COUNTY OF SANTA CRUZ

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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)

- 2010 California Electrical Code (CEC)
- 2010 California Building Code and Residential Code (CBC & CRC)
- 2010 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:

- Plan check drawing 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 of conduit, sizes and routing, location of disconnecting means, and overcurrent devices. Provide two copies of the plan check drawings, 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) through (C). Inverter specifications shall indicate integral GFP protection.

- Specify panel weight (including array rack) per square foot for roof loading evaluation.

- Include roof framing member sizes, species, grades and spacings.

- 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 1.12 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.

- State calculations for dc source and output conductor ampacity and sizing based on module Isc value. State calculations for the ac conductor output ampacity and sizing based on inverter maximum continuous output.

- State de-rating for number of current carrying conductors in raceways. State de-rating for temperature correction factors using 104°F as baseline for conductors in free air or conduit. If conductors are in conduit and located on rooftops, specify conduit installation height above rooftop and apply additional temperature adjustment factor to the baseline temperature per CEC Table 310.15(B)(2)(c).

- State listed terminal termination temperatures for the modules, combiner boxes, overcurrent devices and any miscellaneous equipment for both dc and ac. If rooftop combiner boxes are located in direct sunlight, manufacture specifications will be required for adjustments above 40°C for overcurrent devices.

- 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 690.64(B)(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. Per CEC 690.64(B)(7), if the back fed PV disconnect is not separated by the length of the bus from the service disconnect the maximum back feed shall be limited to 100% of the rating of the busbar or conductor.

- Supply side connections shall be made using an approved method and shall not void the manufacturer listing of equipment. Provide manufacturer equipment listing for proposed supply side equipment alterations.

- 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).

Fire Department Requirements: **

- * *Marking is required on all interior and exterior dc conduit, enclosures, raceways, cable assemblies, junction boxes, combiner boxes, and disconnects. The materials used for marking shall be reflective, weather resistive and suitable for the environment. Markings shall have all letters capitalized with a minimum height of 3/8 inch (9.5 mm) white on red background. The marking shall contain the words “WARNING: PHOTOVOLTAIC POWER SOURCE”. Marking shall be placed on all interior and exterior dc conduit, raceways, enclosures, and cable

assemblies every 10 feet, within 1 foot of all turns or bends and within 1 foot above and below all penetrations of roof/ceiling assemblies and all walls and or barriers.

- ∗ ∗Installation of dc conduit, wiring systems, and raceways for photovoltaic circuits shall be located as close as possible to the ridge or hip or valley and from the hip or valley as directly as possible to an outside wall to reduce trip hazards and maximize ventilation opportunities. Conduit runs between sub arrays and to dc combiner boxes shall be installed in a manner that minimizes total amount of conduit on the roof by taking the shortest path from the array to the dc combiner box. The dc combiner boxes shall be located such that conduit runs are minimized in the pathways between arrays. Dc wiring shall be run in metallic conduit or raceways when located within enclosed spaces in a building. Conduit shall run along the bottom of load bearing members.

- ∗ ∗Roof access, 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 (Ipm) _____, Rated maximum power-point voltage (Vpm) _____, Maximum system voltage (Voc)_____, Short circuit current (Isc) _____”.

- 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”.