



COUNTY OF SANTA CRUZ

PLANNING DEPARTMENT

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Residential Solar Photovoltaic System Plan Review and Permitting Requirements

Reference Information: (This is a general guide for Plan Review and Inspection)

- 2013 California Electrical Code (CEC)
- 2013 California Building Code and Residential Code (CBC & CRC)
- 2013 County of Santa Cruz adopted Fire Code
Exception to Fire code: Detached Group U non-habitable structures such as parking shade structures, carports, solar trellises, and similar type structures are not subject to the requirements of the Fire Code.

Office Plan Check Required Information:

CEC 690.4(E) Equipment and systems and all associated wiring and interconnections shall be installed only by "Qualified Persons". A qualified person is one who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received training to recognize and avoid the hazards involved. This includes the following licensed California contractors, a General contractor, a Electrical contractor and a Solar contractor. Also, home owners that can show equivalent certification through a "NABCEP" or similar program may apply and install their system.

- Per CEC 690.4(E) PV equipment, systems and all associated wiring and interconnections shall be installed only by qualified persons as defined in CEC 100.
- Plan check submittals shall show the locations of modules, array, equipment configuration, point of utility connection, and where installed on structures, show array layout location on rooftops. Indicate types, sizes and routing of raceways, location of disconnecting means, and overcurrent devices. Provide two copies of the plan check submittals, minimum 11"x17".
- Provide manufacturer component specification sheets for modules, inverters and combiner boxes. Equipment shall be identified and listed for the application.
- Grounded dc photovoltaic arrays shall be provided with dc ground-fault protection (GFP) as required by CEC 690.5(A - C). Inverter specifications shall indicate integral GFP protection.

- Arc-Fault circuit protection shall be provided for Photovoltaic systems with dc source circuits, dc output circuits, or both, on or penetrating a building operating at a PV system maximum of 80 volts or greater meeting the requirement of CEC 690.11(1-4).
- Specify module weight (including array rack) per square foot for roof loading evaluation.
- Include roof framing layout and specify framing material, size and spacing.
- Number of series modules, and or number of parallel output circuits shall be clearly indicated and summarized.
- State calculations for VOC per CEC Table 690.7 with correction factor of 1.14 minimum. When open-circuit voltage temperature coefficients are supplied in the instructions for listed PV modules, the calculation shall be stated and used to calculate the maximum PV system voltage instead of using Table 690.7.
- Maximum allowable system design (BOS) and application shall not exceed 600V dc based on maximum system VOC for one and two-family dwellings. For systems over 600V see Art. 690 Part IX.
- State calculations for dc source and output conductor ampacity and sizing based on module Isc and Voc values.
- State calculations for ac conductor ampacities and sizing based on central and or micro-inverter output, times continuous load factor 1.25%.
- State de-rating for number of current carrying conductors greater than three in raceways per CEC Table 310.15(B)(3)(a).
- If conductors are installed in circular raceways and located on rooftops, specify conduit installation height above the rooftop and apply a additional temperature adjustment factor to the baseline temperature of 104°F per CEC Table 310.15(B)(3)(c).
- State the listed terminal termination temperatures for the modules, combiner boxes, overcurrent devices and any miscellaneous equipment for both dc and ac or provide manufacturer listing information. If rooftop combiner boxes are located in direct sunlight, manufacture specifications will be required for adjustments above 40°C for overcurrent devices per CEC 110.3(B).
- State calculations for both dc and ac overcurrent device ratings.
- Indicate layout for array rack mounting attachment points. Provide a roof mount penetration detail ensuring roof integrity will be maintained.
- Per CEC 705.12(D)(2), load side connection ampere ratings of overcurrent devices supplying power to a busbar or conductor shall not exceed 120% of the rating of the busbar or conductor meeting the following condition. Per CEC 705.12(D)(7), back fed connections in a panelboard shall be positioned at the opposite (load) end from the input feeder or main circuit location. If the back fed PV disconnects are not positioned at the opposite load end of the bus from the

feeder or main circuit location supply, the maximum back feed shall be limited to 100% of the rating of the busbar or conductor.

- Center fed panels shall have the combined ampere ratings of overcurrent devices supplying power to a busbar or conductor limited to 100% of the panel/bus rating. As an exception to this, where the bus ampere listing exceeds the panel rating, the bus ampere rating may be used. In lieu of the maximum 100% panel/bus rating and to use CEC 705.12(D)(2) 120%, a load demand schedule shall be provided by a licensed designer stating distribution between the feeder or main circuit location supply to the bus and PV back feed.
- Supply side (line side) connections shall be made using an approved and listed method and shall not void the manufacturer listing of equipment. Provide a manufacturer equipment listing for proposed supply side equipment modifications per CEC 110.3(B).
- Grid-tied systems shall use UL1741 listed inverters.
- Equipment grounding conductors for photovoltaic source and output circuits shall be sized in accordance with CEC 690.45(A) or (B).
- Grounding requirements for grounded dc systems shall be provided as required by CEC 250.166(A) and (B) except as permitted by 250.166(C) through (E).
- CEC 690.31(E)(3 & 4) states marking is required on all exposed dc raceways, enclosures, cable assemblies, junction boxes, combiner boxes. The equipment shall be marked with materials permanently affixed or other approved permanent markings. The marking shall contain the words "PHOTOVOLTAIC POWER SOURCE". Marking shall be placed every 10 feet, above and below all penetrations of roof/ceiling assemblies and all walls and or barriers.
- Beneath roofs, wiring methods shall not be installed within 10" of the roof decking or sheathing except where directly below the roof surface covered by the PV modules and associated equipment per CEC 690.31(E)(1).

Fire Department Requirements:

- Roof access, setbacks, pathways and spacing requirements shall be provided in order to ensure access to the roof; provide pathways to specific areas of the roof; provide for smoke ventilation operations; and to provide emergency egress from the roof.

Exceptions:

1. Requirements relating to ridge, hip, and valleys do not apply to roof slopes of two units vertical in twelve units horizontal (2:12) or less.
 2. Residential structures shall be designed so that each array is no greater than 150 feet by 150 feet in either axis.
 3. The fire chief may allow panels/modules to be located up to the ridge when an alternative ventilation method acceptable to the fire chief has been provided or where the fire chief has determined vertical ventilation techniques will not be employed.
- Residential buildings with hip roof layouts shall have panels/modules located in a manner that provides a 3 foot wide clear access pathway from the eave to the ridge on each roof slope where panels/modules are located. The access pathway shall be located at a structurally

strong location on the building capable of supporting the live load of fire fighters accessing the roof.

- * *Residential building with a single ridge shall have panels/modules located in a manner that provides two 3 foot wide access pathways from the eave to the ridge on each roof slope where panels/modules are located.
- Residential hips and valleys shall have panels/modules located no closer than 18 inches to a hip or valley if panels/modules are to be placed on both sides of a hip or valley. If the panels are to be located on only one side of a hip or valley that is of equal length then the panels shall be permitted to be placed directly adjacent to the hip or valley.
- Smoke ventilation requires panels/modules be located no higher than 3 feet below the ridge in order to allow for fire department smoke ventilation operations.
- Ground mounted photovoltaic arrays do not require setbacks. Vegetation shall be kept clear for a minimum of 10 feet from the ground mounted arrays and associated equipment.

Building Inspection Requirements:

Additional CEC Required Labeling:

- On the photovoltaic disconnect (Inverter) the following shall be labeled, “Rated Maximum power-point current (I_{pm}) _____, Rated maximum power-point voltage (V_{pm}) _____, Maximum system voltage (V_{oc})_____, Short circuit current (I_{sc}) _____”.
- If the AC and DC service disconnects are not grouped together both the AC and DC disconnects shall be labeled with, “The DC Photovoltaic Disconnect is located_____, The AC Service Disconnect is located_____” .
- At interactive points of interconnection, usually the main service, provide labeling stating “Power Source – AC operating current _____, AC operating voltage_____”.
- At the AC service or sub-panel with overcurrent devices connected to a photovoltaic AC output supplying power to busbar or conductors provide labeling stating “The following power sources are present at this location_____”.
- At all disconnects where all terminals may be energized in the open position provide labeling stating “Warning: Electric Shock Hazard. Do not touch terminals. Terminals on both the line and load sides may be energized in the open position”.