



# RESIDENTIAL PHOTOVOLTAIC SYSTEMS

THESE REQUIREMENTS APPLY TO BUILDING PERMITS SUBMITTED ON OR AFTER JANUARY 1, 2014

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## BUILDING DIVISION REQUIREMENTS

A permit is required to install a photovoltaic system. Permits are required prior to installation or replacement of photovoltaic systems. Following is a listing of the general requirements for permit applications based on the 2013 California Electrical Code, 2013 California Building Code, and 2013 California Residential Code. This brochure is intended to provide general information, contact the Building Safety Division for any questions or additional information.

### Installation Standards

- Photovoltaic systems shall be installed by qualified persons. This is defined as a person who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved. (CEC 690.4E)
- Panels shall be adequately anchored to the roof framing. (CBC 1613.5, CRC R908)
- Penetrations of the roof material shall be sealed in accordance with the roofing manufacturer's requirements. (CBC 102.4 and CRC R102.4)

### Electrical Requirements

- Photovoltaic panels, inverters, modules, and all other associated equipment shall be listed by a nationally recognized testing laboratory (i.e., UL) for the intended application.
- Photovoltaic circuits shall not be located in the same raceway, junction box, outlet box, etc. as non-photovoltaic circuits. (CEC 690.4B)
- Photovoltaic systems with DC circuits shall have arc-fault protection (when greater than 80volts) and GFCI protection. CEC 690.11)
- The photovoltaic main disconnecting breaker shall be located at the opposite end of the bus bar from the main disconnecting circuit breaker. (CEC 705.12D)
- GFCI protection shall be provided at the inverters. (CEC 690.5)
- Photovoltaic conductors shall be sized at 125% of the maximum photovoltaic current. (CEC 690.8B)
- A disconnecting means shall be provided to disconnect the conductors within the building from the photovoltaic system conductors. This disconnect shall be readily accessible from the outside of the building or inside at the nearest point of entrance of the conductors. (CEC 690.14C)
- A disconnecting means shall be provided for all photovoltaic equipment. If the equipment is energized from more than one source, the disconnecting means shall be grouped and identified. (CEC 690.15)
- When the photovoltaic inverters are connected on the load side of the main disconnect (after the main breaker), the sum of the photovoltaic disconnects shall not exceed 20% of the main electrical panel rating. (CEC 690.64)
- Circuit breakers that are back-fed must be suitable for such operation (circuit breakers labeled "Line" and "Load" are not suitable for back-feeding.) (CEC 690.64)
- All equipment frames shall be grounded. (CEC 690.43)
- A ground conductor shall be provided that is sized based on the disconnect size connected to the existing grounding system. (CEC 250.47)

GROUNDING ELECTRODE CONDUCTOR FOR AC SYSTEMS (Table 250.66)			
Size of Largest Ungrounded Service-Entrance Conductor		Size of Grounding Electrode Conductor	
Copper	Aluminum or Copper-Clad Aluminum	Copper	Aluminum or Copper-Clad Aluminum
2 or smaller	1/0 or smaller	8	6
1 or 1/0	2/0 to 3/0	6	4
2/0 or 3/0	4/0	4	2

## Marking/Labeling Requirements

All marking and labeling shall be a minimum 3/8 inch high white letters on a red background and the material shall be suitable for the environment where it is located. Marking and labeling shall be applied as follows:

- All interior and exterior direct-current (DC) conduit, enclosures, raceways, cable assemblies, junction boxes, combiner boxes, disconnects and the main disconnect shall be labeled with the wording “WARNING: PHOTO VOLTAIC POWER SOURCE.” The labeling shall be located every 10 feet, within 1 foot of turns or bends, and within 1 foot above and below penetrations of roof/ceiling assemblies, walls or barriers. (CBC 3111, CRC R331)
- The utility-interactive inverter shall be labeled at the ground-fault indicator with the wording “WARNING: ELECTRICAL SHOCK HAZARD IF A GROUND FAULT IS INDICATED. NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED.”
- The DC disconnect, if all terminals are hot while open, and the AC disconnects that are energized from two directions, shall be labeled with the wording “WARNING: ELECTRIC SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINES AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.”
- The photovoltaic breaker shall be labeled with wording “WARNING: INTERFERE OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE.”

## Roof Pathways and Roof Ventilation (CBC 3111, CRC R331)

Panels shall be located to provide the following roof-top clearances (except for roofs with a slope of 2:12 or less)

- Hip roofs shall have a three foot wide pathway from eave to the ridge.
- Single-ridge roofs shall have two accesses that are each three foot wide from eave to the ridge.
- Hips and valleys with panels on both sides shall have an 18 inch clearance from each side to the hip and valley. When panels are located on only one side of the hip or valley, they can be placed directly adjacent to the hip or valley.
- Ridge - Panels/modules to be located no higher than three feet below ridge.

## PERMIT PROCESS

1. Prior to submittal for a building permit, contact the Planning Division to determine if review is required before building permit submittal.

### Building Permit Review

2. Building permit review and issuance is available at the One-Stop Permit Center between the hours of 8:00 a.m. and 12:00 noon, Monday through Friday.

### Inspections

3. One final inspection is required after all of the work has been completed.

### Building Permit Application Requirements (3 copies of each item)

- A completed Building Permit Worksheet application, which is available at the One-Stop Permit Center or on-line at [www.SunnyvaleBuilding.com](http://www.SunnyvaleBuilding.com) (1 copy)
- An approval letter from the Homeowner's Association (if applicable).
- Site plan showing the location of the building and the location of the photovoltaic panels.
- Equipment brochure with installation requirements and UL listing. The installation must meet the manufacturer's requirements
- Attachment details for the panels to the roof structure.
- The weight of the panels to be installed on the roof (if the weight of the panels is excessive the existing roof structure and lateral design may need to be upgraded to accommodate the added load).
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