



BUILDING DIVISION REQUIREMENTS

Permits are required to install photovoltaics. Permits are required prior to installation or replacement of photovoltaics. Following is a *partial* listing of the general requirements for PV permits based on the 2022 California Building, Electrical (2020 NEC) and Residential Code. This brochure is intended to provide general information. **Due to the complexity of the installation, a complete listing of requirements is not possible. It is the installer's responsibility to know the California Electrical Code and the requirements for installation of the PV system.**

- ✓ **NOTE: Qualified personnel are required to install the photovoltaic system. Upon request, certification of completion of NFPA 70E-2012 *Standard for Electrical Safety in the Workplace* shall be presented. The building inspector will determine if the installer is qualified personnel and a licensed contractor may be required.**
- ✓ **Panels shall be anchored to the roof framing at a maximum of 4' on center vertically and horizontally.**

Disconnecting Means

- Means shall be provided to disconnect the PV system from all wiring systems including energy storage, power, and utilization equipment associated with premises wiring. 2022 CEC 690.13
- The PV disconnecting means shall be located at a readily accessible location. 2022 CEC 690.13(A)
- Each PV system disconnecting means shall plainly indicate whether in off or on position and be permanently marked "PV SYSTEM DISCONNECT" or equivalent. 2022 CEC 690.13(B)

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 panels and modules shall be listed and labeled in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2. Inverters shall be listed in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction. (2022 CRC 324.3.1)
- Photovoltaic systems with DC circuits shall have arc-fault protection (when 80 volts or greater) and AFCI protection. (2022 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.
- Photovoltaic conductors shall be sized at 125% of the maximum photovoltaic current. (2022 CEC 690.8(B)(1))

The PV system disconnecting means shall be installed at a readily accessible location. Where disconnecting means of systems above 30V are readily accessible to unqualified persons, any enclosure door or hinged cover that exposes live parts when open shall be locked or require a tool to open. (2022 CEC 690.13)

- 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.
- Fused disconnects, unless otherwise marked, shall be considered suitable for backfeed. Circuit breakers not marked “line” or “load” shall be considered suitable for backfeed. Circuit breakers marked “line” and “load” shall be considered suitable for backfeed or reverse current if specifically rated. 2022 CEC 705.12(D)
- All equipment frames shall be grounded. (2022 CEC 690.43)
- A ground conductor shall be provided that is sized based on the disconnect size connected to the existing grounding system. (CEC 250.122 and Table 250.122)
- Photovoltaic circuits shall not be located in the same raceway, junction box, outlet box, etc. as non-photovoltaic circuits.
- All conduits shall be painted to match the building color and/or the roofing color.

Installation Standards

The installation of equipment and all associated wiring and interconnections shall be performed only by qualified personnel. 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. (2022 CEC 690.4(C))

Maximum Voltage

PV system dc circuits on or in one- and two-family dwellings shall have a maximum voltage of 600 volts or less. (2022 CEC 690.7)

Rapid Shutdown Requirements (2022 CEC 690.12)

PV systems shall include a rapid shutdown function to reduce shock hazard for emergency responders in accordance with 690.12(A) through (D). Some equipment such as inverters and microinverter have rapid shut down built in. Cut sheets for equipment shall be submitted calling out rapid shutdown features. See Marking/Labeling Requirements below.

Roof Access and Pathways (2019 CRC R324.6)

- PV panels shall be located to provide the following roof-top clearances (except for roofs with a slope of 2:12 or less)
- At least two pathways, on separate roof planes from lowest roof edge to ridge and not less than 36 inches wide, shall be provided on all buildings. Not fewer than one pathway shall be provided on the street or driveway side of the roof. For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge on the same roof plane as the photovoltaic array, on an adjacent roof plane, or straddling the same and adjacent roof planes. Pathways shall be over areas capable of supporting fire fighters accessing the roof. Pathways shall be located in areas with minimal obstructions such as vent pipes, conduit, or mechanical equipment. (2019 CRC R324.6.1)
- For PV occupying 33% or less of the roof, an 18” setback is required on both sides of the ridge.
- For PV occupying more than 33% of the roof, a 36” setback is required on both sides of the ridge. (2022 CRC R324.6.2)

- If the building is sprinkled and the PV is occupying 66% or less of the roof, 18” setback is required on both sides of ridge.
- If the building is sprinkled and the PV is occupying more than 66% of roof, 36” setback is required on both sides of horizontal ridge (2022 CRC R324.6.2.1)

Roof Penetrations and Ventilation

Roof penetrations shall be flashed and sealed in accordance with California Residential Code Chapter 9. (2022 CRC R324.4.3)

Marking/Labeling Requirements

A. Stand-Alone Systems - any building or structure with a stand-alone PV system must have a permanent plaque or directory placed at a readily visible location. The plaque must indicate the location of the stand-alone PV system disconnect and that the structure contains a stand-alone electrical system.

B. Utility-Interactive PV Systems

Required Signs & Locations:

1. WARNING: POWER SOURCE OUTPUT CONNECTION - DO NOT RELOCATE THIS OVERCURRENT DEVICE. 2022 CEC 705.12(B)(3)(2)

**WARNING: PHOTOVOLTAIC
POWER SOURCE**

2.

(Within 3 ft. of Rapid Shutdown Labels) 2022 CEC 690.31(D)(2)

WARNING
ELECTRIC SHOCK HAZARD
TERMINAL ON THE LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION

3.

2022 CEC 690.13 (B)

WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

4.

CAUTION
PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFED

5.

2022 CEC 690.59

**RAPID SHUTDOWN SWITCH
FOR SOLAR PV SYSTEM**

6.

2022 CEC 690.56(C)(2)

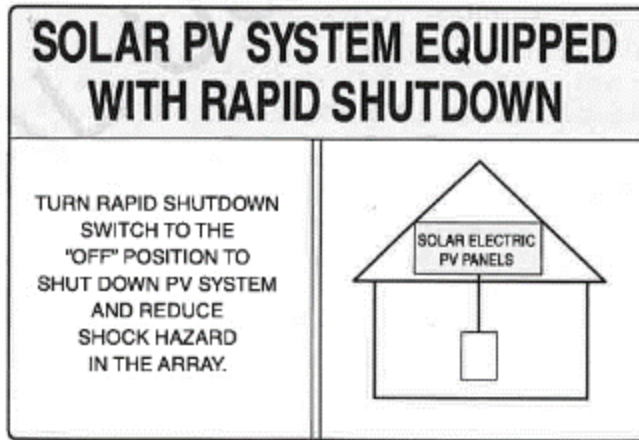
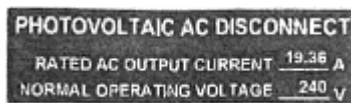


FIGURE 690.56(C)(1)(A) Label for PV Systems that Shut Down the Array and the Conductors Leaving the Array.

7.



8.

2022 CEC 690.54



9.

2022 CEC 690.15(C) & 690.33(D)(3)

10. DIRECTORY PLACARD 2022 CEC 705.10 & CEC 690.56(B) requires a permanent plaque or directory denoting all electric power source on or in the premises or rapid shutdown equipment install at main service panel. 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:

- a. 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 VOLTAGE 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.
- b. 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 THE LINES AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION." (CEC 690.13(B))

Structural Requirements

This is to clarify the non-engineered requirements for solar photovoltaic (PV) and solar water heating systems, hereby referred to as solar energy systems for 1 & 2 story single family and duplex.

1. The modules and support components combined weigh no more than 4 psf for photovoltaic arrays or 5 psf for solar thermal arrays.
2. The solar energy device top of panel is installed within 12" of the roof plane below.
3. The maximum concentrated load imposed by a solar energy device support onto the roof structure does not exceed 64 pounds.

4. The roof has only one layer of roofing material.
5. The roof appears structurally sound, without signs of alteration or structural deterioration or sagging.
6. Modules do not overhang any roof edges (ridges, hips, gable ends, eaves).
7. The array covers no more than half of the total roof areas comprising all roof plans.
8. The plane of the panels is parallel to the roof.
9. There is a 2" minimum and 10" maximum between the underside of the module and the roof surface.

When requirements above are not met, a registered professional engineer (Civil or Structural Engineer) or architect licensed in the State of California shall be required to prepare the plans.

Over-the-Counter Plan Check: Flush mounted rooftop system installations on one- or two-family dwellings may be checked over-the-counter if within the requirements as stated above or by the Supervising Plan Check Engineer.

Applications such as for Commercial/Multi-Family which do not qualify for over-the-counter plan check under the above criteria shall be submitted for Regular Plan Check review by a professional Civil or Structural Engineer.

NOTE: Panels shall be adequately anchored to the roof framing at a maximum of 4' on center vertically and horizontally.

Penetrations of the roof material shall be sealed in accordance with the roofing manufacturer's requirements.

PERMIT PROCESS

1. Upload plans at [E-OneStop Online Services](#).
2. To schedule an over-the-counter appointment, please email pcappointment@sunnyvale.ca.gov after you have uploaded your plans.

Inspections

1. One final inspection is required. Please see below for inspection items expected at final. Please be prepared to expose items that need inspections.

Building Permit Application Requirements Plans shall be digital.

- ☐ A completed [Building and Fire Application](#).
- ☐ Site plan showing the location of the building and the location of the photovoltaic panels.
- ☐ Equipment brochure(s) with installation requirements and UL listing. The installation must meet the manufacturer's requirements.
- ☐ Attachment details for the panels to the roof structure. Attachment must be no greater than 4' on center.
- ☐ 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).
- ☐ A single-line diagram is required as part of the submittal.

REQUIRED INSPECTIONS: The items listed below shall be available for inspection and violations shall be corrected prior to final.

ALL ITEMS LISTED IN THIS HANDOUT ARE SUBJECT TO INSPECTION.

SOLAR TILES:

1. Underlayment of roofing before tiles are installed.
2. Verification of wire management.
3. Electrical panels will be verified including, but not limited to, grounding, wire sizes, breaker sizes, grounding rods, grounding bonding.
4. Labeling is installed.
5. Smoke detectors/carbon monoxide installations. [Smoke and Carbon Monoxide Detector Requirements](#)
Self-certification of the installation of smoke and carbon monoxide alarms is available. This completed form is required at inspection. [Self-Certification Form](#)

PHOTOVOLTAIC PANELS AND/OR ESS SYSTEMS:

1. Verify 4' spacing of supports.
2. Verify support racks are bonded.
3. All junction boxes have weep holes.
4. Bonding wires (of panels) in junction boxes must be non-reversible method.
5. Verify wire management under panels.
6. Conduit ¾" above roof surface.
7. Conduit painted to match building and/or roof material.
8. Mounting of conduit is to code.
9. Panels are correctly installed and at the correct orientation.
10. Verify the correct size of conduit, wires, and breakers.
11. Electrical panels will be verified including, but not limited to, grounding, wire sizes, breaker sizes, grounding rods, grounding bonding.
12. Labeling is installed.
13. Smoke detectors/carbon monoxide installations. [Smoke and Carbon Monoxide Detector Requirements](#)
Self-certification of the installation of smoke and carbon monoxide alarms is available. This completed form is required at inspection. [Self-Certification Form](#)