

A. GENERAL

1. **Applicable codes.** All projects shall comply with the following referenced codes:
 - a. 2022 California Electric Code (CEC)
 - b. 2022 California Building Code (CBC) and/or 2016 California Residential Code (CRC)
 - c. 2022 California Plumbing Code (CBC)
 - d. 2022 California Mechanical Code (CMC)
 - e. County of San Diego Consolidated Fire Code (latest version)

B. ROOF

1. **Roofing and weatherproofing.** All roofing and weatherproofing installation shall comply with the following methods and requirements:
 - a. Any arrays integrated with the roofing material shall be Class "A" rated in accordance with ASTM E 108 or UL 790. (County of San Diego Building Code 92.1.1505.1, CBC 1505.8, CRC 902.3)
 - b. All roof penetrations shall be secure and weather-tight. (CRC 903..2)
 - c. Module installations shall not cover or block any roof plumbing or mechanical vent locations. (CPC 904, CPC 906, CMC 802.6, CMC 510.8)
2. **Firefighter access requirements.** All roof-mounted solar photovoltaic systems shall comply with the following:
 - a. Roof access points shall be provided per the following and in conformance with CRC R324 or CBC 3111 as applicable:
 1. Located in areas not requiring placement of ground ladders over openings such as doors or windows.
 2. Located at strong points of building construction in locations where access point does not conflict with overhead obstructions such as tree limbs, wires, or signs.
 3. Panels and modules installed on dwellings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway not less than 36 inches (914mm) wide shall be provided for emergency escape and rescue opening.
3. **Inspector access requirements.** A portable ladder complying with CAL-OSHA requirements shall be made available and secured in place for inspection.

C. ELECTRICAL

1. **Wiring methods.** All wiring installation shall comply with the following wiring methods and requirements:
 - a. Corrosion resistant conduit shall be used for all underground runs and installations. (CEC 690)
 - b. All exposed wiring shall be listed for wet location and sunlight resistant. All outdoor equipment shall be NEMA 3R rated. (CEC 690.31, CEC 310.8)
 - c. Photovoltaic DC conductors entering the building shall be installed in a metallic raceway. (CEC 690.31)
 - d. Markings shall be placed on interior and exterior DC conduit, raceway, enclosures, and cable assemblies every 10 feet -- and within 1 foot of turns or bends and within 1 foot above and below penetrations of roof/ceiling assemblies, walls, or barriers -- with minimum 3/8-inch-high white lettering on red background reading: "WARNING: PHOTOVOLTAIC POWER SOURCE." (CEC 690.31)
 - e. DC breakers shall be listed and rated for PV use. (CEC 705.12)
 - f. All equipment shall be identified on a warning placard clearly showing the location of all pertinent equipment and disconnects. Alternate power source placard shall meet the specifications of the San Diego Area Newsletter. The placard shall be metal or plastic, with engraved letters in a contrasting color to the placard, include the location of meter, disconnects, inverter, the array, and a footprint of the entire building and site. The placard will be attached by pop-rivets, screws, or other approved fasteners. Refer to the sample placard for alternative power source (diagram on the right) for further requirements. (CEC 110)
 - g. PV connection in panel board shall be positioned at the opposite (load) end from the input feeder location or main circuit location. (CEC 705.12)
 - h. If approved plans show de-rating of the main breaker, a placard label is required at the panel stating: "THIS PANEL HAS BEEN DE-RATED TO (insert ampere size). DO NOT INSTALL LARGER BREAKERS." Refer to the sample placard for alternative power source (diagram on the right) for further requirements. (CEC 690.53, CEC 690.17, CEC 705.10)
 - i. Wire sizing and terminations shall be in conformance with the seventy-five-degree (75°) column of CEC Tables 310.15(B).
 - j. All exterior conduit placement and sizing shall have ambient temperature adjustments in conformance with the ASHRAE designated design temperate and comply with CEC 310.15(b)(3)(c).
 - k. Main service panel and buss bar ratings must be verifiable at time of inspection with fixed labeling.
 - l. Integrated and or micro-inverter systems shall have a rooftop AC disconnect and comply with CEC 690.14 (D) (1) and CEC 690.14 (D) (2).
 - m. PV system circuits installed on or in buildings shall include a rapid shutdown function that controls specific PV conductors in accordance with CEC 690.12 (1) through (5) and have the associated placard stating: "PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN". Refer to the sample placard for alternative power source (diagram on the right) for further requirements.
 - n. Above ground conduit and wiring methods outside of the building footprint shall be approved by the building inspector prior to installation.
2. **Grounding methods.** All grounding installation shall comply with the following grounding methods and requirements:
 - a. All modules shall be grounded in accordance with the CEC and the manufacturer's installation instructions. Approved plans and all reference documents shall be available on site for inspection verification. (CEC 250)

- b. Third-party grounding devices must be specifically mentioned in the module manufacturer's installation instructions by device make and model. These installation instructions must be reviewed by the module listing agency as part of the listing of the module to UL 1703. Grounding devices listed to UL 2703 also may be acceptable if the device installation instructions mention the specific module make and model.
- c. PV system grounding configuration shall be in accordance to CEC 690.41 and grounding electrode system shall be in accordance to CEC 690.47.
- d. Electric service panels shall be grounded with a grounding electrode(s) that complies with CEC Article 250. Ground-rods shall be supplemented by a second ground-rod installed at least 6 feet apart. (CEC 690.47)
- e. If the existing main service panel does not have verifiable grounding electrode, it shall be the contractor's responsibility to install a supplemental grounding electrode. Service grounding electrode must be verified at the time of inspection for all buildings. Buildings with a metallic water pipe system as the sole grounding electrode shall have a supplemental electrode installed. (CEC 690.47)
- f. All proposed equipment shall be listed or field labeled for PV application by a nationally recognized testing agency. (CEC 690.4)
- g. Manufacturer's technical cut sheets and installation manuals for all equipment and components shall be provided on site.
- h. All terminals of the disconnecting means may be energized in the open position in conformance with CEC 690.17.
- i. All electrical terminus torquing shall be in accordance with the CEC, San Diego Area News Letter, and the manufacturer's installation instructions. (CEC 110.3 (B), CEC 110.14)

D. MISCELLANEOUS

1. **Zoning requirements.** All roof-mounted solar photovoltaic systems shall comply with:
 - a. County of San Diego zoning requirements per setbacks for Solar Photovoltaic Panels. Reference handout PDS#276 for further details.
2. **Manufactured or mobile home requirements.** All roof-mounted solar photovoltaic installations on manufactured or mobile homes require a permit from the State of California Department of Housing and Community Development (HCD). Contact HCD at (951) 782-4420 for further information.

E. GREEN BUILDING STANDARDS CODE (CALGREEN)

1. **Construction waste reduction, disposal, and recycling:** Reduce and/or salvage for reuse a minimum of 65 percent of the nonhazardous construction and demolition debris. (CalGreen 4.408.1) Exception: Excavated soil and land-clearing debris. Exception: Alternate waste reduction methods developed by working with local agencies if diversion or recycle facilities capable of compliance with this item do not exist or are not located reasonably close to the jobsite
The County of San Diego, Department of Public Works, Construction & Demolition (C&D) Facilities Guide is online at: http://www.sdcountry.ca.gov/dpw/recycling/Files/Construction_Guide_SJ8_Pgs_1-27.pdf.
2. **Construction waste management plan:** A construction waste management plan shall be prepared and available on site during construction. Documentation demonstrating compliance with the plan shall be accessible during construction for the enforcing agency. (CalGreen 4.408.2) The plan:
 - a. Identify the construction and demolition waste materials to be diverted from disposal by recycling, reuse on the project or salvage for future use or sale
 - b. Specify if construction and demolition waste materials will be sorted on-site (source-separated) or bulk mixed (single stream)
 - c. Identify diversion facilities where the construction and demolition waste materials will be taken
 - d. Identify construction methods employed to reduce the amount of construction and demolition waste generated
 - e. Specify that the amount of construction and demolition waste materials diverted shall be calculated by weight or volume, but not by both.

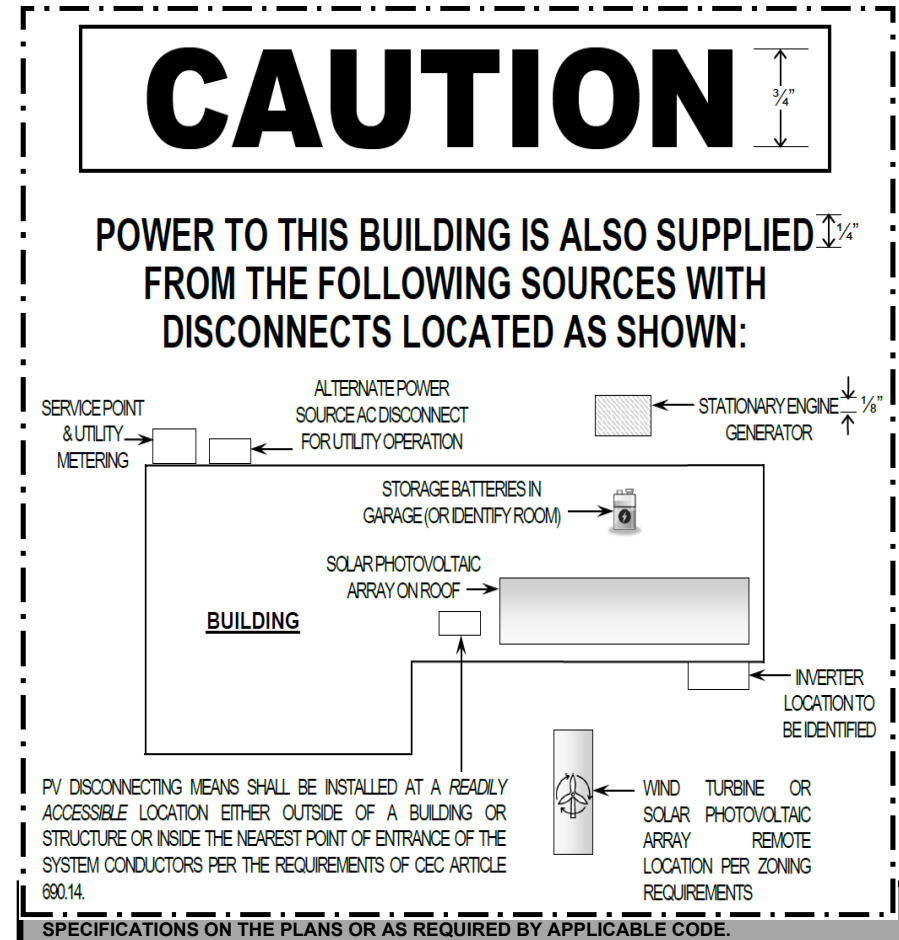
F. BATTERY BACKUP SYSTEM (BBS) AND ADVANCE ENERGY STORAGE (AES):

1. **General Requirements:** All battery and AES shall comply with the following:
 - a. All battery, BBS, and AES systems shall be installed in accordance with the CEC and the manufacturer's installation instructions. Approved plans and all reference documents shall be available on site for inspection verification. Additional fire and engineering requirements may be required based on site specific review and inspections.
 - b. All inverter, charger, racking, and storage products shall be individual component listed, and full system and equipment listed to UL-9540 & UL-9540A, for battery and advance energy storage use by a nationally recognized testing agency complying with CEC article 480 and CEC article 690.
 - c. Stationary storage battery systems installed in a location subject to vehicle damage shall be protected by approved barriers (CRC R328.8)
 - d. When an "emergency system" is required, storage battery systems used as an alternative power source to have equivalent capacity and operating duration as an equivalent generator set operating on an on-site fuel supply (CEC 700.12)
 - e. Power supply to premises wiring systems fed by stand-alone or isolated microgrid power source shall be permitted to have less capacity than the calculated load. The capacity of the sum of all sources of the stand-alone supply shall be equal to or greater than the load posed by the largest single utilization equipment connected to the system (CEC 220, CEC 220.87, and CEC 710.15 (a))
2. **Electrical Requirements:** All battery and advance storage systems shall comply with the following:
 - a. All combiner boxes, disconnects, and fuses shall be listed for DC current and listed by a nationally recognized testing agency complying with CEC article 480 and CEC article 690. Ground fault protection for battery, BBS, and AES shall comply with CEC 690.5 and storage overcurrent device(s) shall be installed in accordance with CEC 240.21 (H) and 690.71 (C).

- b. All vented storage cells shall be equipped with flame arresters complying with CEC 480.10 (A) and all sealed storage cells shall be equipped with pressure-release vents complying with CEC 480.10 (B). The storage cells and battery locations shall comply with CEC 480.9 and CEC 690.71. The storage cells shall be located inside a lockable enclosure or room (CEC 690.71 (B) (2)) with adequate accessibility for all equipment (CEC 110.26 & CEC 480.8 (C)). Appropriate to the battery technology, sufficient ventilation shall be provided in accordance with CEC 480.9 (A). All racking and trays shall meet provisions within CEC 480.8.
- c. Critical loads and critical loads centers shall be clearly identified and load calculations shall be available on site for inspection verification. The residential total battery system voltage, system wiring, and conductor sizing shall be calculated in accordance to CEC 690.8 (A) (4) and not exceed 50 volts (CEC 690.71 (B) (1)). All breaker and/or fuse rating protecting the conductors shall comply with CEC 690.8 (B) (1).
- d. Circuit transformers and metering devices shall be listed for such use by a nationally recognized testing agency complying with CEC 690.60 and CEC 690.61.
- e. All charge controllers required for BBS and AES shall comply with CEC 690.72.
- f. All photovoltaic power system employing a diversion charge controller as the sole means of regulating the charging of a battery shall be equipped with a second independent means to prevent overcharging of the battery. (CEC 690.72 (B) (1))
- g. Circuits containing a DC diversion charge controller and a DC diversion load shall comply with CEC 690.72 (B) (2).
- h. All photovoltaic power system using utility-interactive inverters to control battery state-of-charge by diverting excess power into utility system shall comply with (CEC 690.72 (B) (3)).
- i. Buck/boost charge controllers and other DC power converters that increase or decrease the output current or output voltage with respect to the input current or input voltage shall comply with CEC 690.72 (C), 690.72 (C) (1), and 690.72 (C) (2).
- j. All photovoltaic power system employing energy storage shall also be marked with the maximum operation voltage, including any equalization voltage and the polarity of the ground circuit conductor per CEC 690.55.
- k. BBS or AES intended as stand-alone systems shall comply with all the requirements listed under CEC 690.16 (A) through (E).
- l. All battery, BBS and AES systems shall be protected from physical damage and comply with CEC 110.27.

SAMPLE PLACARD FOR ALTERNATE POWER SOURCE

This is a sample placard required when there is an alternate source of power connected to the premises wiring system. Specify the type of generation, such as stationary engine generator, solar photovoltaic (PV) array, wind turbine, batteries, fuel cell, etc. The placard must be metal or plastic, with engraved letters in a contrasting color, and must include the location of the service point, utility meter, AC and DC disconnects, inverter, and PV array, generator, or other type of generation source, and a footprint of the entire building and site. The placard shall be attached to the service disconnect with pop-rivets, machine screws, or other fasteners as approved by the County of San Diego, Building Division. *Epoxy is not an acceptable method of securing the placard.*



BUILDING RECORD ID:

OWNER OR CONTRACTOR SIGNATURE:

County of San Diego, Planning & Development Services
SOLAR PV MINIMUM CONSTRUCTION SPECIFICATIONS
BUILDING DIVISION

Sheet Number
SPV-CS-1