the building's service disconnecting means is permissible.



## Ground-Fault Performance Testing

(Page 1 of 2)

Code Reference: 2019 California Electrical Code Article 230.95

Published: April 1989

Revised: January 2020

Section 230.95 requires that ground-fault protection of equipment shall be provided for solidly grounded wye electrical services of more than 150 volts to ground but not exceeding 1,000 volts phase-to-phase for each service disconnect rated 1,000 amperes or more. The grounded conductor for the solidly grounded wye system shall be connected directly to ground . . . without inserting any resistor or impedance device. Subsection (C) requires testing of such system to assure that the equipment performs its intended function. This code section does not define who is to perform these tests or what information is to be included in the written report for the authority having jurisdiction (AHJ). Additionally, the requirement that these tests be performed on the system "when first installed on-site" often results in a test of a system that is incomplete. (See boxed text.)

A ground-fault protective system includes the ground-fault device (main disconnect and fault current sensor) and all wiring supplied by this device. For this reason, performance testing should normally be accomplished after all wiring is installed to ensure that the ground-fault device functions properly.

The following standards are established to assure that performance testing of ground-fault systems is accomplished in a uniform and acceptable manner:

1. Performance testing shall be performed by a third-party testing company acceptable to the AHJ and capable of demonstrating both the knowledge and the equipment necessary for such tests.
2. The ground-fault protective system must be tested after all wiring is installed and before the building is approved for final occupancy. This test must be performed prior to the AHJ authorizing the local utility to energize the service equipment.

Exception: The use of permanent service equipment for temporary power is common in the industry. The standards established by this newsletter are intended to recognize and permit this use. Where a temporary service is allowed for construction or equipment testing, prior to the final approval of the building, it is permissible for the testing of the ground-fault protective system to be accomplished in two separate parts.

Part 1. Testing of the ground-fault protective device must be completed before the service will be energized, along with testing all neutral and ground connections installed at the time of the Part 1 testing. This provides a reasonable level of protection for the service equipment during the period that temporary wiring is in use.

Part 2. All remaining neutral and ground connections not tested in Part 1 shall then be tested after all wiring is installed and before the building is approved for final occupancy. This testing normally requires a Utility outage, but the outage may be waived at the discretion of the testing company performing the test.

Note: Most ground-fault protective device testing requires that the service be de-energized. There are fees for the Utility to disconnect and reconnect the power. This applies to Part 1 and Part 2 if the service is required to be disconnected. Contact the Utility Planner for additional information.

## Ground-Fault Performance Testing

(Page 2 of 2)

Code Reference: 2019 California Electrical Code Article 230.95

Published: April 1989

Revised: January 2014

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3. A written record of the testing shall be provided, by the contractor, to the AHJ and shall include:
  - a. A statement that the testing was performed in accordance to the manufacturer's instructions and in accordance with the procedures of the International Electrical Testing Association (NETA)
  - b. The ground-fault set point and trip times are to be provided to the third party doing the testing prior to or at the time of the initial testing (These set points must be provided by a qualified engineering firm and should be based on a short circuit and relay coordination study)
  - c. A statement that the service grounding connections are correctly installed for a ground-fault system
  - d. A statement that all neutral conductors in the distribution system have been tested and found to be ungrounded (Describe the test method used)
  - e. A statement that the ground-fault equipment functioned properly when tested (Include the actual settings and trip-times of the test based on the information required in Section b above)

# Grounding Electrode System & Grounding Electrode Conductor

Code Reference: 2019 California Electrical Code Article 250 Part III

Published: December 1981

Revised: December 2020

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This section has generated many questions regarding the use of metal underground water pipes as grounding electrodes, the type of grounding electrodes acceptable as supplements to a metal underground piping system, and the type of grounding electrode required where there is no underground water piping on the premises.

The intent of this newsletter is to interpret Sections 250.50, 250.52, and 250.53 so that the requirements for grounding electrode systems are related to typical construction methods in a practical and consistent manner.

The intent of Section 250.50 is to ensure that at least one permanent and effective grounding electrode is installed for every building or structure, and that all electrodes are at the same potential with respect to the earth.

The following requirements for the installation of grounding electrodes meet the intent of Section 250.53, are consistent with typical construction methods, and are mandatory in the San Diego area:

1. Any construction that includes new concrete foundations shall be provided with a concrete-encased electrode installed per the requirements of Section 250.52 (A)(3).

Note: Where a concrete-encased electrode of the type identified in Section 250.52 (A)(3) is not available at final, a grounding electrode consisting of a minimum 20 feet of #2 bare copper conductor buried at a depth of 30" in a trench parallel to and at least 18" away from the foundation of building may be substituted. The conductor forming the grounding electrode must be continuous, unbroken and un-spliced, and be connected to the electrical service. Ground rods are not acceptable substitutes for the required grounding electrodes for new construction. A connector is always required where the grounding electrode conductor enters the service equipment.

2. Other new construction shall be provided with at least one of the grounding electrodes specified in sections 250.52 and installed in compliance with section 250.53. When new or replacement services are installed for existing buildings, existing underground metal water piping systems shall be supplemented by an additional electrode.
3. Grounding electrodes and grounding electrode conductors shall not be installed within wiring compartments with Utility-sealed access doors or covers. When the Utility installs their seal, the compartment is no longer considered accessible for inspection by the authority having jurisdiction (AHJ).

## Revised: December 2020

## **Ground Rods**

Code Reference: 2019 California Electrical Code Article 250.52 (A)(5), 250.53 (G), 250.64 (B)

Published: April 1985

Revised: December 2013

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The following interpretations are intended to alleviate the more common problems and establish guidelines for a ground rod installation that will be generally accepted in the San Diego area:

1. It is acceptable to install one or more driven ground rods so that no more than 3 inches projects above ground level. Connection of the grounding electrode conductor shall be made on this accessible portion of the rod. The portion of the rod with the listing mark and a ground rod clamp listed for this purpose shall be inspected by the authority having jurisdiction (AHJ). Ground rods should be installed in areas where they are not subject to physical damage or shall be provided with protection from such damage.
2. Due to adverse soil conditions in the San Diego area, galvanized ground rod and/or pipe are not acceptable. Only listed stainless steel or non-ferrous rods are acceptable.

## Underground Metal Conduit

Code Reference: 2019 California Electrical Code Article 342, 344, 358

Published: April 1985

Revised: January 2020

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It is the finding of the authorities having jurisdiction (AHJs) in the San Diego area that the soil conditions are not suitable for the direct burial of metallic conduits. Experience has shown that direct buried metallic conduits corrode rapidly.

Therefore, the direct burial of metallic conduit is prohibited in the San Diego area.

Exception 1: Listed Rigid Metal Conduit encased in concrete may be installed underground.

Exception 2: Intermediate Metal Conduit, Rigid Metal Conduit, and Electrical Metallic Tubing with an approved "factory-applied" non-metallic coating may be installed underground according to the manufacturer's listing and installation instructions. The AHJ may approve "field-applied" materials utilizing a listed primer and wrap, or coatings, for short sections or repairs of metallic raceways.

Note: These exceptions do not apply to conduits containing Utility-owned conductors. Consult the Utility for their requirements.
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## Busways

Code Reference: 2019 California Electrical Code Article 368

Published: August 2005

Revised: January 2020

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The intent of this newsletter is to provide information only. The guidelines for the testing and acceptance of busway installations to ensure protection against potential life-safety hazards are included. Busways as defined in Article 368 is a raceway consisting of metal enclosures containing factory-mounted, bare or insulated conductors, which are usually copper or aluminum bars, rods, or tubes. Busway installations are common for customer-owned service entrance installations from the Utility's service point to the service equipment, for unmetered feeder installations, for high-rise multifamily construction with remote metering, and for metered feeder installations to accommodate multiple taps for distribution. Several incidents of transposed phase or neutral conductors have resulted in the Utility closing in to a fault condition when energizing a new transformer.

Busways shall be installed to meet the requirements of Article 368 and the manufacturer's installation instructions.

The Utility requires all service entrance and unmetered feeder busways be tested in accordance with the latest edition of the Inter National Electrical Testing Association, Inc. (NETA), Acceptance Testing Specifications for Electrical Power Distribution Equipment and System. An independent testing organization acceptable to the AHJ and the Utility shall perform a continuity test on each busway section to confirm proper phasing and connection after each section is installed. The installer of the system shall provide a written test report to the AHJ and the Utility's Inspector. The AHJ will not release an inspection clearance to the Utility, nor will the Utility energize its transformer and the service until receipt, review, and acceptance of the written test report.

## Switchboards & Panelboards

Code Reference: 2019 California Electrical Code Article 408

Published: June 1990

Revised: January 2020

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The testing and listing standards for switchboards and panelboards require that the manufacturer identify any equipment intended to be installed in the field. The part or catalog number on a label in the switchboard or panelboard must identify equipment intended for field installation. The manufacturer must also provide any instructions necessary for the proper installation of such equipment. These requirements specifically include terminal connectors.

Most switchboards are designed to be connected to other sections or equipment with splice and through bus. Some switchboards also provide a set of factory-installed terminals for tapping a single circuit ahead of the service main. Very few switchboards are designed for the field installation of terminals on busses in order to make cable connections. Switchboards and panelboards designed for this application will include the required markings and installation instructions at the time they are originally manufactured.

The following procedures are established to ensure that switchboards and panelboards are installed in conformance with the testing and listing standard for such equipment:

1. Plan reviewers will approve plans showing field connection of cable to busses when there is documentation from the original equipment manufacturer (OEM) that the equipment is suitable for the field installation of terminals.
2. All new switchboards and panelboards will be inspected to determine compliance with the listing and manufacturer's instructions provided with the equipment.
3. All installations of new cables in existing switchboards and panelboards will be inspected to determine compliance with the listing and manufacturer's instructions provided with the equipment. In some cases, this will require changes to existing cable connections. Special attention will be given to conductor bending space, the routing of the conductors for heat dissipation in close proximity to the bus, and proper conductor support independent of energized bus.
4. Existing switchboards and panelboards not designed and marked for the field installation of terminals may be modified in the field, when:
  - a. A third-party manufacturer certifies compliance with applicable industry standards by providing approved engineered drawings prepared by a PE registered in the State of California and through a field evaluation acceptable to the AHJ with special attention given to conductor bending space, the routing of the conductors for heat dissipation in close proximity to the bus, and proper conductor support independent of energized bus as well as isolation methods to protect against inadvertent contact to energized bus ahead of the main.

Note: The Utility requires submittal of engineered drawings for approval prior to the installation of terminals or bussing for service entrance use. An example is when a field tap is required in an existing terminating enclosure to facilitate the addition of new service and metering equipment. Reference SDG&E Service Standards & Guide page SG 517.1.



# Generators

(Page 1 of 2)

Code Reference: 2016 California Electrical Code Article 445

Published: August 2007

Revised: January 2014

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The purpose of this newsletter is to clarify the requirements for permanently installed stationary engine generators such as stand-alone (sole source of power) and back-up generator systems. Also, see Articles 700, 701, and 702 for emergency, legally required, and optional standby systems.

## Types of Generator Systems

In general, there are two types of generator systems, "Stand-Alone" and "Back-Up" generators.

"Stand-Alone" – Generator systems provide the primary source of power to the premises wiring system and are not connected to SDG&E's distribution system. There may be additional sources of power, such as solar photovoltaic and batteries, that are interconnected with a "stand-alone" generator system to provide additional reliability.

"Back-Up" – There are two types of back-up generator systems:

1. The "Emergency System" is intended to supply power essential for safety to human life when normal power fails. When required, the generator shall be outside of the building or in a room designed to provide equivalent protection from fire or damage. The room shall be identified "Emergency Generator Room" in 1-inch block letters on a red plaque. Such systems have stringent requirements and use a completely isolated wiring system to ensure service in an emergency. Consult the local fire department for specific requirements pertaining to remote switching and monitoring of emergency generators from the fire control room.
2. The "Standby System" is intended to protect private business or property and may be integrated into existing wiring. These systems can be turned on manually or automatically when the primary power fails. The standby system is intended only to provide back-up electricity and not intended to permanently replace existing Utility power.

## Basic Requirements for Generator Systems:

1. A building permit is required.
  - a. Applications for permits must include three copies of a plot plan with a detailed description of the proposed work, the location of the generator, existing structures, utilities, property lines, etc.
  - b. All installations will require a single-line drawing showing the size of the generator, location of generator disconnecting means, the overcurrent protection, grounding and wiring methods, type of transfer device, and the connection to the current premises wiring system.

## Generators

(Page 2 of 2)

Code Reference: 2016 California Electrical Code Article 445

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- c. The generator shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time. (Equipment may be lighting, motors, heating, receptacles, and any other end use equipment the generator is intended to serve.)
  - d. The manufacturer's data sheet(s) for the generator and transfer device shall be submitted.
  - e. The complexity of the job will dictate which disciplines (mechanical, electrical, fire, structural, noise, hazardous materials, zoning, APCD, etc.) need to review and approve the plans. All systems powered by liquid fuel shall be approved by the authority having jurisdiction (AHJ) and all appropriate agencies, i.e. fire departments, County of San Diego, Department of Environmental Health, Hazardous Materials Division, Air Pollution Control District, etc.
- 2. Permanent stationary engine generators shall be listed or evaluated to comply with UL 2200. Engine generators evaluated for hazardous locations are evaluated to both UL 2200 and NFPA 496.
  - 3. Generator systems shall comply with the property line sound level limits. An acoustical analysis may be required prior to final inspection approval.
  - 4. A plaque shall be installed at the electrical service disconnect indicating type and location of the on-site generator power source(s) and its disconnect location. See the sample plaque in Newsletter 705.10.
  - 5. Generator locations must also comply with Article 430.14, Location of Motors.

Note: Portable generators intended for cord and plug connections are not allowed to be hard-wired or cord-connected to a premises wiring system without a code-compliant method of isolating the wiring service from the Utility Service. In addition, portable generators do not qualify as a required stand-alone or back-up system. Electrical permits are not normally issued for portable generators. However, consult with the appropriate AHJ and the Utility for specific requirements.

In compliance with the California Health & Safety Code, the Utility shall be notified in advance of installing "back-up" systems for review and approval of the transfer device and sequence of operations.

# Transformers

Code Reference: 2019 California Electrical Code Article 450

Published: December 1981

Revised: January 2017

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## Means of Disconnect:

Transformers, other than Class 2 or 3, are required to have means of disconnect on the primary side of the transformer. If the means of disconnect is in a remote location, the disconnect shall be lockable in accordance with Article 110.25 and the transformer must be marked with the location of the disconnecting means. The means of identifying the remote disconnect shall be a plaque made of metal or plastic, with engraved or machine-printed letters in a contrasting color to the plaque, which shall clearly identify the location of the disconnect. The plaque shall be attached to the exterior of the transformer or on an adjacent wall with a method acceptable to the authority having jurisdiction (AHJ) per Article 450.14.

## Ventilation:

Transformers in enclosed spaces shall have provisions to maintain an ambient temperature that does not exceed the temperature rating of the transformer. Note: Consideration of the conductor insulation temperature rating must be given in areas containing transformers when the ambient temperature exceeds 86 degrees °F (30 degrees °C). Refer to the ampacity correction factors in Table 310.15 (B)(16) when needed. Transformer ventilations may be accomplished by natural or mechanical ventilation, by mechanical cooling, or by other means.

1. Mechanical ventilation that provides for air movement of three cubic feet per minute/per kVA of transformer rating shall be acceptable.
2. Mechanical cooling, which can be demonstrated to maintain an ambient temperature below that of the transformer rating, shall be acceptable.
3. Any other means, including combinations of the above methods which can be demonstrated to maintain an ambient temperature below that of the temperature rating of the transformer, shall be acceptable.

Note: For transformer vault rooms, see Article 450 III.

SDG&E requirements for transformer vaults are contained in the SDG&E's Transformer Vault Specification manual.

# Examination of Electrical Equipment Exceeding 1,000 Volts

(Page 1 of 2)

Code Reference: 2010 California Electrical Code Article 490

Published: January 2014

Revised: January 2020

**Intent:** The San Diego area has seen an increase in the number of primary (systems exceeding 1,000 volts) services and distribution systems in all jurisdictions. The 2016 edition of the California Electrical Code includes a number of requirements for the installation, testing, and grounding of medium-voltage equipment and systems exceeding 1,000 volts nominal. The local authority having jurisdiction (AHJ) may have specific requirements regarding these installations. Consult your local AHJ if there are questions.

## Code Requirements (Reference only)

1. Wire methods over 1,000 volts (Article 300.31)
2. Conductors rated 2,001-35kV (Article 310.60)
3. Grounding of AC systems over 1kV (Article 250, Part X)
4. Equipment over 1,000 volts nominal (Article 490)
5. Surge arresters over 1kV (Article 280)
6. Requirements for installations over 600 volts nominal (Article 110, Part III)
7. Transformers (Article 450)
8. Outside branch circuits and feeders over 1,000 volts (Article 225, Part III)
9. Substation design, documentation, and required diagram (Article 490.48)
10. PV systems between 1,000 and 1,500 volts (Article 690.7)

## Plan, Equipment, Design, & Submittal Requirements

1. Plan submittals are required for all work.
2. Equipment submittals shall be accurate.
3. Design submittals are required from a State of California Licensed Electrical Engineer.

### Utility Requirements

- Refer to Electrical Utility Service Equipment Requirements Committee (EUSERC) drawings.
- Medium-voltage service and metering equipment – See SDG&E Service Standards & Guide SG 601-609
- Consult Utility for possible additional requirements for testing.

# Examination of Electrical Equipment Exceeding 1,000 Volts

(Page 2 of 2)

Code Reference: 2016 California Electrical Code Article 490

Published: January 2014

Revised: January 2020

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## Inspection Requirements

1. Approved plans shall be available at the time of the inspection.
2. Manufacturer's installation instructions shall be available at the time of the inspection.
3. Equipment installed shall be both listed and labeled or field evaluated by an acceptable testing agency. See Electrical Newsletter pg.1 "**Approval of Electrical Equipment**" for additional information.
4. Grounding of Equipment: When working on existing systems, it is necessary to verify that the requirements of Article 250, Part X are met.
5. Terminations: When required by design specifications, hi-pot testing of cables, and/or partial discharge testing (to IEEE standards) shall be performed by a qualified company who either meets NETA standards or is NETA accredited.

## Existing Systems

1. When working on existing systems, it is necessary to verify that requirements of CEC 250.190 are met.
2. Minimum testing of the existing equipment shall be line-voltage meggering to verify acceptable resistance and identify blatant defects.

# **Electric Vehicle Charging Systems (EVCS)**

Code Reference: 2016 California Electrical Code Article 625

Published: January 2017

Revised: January 2017

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The intent of this newsletter is to clarify general requirements for the permitting and inspection of plug-in Electric vehicles (PEV). For specific requirements, consult your authority having jurisdiction (AHJ).

## **Plan Review and Design Criteria**

The following items shall or may, depending on the AHJ's requirements, be required to obtain a permit for an EVCS installation:

### **General:**

1. Plans are required to have electrical sections and a site plan. If a commercial grade system is proposed, then typically, a registered professional engineer may be required to design the electrical system.
2. For residential system level two, or less, consult the AHJ for further information and permitting requirements.
3. Zoning and Planning approvals may require consideration for setbacks, height limitations, parking requirements, open space easements, Utility easements, etc. Consult with the local zoning technician for further information.
4. For PEV charging stations provided as public accommodations facilities or within covered multi-family dwelling units, the designer should consult the California Building Codes for minimum access requirements.

### **The Electrical Section of the submittal shall include:**

1. Provide cover sheet with each page identified for content.
2. Each submitted sheet shall have a page number.
3. Submit the appropriate number of plan sets and supporting documents when applying for permits. Verify with the AHJ the number of plan sets required.
4. Plans shall include the specifications, the level of charging, physical location of the existing electrical equipment, method of wiring, and new EVCS. Plans shall also indicate the applicable design code edition.
5. An electrical line diagram showing the number of EVCS with voltage and kilowatt ratings, the size of all electrical panel bussing, and the size of the circuit breaker in amperes. Include wiring methods, sizing, grounding, and calculations in conformance with Article 625 and other applicable articles of the CEC.
6. Plans shall also include the manufacturer's data sheets for all equipment. All electrical equipment shall be listed for this purpose. All equipment includes, but is not limited to, inverters, controllers, metering, and interconnection system equipment.
7. All equipment must be in compliance with Article 625.15.

## **Electric Vehicle Supply Equipment (EVSE)**

**Note: Applicable to residential installations only**

Code Reference: 2016 California Electrical Code Article 625.48

Published: January 2014

Revised: January 2017

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The serving Utility does not currently support interconnection of an Electric Vehicle (EV) as a source of electrical energy for the purpose of operating in parallel with the Utility's electrical distribution system. California Electrical Code (CEC) Article 705 will not apply.

Use of an EV as an optional source of standby electrical power must meet the requirements of CEC Article 702 and Utility review and approval of the proposed transfer switch is required.

Additional related laws in the State of California are as follows:

- The legislature of the State of California has enacted the California Health and Safety Code, Division 104, Part 15, Sections 119075 through 119090, which is intended to prevent electricity generated by permanent or portable electric generator from back feeding into a Utility electrical system.
- The California Code of Regulations, Title 8, Section 2320.9 states:
  - No electrical power source, permanent or temporary, shall be connected to a premises wiring system, or parts of such a system, unless positive means are used to prevent the transmission of electricity beyond the premises wiring system, or beyond any intentionally segregated parts of such a system.

When planning for your PEV, consult the Utility for advantageous Time of Use rate schedule information specific to EV charging.

# Solar Photovoltaic Systems

(Page 1 of 3)

Code Reference: 2016 California Electrical Code Article 690

Published: August 2005

Revised: January 2014

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The intent of this newsletter is to clarify general requirements for permitting and inspection of Solar Photovoltaic systems. For specific requirements, consult your authority having jurisdiction (AHJ).

Other agencies may have requirements in addition to the following building department requirements, and include, but are not limited to:

- California Center for Sustainable Energy (CSE) – State rebates
- California Department of Housing and Community Development (HCD) – State agency for manufactured homes
- County of San Diego Department of Environmental Health (DEH)
- Fire Districts

## Plan Review and Design Criteria

The following items shall or may, depending on the AHJ's requirements, be required to obtain a permit for a PV installation:

### General:

1. Plans are required to have electrical and structural sections. If a commercial grade system is proposed, then typically registered professional engineers may be required to design the electrical and structural system.
2. For stand-alone PV systems (not interconnected with the Utility's system), consult the AHJ for further information.
3. If the proposed system is for a manufactured home, the State of California must also be contacted. Permit and inspection will be required from the State.
4. If proposed system is ground-mounted and the parcel has a septic system, you must have Department of Environmental Health approval for the location.
5. Zoning and Planning approvals may be required for consideration of setbacks, height limitations, environmentally sensitive areas, brush management areas, open space easements, Utility easements, etc.
6. Supply-side connections require pre-approval by the Utility, the AHJ, and must not violate the panelboard manufacturer's listing.



# Solar Photovoltaic Systems

(Page 2 of 3)

Code Reference: 2016 California Electrical Code Article 690

Published: August 2005

Revised: January 2014

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## **The Electrical Section shall include:**

1. Provide cover sheet with each page identified for content.
2. Each submitted sheet shall have a page number.
3. Submit appropriate number of plan sets and supporting documents when applying for permits. Verify with AHJ the number of plan sets required.
4. Plans shall include the specifications and physical location of the existing electrical equipment and new PV system. Design plans should also indicate the applicable electrical code edition.
5. An electrical single-line diagram showing the number of photovoltaic panels with voltage and kilowatt output, module series fusing, all disconnects, all inverters with input and output ratings, the size of all electrical panel bussing, and the size of the PV circuit breaker in amperes. Include wiring methods, sizing, grounding, and calculations in conformance with Article 690 and other applicable articles of the CEC.
6. Plans shall also include the manufacturer's data sheets for all equipment. All electrical equipment shall be listed for this purpose. All equipment includes but is not limited to inverters, modules, converters, controllers, and interconnection system equipment.
7. Devices used to ground PV Modules in accordance with CEC 690.43 (A) shall be listed and labeled for use with the specific module used and installed per the module manufacture installation instructions.
8. A plaque identifying the location of all customer self-generation equipment, the service point, the DC disconnect(s), and the AC disconnect for Utility Operation, if required, must be installed on the service equipment per the specifications shown on page 32 of this Newsletter.

## **The Structural Section shall include:**

### **Plan Review Items:**

1. All roof-mounted and ground-mounted solar PV arrays will require an approved plot plan with all property, setback, and easement lines properly marked. Additionally, the location of all overhead power lines shall be shown on the plot plan. Consult with the Utility for clearance requirements from power lines. If the proposed system is roof-mounted, the plans must clearly indicate fire fighter access points and pathways as required by California Building Code (CBC) 3111.1, California Residential Code (CRC) R331, and California Fire Code (CFC) 605.11. An elevation plan may be required. Consult with the AHJ for specific requirements.
2. A plan view of the installation of the PV solar panels including racks or other supports, details of the supporting structure, connections to the roof framing members, and the calculated roof- and wind-loading values.
3. A registered architect, structural engineer, or civil engineer shall also stamp any plans requiring, but not limited to, soils reports, high-strength concrete footings, shop-fabricated support structures, field-fabricated ground-mounted support structures or field welding.
4. Check with the AHJ regarding specific requirements.

### **Design Criteria Items:**

1. Dimensioned layout of the arrays and footing details for the supporting structure.
2. All arrays must be attached to either an approved racking system or the proposed support structure and attachment methods must be certified by a State of California licensed civil or structural engineer or subject to AHJ structural plan review and approval.
3. If the roof- or wind-loading values exceed 5 pounds per square foot (or 7 pounds per square foot depending on the AHJ's requirement), the engineered system's plans and calculations must be stamped by a registered architect, structural engineer, or civil engineer.

Information on the Utility's requirements for interconnection and Net Energy Metering can be found on their website at [www.sdge.com/solar](http://www.sdge.com/solar). The Utility may require the customer to provide an AC disconnect(s) that is/are capable of being visibly checked in the open position and be lockable. The AC disconnect(s) is/are to be located immediately adjacent to the electric service and meter location. Contact the Utility for exceptions to the location of the AC disconnect(s) location.

PV systems will not be authorized for interconnection until all Utility requirements have been completed which includes the Utility receiving an inspection clearance from the AHJ.

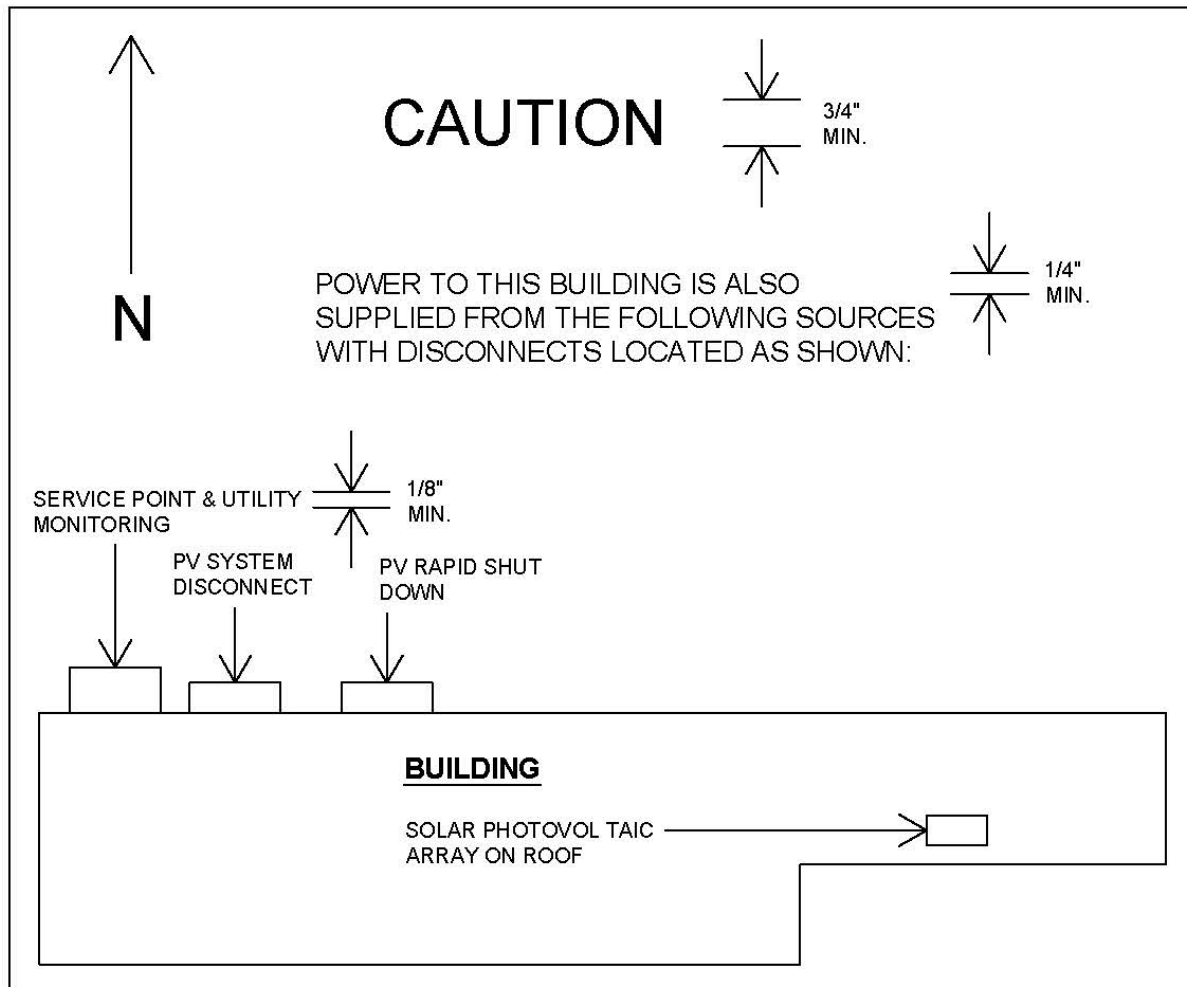
## Alternate Sources of Power

Code Reference: 2019 California Electrical Code Article 705.10 (See Table 705.3)

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This is a sample of the plaque or directory required when there is an alternate source of power connected to the premises wiring system. For this plaque example, a Solar photovoltaic System is the alternate source of power.



A single plaque shall properly reflect the location of all alternate power sources, the disconnects, and the utility service point(s). The plaque or directory shall be manufactured in metal or plastic, suitable for the environment, with engraved or machine-printed lettering or electro-photo-plating in a contrasting color. The plaque shall include a properly oriented footprint of the entire building. The plaques shall be located at each source disconnect location and securely fastened by a permanent means acceptable to the AHJ.

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