



*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 2014  
Based on the  
2013 edition of the  
California Electrical Code  
(2011 National Electrical Code)

# *San Diego Area Chapter International Code Council*

<b>Code Reference</b>	<b>Subject</b>	<b>Page</b>
90.7	Approval of Electrical Equipment	1
110.14	Torque Requirements	2
110.26	Electrical Equipment Rooms	3
110.26(E) (2)	Outdoor dedicated equipment space	4
200.6, 210.5 (C), 215.12 (C)	Identifying Conductors	5
210.52(E)	Unconditioned Enclosed Patio	6
220	Electrical Service Plan Check Requirements	7
225.30	Number of Supplies (Feeders)	8
230.2	Number of Services	9-12
230.70	Service Equipment - Disconnecting Means	13
230.95	Ground Fault Performance Testing	14, 15
250 part III	Grounding Electrode System & Grounding Electrode Conductor	16
250.52(A) (3)	Concrete Encased Electrode (Rebar)	17
250.52(A) (5), 250.53(G)	Ground Rods	18
342, 344 & 358	Underground Metal Conduit	19
368	Busways	20
408	Switchboards and Panelboards	21
445	Generators	22, 23
450	Transformers	24
490	Electrical Systems and Equipment Exceeding 600 v	25, 26
625	Electric Vehicle Supply Equipment (EVSE)	27
690	Solar Photovoltaic Systems	28-31
	Index	32

# 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 2013 California Electrical Code based on the 2011 edition of the National Electrical Code in compliance with Article 90.4 that reads in part: "The authority having jurisdiction 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 Service Standard & 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

## *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 Santee  
City of Vista

City of Lemon Grove  
City of National City  
City of Oceanside  
City of Poway  
City of San Diego  
City of San Marcos  
City of La Mesa  
City of Imperial Beach  
City of Solana Beach  
County of San Diego

# Approval of Electrical Equipment

2013 California Electrical Code Article 90.7

Published: January 2008

Revised: January 2014

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The authority having jurisdiction 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/otpca/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 the NRTL's protocol.

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.

- a. Field evaluator shall notify the AHJ that they have been contracted to examine equipment.
- b. 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.
- c. 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 may be required.

# Torque Requirements

2013 California Electrical Code Article 110.3(B) and 110.14

Published: October 1987

Revised: January 2014

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Underwriter's Laboratories (UL) Standards require all terminals and lugs to pass more stringent tests as a part of the listing process. As a result, the listings for terminals and lugs now include specific torquing requirements. All manufacturers are required to identify appropriate torque values for each type of termination as part of their installation instructions. It is the contractor's responsibility to ensure that all terminations are properly torqued. It is the inspector's responsibility to verify correct installations.

To this end, the local authorities having jurisdiction (AHJ) have 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 employ a third party testing company, acceptable to the AHJ, to certify the proper torquing of all terminations.

At any time where it is apparent that terminations have not been properly torqued, the AHJ may require the contractor to employ a third party testing company, acceptable to the AHJ, to certify the proper torquing of all terminations.

# Electrical Equipment Rooms

2013 California Electrical Code Article 110.26

Published: October 1987

Revised: January 2014

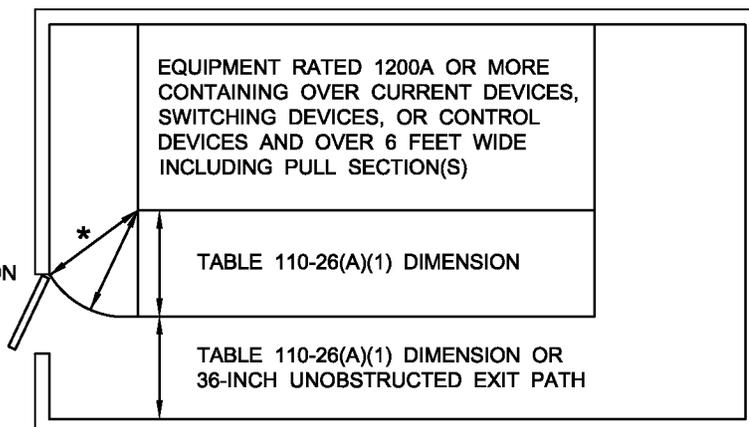
Section 110.26 uses the term "equipment" instead of "switchboards and panelboards". The intent is to include any type of equipment that contains overcurrent, switching or control devices. The local authorities having jurisdiction (AHJ) have made the following interpretations regarding this section:

1. Section 110.26(c)(2) applies only to equipment individually listed and marked with a rating of 1200A or more and over six (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 1200 A or larger. Consult the Utility for their requirements relating to pull sections.
3. The widths of all individual sections of 1200A or larger rated equipment installed in the same room or area will be included in the six-foot measurement to determine if two (2) doors are required.
4. There shall be one entrance to the required working space not less than 24-inch wide\* and 6-1/2 ft. high at each end of the working space. A single entrance to the required working space shall be permitted if either a. unobstructed exit or b. extra working space is provided.
  - a. *Unobstructed exit is defined as an exit path located entirely outside the minimum required working space area, a minimum of 36-inch 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)*
5. For electrical rooms containing equipment rated 1200 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.

For electrical meter rooms containing equipment rated less than 1200 amperes, the utility requires room doors to open out utilizing "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.

\* The Utility requires all doors in an electric meter room to be a minimum of 36-inches in width and all doors to swing out. Consult with the Utility when doors not required by Code are part of the meter room.

\* EDGE OF THE DOOR CLOSEST TO THE EQUIPMENT MUST BE OUTSIDE OF TABLE 110-26(A)(1) DIMENSION



# Outdoor Dedicated Equipment Space

2013 California Electrical Code Article 110.26(F)(2)

Published: August 2005

Revised January 2014

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The intent of this Newsletter is to clarify the allowable deviation from outdoor dedicated equipment space per Section 110.26(F)(2) when existing gas meters are located in the working clearance space of electrical service equipment.

Prior to the mid 1980's, gas meters were allowed in the working clearance space of electrical equipment. When customers need to upgrade their electrical service, the question is whether the customer must have the gas service and meters relocated, or move the electrical service and metering equipment location.

Per local policy, it is allowable for gas meters to remain in the working space of the electric service and metering equipment provided the gas meter does not extend more than 18 inches into the working space of the electrical equipment measured from the face of the panel for the entire width of the working clearance space. This policy only applies to gas meters installed directly below the electric service and metering equipment, not to gas meters located on a wall perpendicular to the existing electric service and metering equipment.

# Identifying Conductors

2013 California Electrical Code Article 200.6, 210.5(c), 215.12, 310.12

Published: January 2008

Revised: January 2014

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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 210.5 (C).

When a new nominal voltage is installed in an existing building, all new wiring will be required shall be required to comply with 210.5 (C).

Note: It is the responsibility of the contractor to verify the existing system identification means before doing any work.

## **Unconditioned Enclosed Patio**

2013 California Electrical Code Article 210.52(E)

Published: April 1985

Revised: January 2014

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Enclosed patios, are not considered to be habitable rooms and need not meet the outlet spacing requirements of 210.52(A). CEC 210.52E(3) applies and a receptacle outlet shall be required. Receptacles installed will require GFCI protection. If the existing outdoor receptacle is enclosed by the construction, an additional receptacle must be provided on the building exterior wall per 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 210.70(A) (2) (B).

# Electrical Service Plan Check Requirements

2013 California Electrical Code Article 200

Published: April 1985

Revised: January 2014

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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 regardless of size and residential services over 200 amperes\* require complete electrical plans. These plans shall include a description of all loads to be served, the size of service, feeder and branch circuit overcurrent devices, the size and type of conductors, the AIC rating of equipment, grounding and bonding details and the wiring methods to be utilized. Calculations to justify the proposed installation must be provided. Generally, 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 authority having jurisdiction (AHJ) require meter locations be shown on all building plans 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. Plan review should include review of code provisions, such as exit court requirements and requirements for fire protection of exterior walls based on distance to property line.

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 AHJ for specific requirements based on size of service.

# Number of Supplies (Feeders)

2013 California Electrical Code Article 225.30(B)

Published: May 2000

Revised: January 2014

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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 225.30 (B) will be accepted.

**Special Occupancies:** By special permission, additional feeders or branch circuits shall be permitted for the following:

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

- I. 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.
- II. 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, a permanent plaque or directory shall 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 required by this section shall be metal or plastic, with engraved or machine printed letters in a contrasting color to the plaque, shall include a plot map of the entire building, and shall be attached to the disconnecting means with screws, pop-rivets, or other fasteners approved by the AHJ. For minimum letter size and acceptable wording, see sample plaques in the 230.2 Newsletter.

## Number of Services (1 of 4)

2013 California Electrical Code Article 230.2

Published: December 1981.

Revised: December 2014

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Some of the multiple services permitted as exceptions to Section 230.2 conflict with other provisions of Article 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 AHJ for zoning requirements that will determine whether more than one service will be allowed to a premise.

**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). Sections 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.

**(B) Special Occupancies.** By special permission, additional services shall be permitted for 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") or

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

\* Structures Sufficiently Large: See SDG&E Service guide for dimensions.

Special permission for (B) (1) will not normally be granted unless the building is sufficiently large\* in size 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 (2 of 4)

2013 California Electrical Code Article 230.2

Published: December 1981.

Revised: January 2014

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

- (1) Where the capacity requirements are in excess of 2000 amperes at a supply voltage of 600 volts or less, or

SDG&E only allows two or more services of the same class where the capacity requirements are in excess of 4000-amperes at a supply voltage of 600 volts, or less. The Utility normally allows a maximum of three (3) at 4000-ampere secondary voltage services, unless additional services are required to serve multi-family dwelling units and house loads in a single building. Reference SDG&E Service Standards & Guide pages 013.1 - 013.8.

- (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 1: 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.

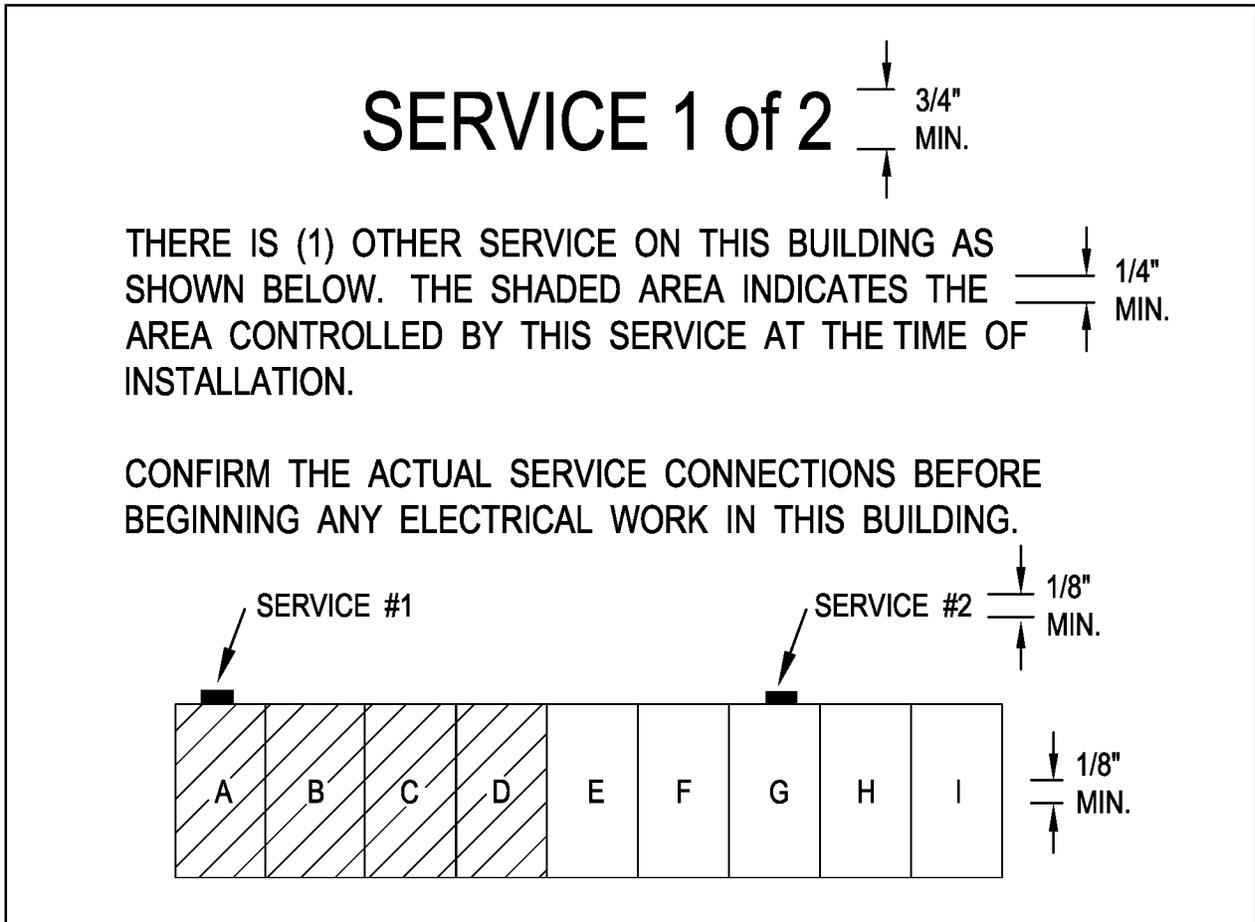
(E) Identification. Where a building or structure is supplied by more than one service, or any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders, and branch circuits supplying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

Note 1: The plaque required by this section shall be metal or plastic, with engraved or machine printed letters in a contrasting color to the plaque, shall include a footprint of the entire building, and shall be attached to the service disconnect with pop-rivets, machine screws, or other fasteners acceptable to the AHJ. Epoxy is no longer an acceptable method of securing. For minimum letter size and acceptable wording, see sample plaques on the next two pages.

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: 2007 California Fire Code, Chapter 6, Section 605.3.1

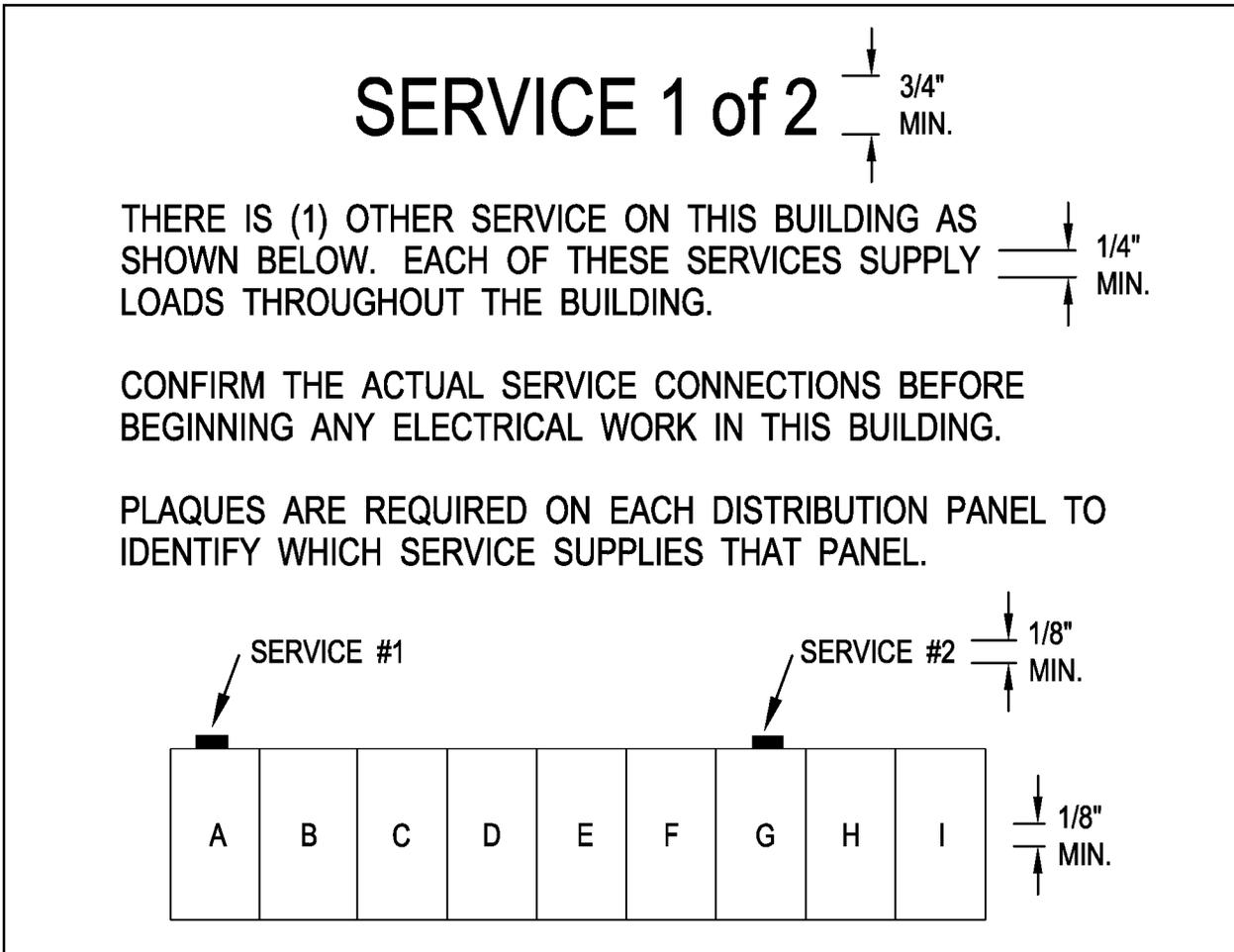
In addition to the above requirements, when a building has more than one electric meter room SDG&E requires that a plaque is secured to the exterior door of each electric meter room identifying the suites served by the meters in that room. Reference SS&G pages 604.2 - 604.4.

**Typical Plaque for A New Building or  
An Existing Building with Separate Service Areas**



The plaque or directory required by Section 230.2 shall be manufactured in metal or plastic with engraved or machine-printed lettering or electro-photo-plating in a contrasting color. The plaque shall include a footprint of the entire building with the area served by each service clearly delineated. The plaques shall be attached to the service disconnecting means with pop-rivets, machine screws, or other fasteners acceptable to the AHJ. Epoxy is no longer an acceptable method of securing.

**Typical Plaque for An Existing Building  
With Intermixed Service Areas**



The plaque or directory required by Section 230.2 shall be manufactured in metal or plastic with engraved or machine-printed lettering, or electro-photo-plating, in a contrasting color. The plaque shall include a footprint of the entire building and shall be attached to the service disconnecting means with pop-rivets machine screws, or other fasteners acceptable to the AHJ. Epoxy is no longer an acceptable method of securing.

# **Service Equipment - Disconnecting Means**

2013 California Electrical Code Article 230.70

Published: August 2005

Revised: December 2013

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The intent of this Newsletter is to provide a guideline for designers, contractors, plan reviewers, inspectors and Utility representatives 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 un-fused 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 structural, utility supply, or other conditions, cannot have the service disconnecting means immediately adjacent to the service point.

It is permissible to have not more than 10 feet of un-fused conductor or bus from the service point to the building's service disconnecting means.

# Ground Fault Performance Testing (1 of 2)

2013 California Electrical Code Article 230.95

Published: April 1989.

Revised: December 2014

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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 600 volts phase-to-phase for each service disconnect rated 1000 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 that tests be performed on such systems, presumably 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 insure 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.

<p>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</p>
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## **Ground Fault Performance Testing (2 of 2)**

2013 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); and
  - 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 b above.

# Grounding Electrode System and Grounding Electrode Conductor

2013 California Electrical Code Article 250 Part III.

Published: December 1981.

Revised: December 2013

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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.

Section 250.50 requires that all grounding electrodes "present at each building or structure" be bonded together to form the grounding electrode system... . The need is to insure that at least one permanent and effective grounding electrode is installed on every building or structure.

The following requirements for the installation of grounding electrodes meet the intent of Section 250.53 and are consistent with typical construction methods. These requirements 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 a building may be substituted. The conductor forming the grounding electrode must be continuous, unbroken and unspliced, 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 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 on 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 AHJ.

Wireless Communication Systems (Cell Site and others) with Separate Services that utilize a common structure for antenna locations shall have a common grounding electrode system. An external bonding location shall be provided.

# Concrete Encased Electrode (Rebar)

2013 California Electrical Code Article 250.52(A)(3)

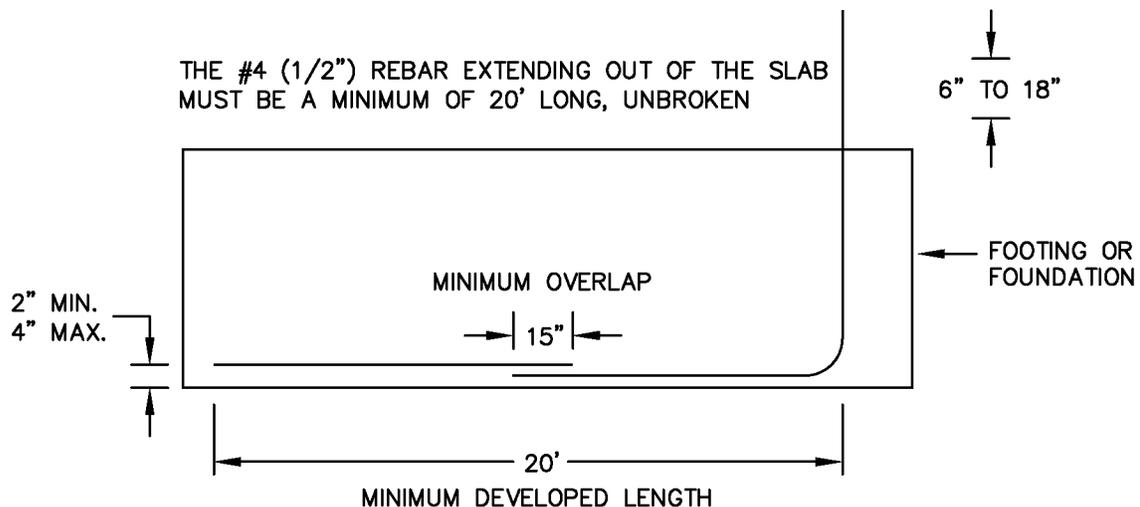
Published: May 1980.

Revised: December 2013

The NEC makes it clear that underground metal water pipe can no longer be relied upon to assure a permanent and effective ground. To this end, several different grounding electrodes are identified as acceptable alternatives to the water pipe. The two most commonly used are the ground rod and the concrete encased electrode. The use of ground rods and concrete encased electrodes has raised questions.

The intent of this newsletter is to identify the minimum requirements for an acceptable concrete encased electrode constructed of reinforcing steel (rebar), commonly called a "ufer" ground. These minimum requirements are as follows:

1. The #4 (1 / 2 ") or larger rebar to which the grounding electrode conductor is connected must be a minimum of 20 feet long, unbroken.
2. The total developed length of rebar at the bottom of the foundation must be no less than 20 feet. Where splices are necessary to obtain the required 20 feet of rebar, they must be made so that the two bars overlap by no less than 15 inches and are secured by at least two steel tie wires.
3. The rebar may only extend out of the slab in a dry location.
4. The rebar must extend out of the slab at least six inches and no more than 18 inches and the point of connection of the grounding electrode conductor must be accessible. Exception: Where the connection of the grounding electrode conductor is encased in concrete and the connector is listed for concrete encasement.



## **Ground Rods**

2013 California Electrical Code Article 250.52(A)(5) and 250.53(G) and 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 a driven ground rod so that no more than 3" 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 the purpose shall be inspected by the 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 nonferrous rods are acceptable.

# Underground Metal Conduit

2013 California Electrical Code Article 342, 344 and 358

Published: April 1985.

Revised: January 2014

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It is the finding of the AHJ's 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.: Listed Rigid Metal Conduit, Intermediate 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.

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

2013 California Electrical Code Article 368

Published: August 2005

Revised: January 2014

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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 are grounded metal enclosures containing factory-mounted, bare or insulated conductors. 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 InterNational Electrical Testing Association, Inc. (NETA), Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems. 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 and Panelboards

2013 California Electrical Code Article 408

Published: June 1990

Revised: August 2014

The testing and listing standards for switchboards and panelboards require that the manufacturer identify any equipment intended to be installed in the field. 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. Those designed for this application will include the required markings and installation instructions.

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

1. Plan reviewers will reject plans showing field connection of cable to busses unless there is documentation 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.
4. Existing switchboards and panelboards not designed and marked for the field installation of terminals cannot be modified in the field, except:
  - a ) When authorized by the manufacturer and with a field evaluation by the original testing company or a third party testing company acceptable to the AHJ; or
  - b) When a third-party manufacturer certifies compliance with applicable industry standards by providing approved engineered drawings and through a field evaluation acceptable to the AHJ.

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 SD&GE Service Standards & Guide page 623.

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 insure service in an emergency. Consult the AHJ's 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.
  - 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.
  - 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 (2 of 2)

2013 California Electrical Code Article 445

Published: August 2007

Revised: January 2014

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- 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).
  - The manufacturer's data sheet(s) for the generator and transfer device shall be submitted.
  - 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 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 UL2200. 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 sign shall be placed at the service entrance equipment indicating type and location of an on-site generator power source(s). Refer to the sample plaque or directory in the Newsletter pertaining to Article 690, Solar Photovoltaic Systems.
  5. Generator locations must also comply with 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 service from the Utility. 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

2013 California Electrical Code Article 450

Published: December 1981.

Revised: January 2014

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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 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 it 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 pop-rivets, machine screws, or other fasteners acceptable to the AHJ.

See 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 3 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's requirements for transformer vaults are contained in their Transformer Vault Specification manual.
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# Examination of Electrical Equipment Exceeding 600 Volts (1 of 2)

2013 California Electrical Code Article 490

Published: January 2014

Revised: N/A

**Intent:** The San Diego area has seen an increase in the number of primary (systems exceeding 600 volts) services and distribution systems in all jurisdictions. The 2013 edition of the California Electrical Code includes a number of new requirements for the installation, testing, and grounding of medium voltage equipment and systems exceeding 600 volts, nominal. Local jurisdictions may have specific requirements regarding these installations. Consult your local jurisdiction if there are questions.

## Code Requirements (Reference only)

1. Wire methods over 600 volts-- 300.31
2. Conductors rated 2001-35 KV-- 310.60
3. Grounding of AC systems over 1KV-- 250 Part X
4. Equipment, over 600 volts, nominal - 490
5. Surge arresters over 1 KV - 280
6. Requirements for installations, over 600 volts, nominal--110 Sec III
7. Transformers--450
8. Outside branch circuits and feeders over 600 volts--225 Part III Isolation Switches
9. Disconnecting means, inspection and testing/substations

## Design/ Submittals and Review

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

## Utility Requirements

- Refer to Electrical Utility Service Equipment Requirements Committee (EUSERC) drawings.
- High voltage service and metering equipment- See SDG&E Service Standards and Guide 670-685.2
- Consult Utility for possible additional requirements for testing.

## 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 CEC 225.56(A)}
4. Grounding of Equipment- when working on existing systems, it is necessary to verify that the requirements of 250.190 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.

\* Acceptable testing agencies determined by the Authority Having Jurisdiction

## 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 megging to verify acceptable resistance and identify blatant defects.

# **Electric Vehicle Supply Equipment (EVSE)** Note: Applicable to residential installations only 2013 California Electrical Code Article 625.26

Published: January 2014

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The purpose of this newsletter is to help with the process when considering a plug-in Electric vehicles (PEV). Consult the utility when planning for your PEV.

1. Serving utility does not currently support interconnection of Electric Vehicle (EV) energy for export to premise wiring.
2. Utility review and approval is required for any proposed transfer switch meeting the requirements of Article 702 to facilitate use of EV use as optional standby.
3. Utility domestic Time-Of-Use (TOU) rates for EV charging:
  - a. Separate EV metering
  - b. Combined EV and house metering
4. All access and working space requirements apply

The intent of this newsletter is to clarify general requirements for permitting and inspection of Solar Photovoltaic systems. Other agencies (Such as California Center for Sustainable Energy (State rebates), HCD (State agency for manufactured homes), County of San Diego Dept. of Environmental Health and Fire Districts may have requirements in addition to the following building department requirements. For specific requirements, consult your 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 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 engineer's 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 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 taps require pre-approval by the Utility and the AHJ, and must not violate the panelboard manufacturer's listing

**The Electrical Section will to shall include:**

1. Provide cover sheet with each page identified as to 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, physical location of the existing electrical equipment, and new PV system. Plans shall also indicate the applicable design code edition.

## **Electrical Section shall include: Continued**

5. An electrical 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 the 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(D) 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 the sample plaque shown on the following page 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 proposed system is roof-mounted, the plans must clearly indicate Fire Fighter access points and pathways as required by CBC 3111.1 and CRC R331. An elevation plan may be required. Consult with 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 and 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 plan requiring soils reports, high-strength concrete footings, shop-fabricated support structures, field fabricated ground mounted support structures or field welding.
4. Check with the Authority Having Jurisdiction regarding specific requirements.

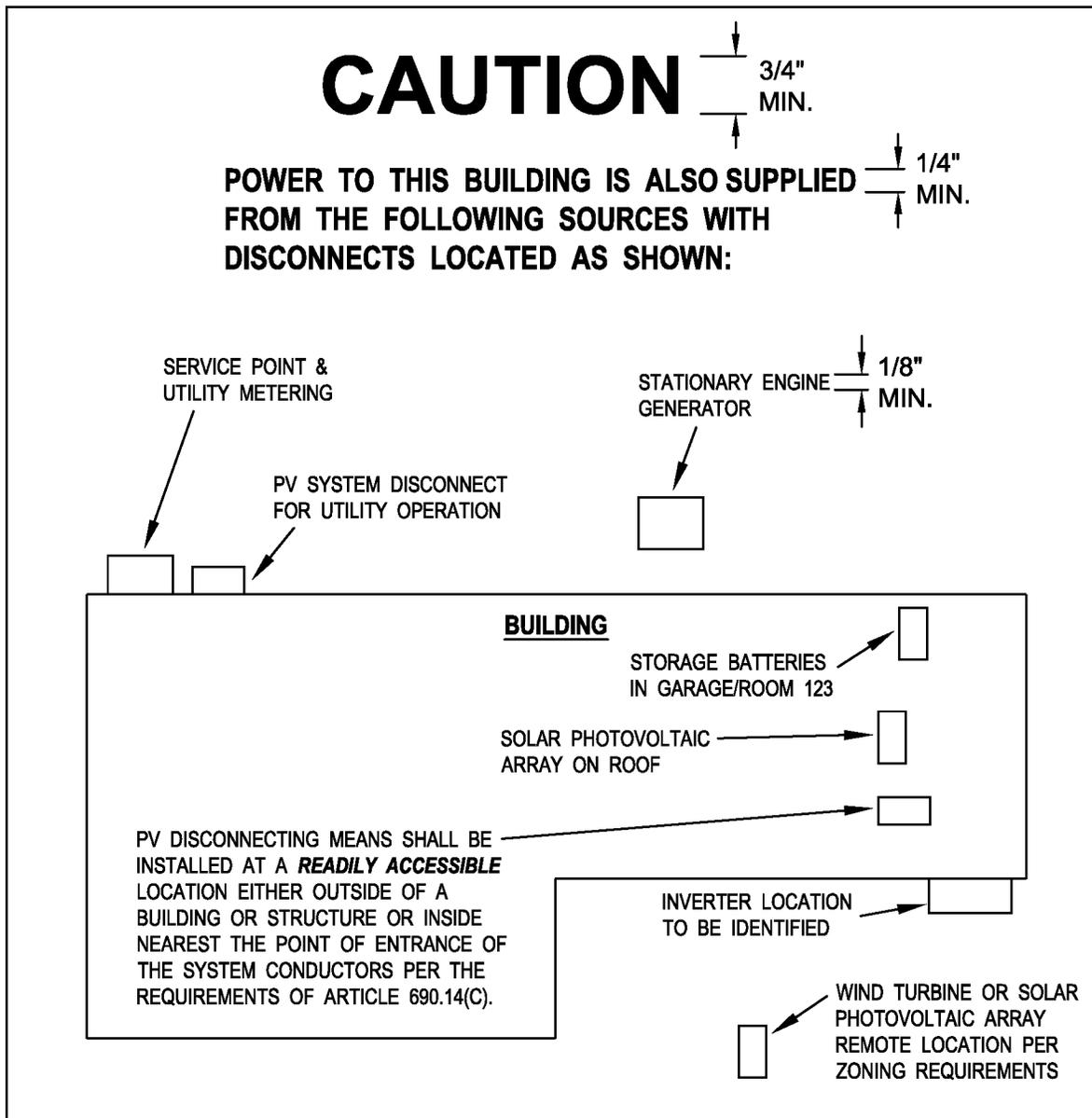
Design Criteria Items:

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 five pounds per square foot (or seven 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.

THIS IS A SAMPLE OF THE PLAQUE OR DIRECTORY REQUIRED WHEN THERE IS AN ALTERNATE SOURCE OF POWER CONNECTED TO THE PREMISES WIRING SYSTEM. SPECIFY THE TYPE OF GENERATION, SUCH AS STATIONARY ENGINE GENERATION, PV ARRAY, BATTERIES, MICRO TURBINE, FUEL CELL, ETC.



The plaque shall be metal or plastic, with engraved or machine printed letters in a contrasting color to the plaque, shall include the location of the service point, utility meter, AC and DC disconnects, inverter, PV Array, Generator or other types of generation sources, and a footprint of the entire building and site. The plaque shall be attached to the exterior of the enclosure for the service disconnect with pop-rivets, machine screws, or other fasteners acceptable to the AHJ. Attachment methods must be made watertight and the integrity of the enclosure rating must be maintained. Epoxy or other adhesive is no longer an acceptable method of securing.

# Index

<b>Subject</b>	<b>Page</b>
Approval of Electrical Equipment	1
Busways	20
Concrete Encased Electrode (Rebar)	17
Electrical Equipment Rooms	3
Electrical Service Plan Check Requirements	7
Electric Vehicle Supply Equipment (EVSE)	27
Electrical Systems and Equipment exceeding 600v.	25, 26
Generators	22-23
Ground Fault Performance Testing	14, 15
Ground Rods	18
Grounding Electrode System & Grounding Electrode Conductor	16
Identifying Conductors	5
Number of Services	9-12
Number of Supplies (Feeders)	8
Outdoor Dedicated Equipment Space	4
Service Equipment - Disconnecting Means	13
Solar Photovoltaic Systems	28-31
Switchboards & Panelboards	21
Torque Requirements	2
Transformers	24
Unconditioned Enclosed Patios	6
Underground Metal Conduits	19
Index	32