Solar Photovoltaic (PV) System Submittal Requirements

The City of Berkeley encourages the installation of renewable systems through low permit fees for solar photovoltaic (PV) installations and standardized solar permitting guidelines. All solar PV installations need an electrical permit. Building permits are needed only if structural work is necessary to support the solar PV system (such as the addition of new struts and purlins or new framing members between existing framing to reduce spacing). The required elements for permit applications for solar PV installations are detailed below.

All plans submitted for solar PV systems must comply with, and reference, the 2013 California Building Standards Code that became effective on January 1, 2014, including the 2013 California Residential Code (CRC) and 2013 California Electric Code (CEC), as appropriate.

Requirements for Permit Submittal

Before approval and issuance of permit(s) for solar PV systems, applicant shall submit three (3) sets of plans (minimum size 11“x17”), which are drawn to scale (or at the very minimum are fully dimensioned), readable, legible, and include the following information:

(Plan information listed in the items below could be combined if clarity is maintained.)

1. Cover Sheet showing the following information: (a) project address; (b) owner’s name, address, and phone number; (c) name, address, and phone number of the person preparing the plans; (d) scope of work statement; (e) number of stories and number of dwelling units; (f) sheet index indicating each sheet title and number; (g) legend for symbols, abbreviations, and notations used in the drawings.

2. Schematic Site Plan showing building footprint with locations of property lines, distances of building walls to property lines, location of the solar PV systems, location of the main service and the exterior and interior locations of all equipment and disconnects with working space clearances, and locations of other structures (if any) on the property. For multi-story buildings, indicate the roofline at each floor level on the site plan.

3. Electrical Plan showing:
   a. The kW rating of the solar PV system and whether it is a utility interactive, stand-alone, or ground mount system;
   b. Complete electrical calculations for the proposed solar PV system;
   c. Single line diagram of the electrical installation which includes the solar PV panel layout, PV power source short circuit current rating, conductor size and type, conduit size and type, location and lengths of runs, wiring methods, inverter location, disconnect
locations, battery locations (if applicable), point of connection to the existing electrical system (with the existing service and disconnect size and the number of meters) and existing PV system (if applicable);
d. Site specific signage information required for the solar PV installation suitable for the environment per 2013 CEC 690.51-690.56;

4. **Roof Plan and Cross-Section** including:
   a. An aerial photo of the structure, such as Google Earth;
   b. The existing roof types, slopes (i.e. hip roof, slope less than 2:12 or greater than 2:12, as appropriate), roofing material, and number of layers;
   c. Size, spacing, span and direction of existing rafters, ceiling joists, and framing support members. **Note:** Roof framing shall comply with:
      i. 2013 CRC Section R802.2 and Tables R802.5.1(1) or (2), OR
      iii. If the roof framing exceeds the allowable spacing or span limits, provide stamped and signed engineered calculations justifying the adequacy of the existing roof framing, OR provide stamped and signed engineered plans and calculations for framing modifications necessary to accommodate the solar panel installation, OR provide roof framing plan and details for modifications to meet conventional framing requirements of 2013 CRC Section R802.2 and Tables R802.5.1(1) or (2). Allow 5 working days for review of plans with structural calculations;
   d. Location of load bearing walls on the framing cross-section;
   e. Section or detail showing that the solar PV panels are flush mounted 10” or less
      i. **Note:** Panels that are not flush mounted require a licensed engineer to provide structural design calculations and details for wind uplift and all connections. Allow 5 working days for review of plans with structural calculations;
   f. Attachment details showing the type, diameter, and length of embedment of bolts and their spacing; the number of bolts per solar PV panel (or alternatively, the square footage of panel per bolt).

5. **Manufacturer’s Specification Sheets** with make, model, listing, size, and weight for all components including, but not limited to, inverters, panels, racks, and combiner boxes. Provide two (2) complete copies of the Solar Panel Installation Manual as well as the specifications for the grounding method to be used. Grounding method used must comply with installation manual requirements.

6. **Fire Safety Requirements** as shown on plans must include:
   a. Notes indicating **markings** on interior and exterior DC conduit, enclosures, raceways, cable assemblies, junction boxes, combiner boxes and disconnects per 2013 CRC Section R331.2 and 2013 California Fire Code (CFC) Section 605.11.1. Details as follows:
i. Material: Reflective, weather resistant and suitable for the environment. All letters capitalized with a minimum height of 3/8” white on red background.
ii. Content: Contain the words “WARNING: PHOTOVOLTAIC POWER SOURCE.”
iii. Main service disconnect: Marking placed adjacent to main service disconnect in a location clearly visible from the location where the disconnect is operated.
iv. Location: Markings at 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. Locations of DC conductors to meet the criteria of 2013 CRC Section R331.3 and 2013 CFC Section 605.11.2:
   i. Conduit, wiring systems, and raceways 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;
   ii. Conduit runs between sub arrays and to DC combiner boxes shall be installed in a manner that minimizes the total amount of conduit on the roof by taking the shortest path from the array to the DC combiner box.
   iii. DC wiring shall be installed in metallic conduit or raceways when located within enclosed spaces in a building.
   iv. Conduit shall run along the bottom of load bearing members.

c. Locations of Roof Access Points (RAPs) on an elevation plan OR photos of the exterior side of the structure. Per 2013 CRC Section R331.4, RAP must be located such that:
   i. A ground ladder is not placed over windows or doors;
   ii. It is at a building strong point;
   iii. It does not conflict with overhead obstruction such as tree limbs, wires, or signs;
   iv. It has a minimum of 3’x 3’ ground clearance for ladder placement for one story structures, and 6’ deep by 3’ wide for 2 story structures.

d. Locations of clear access paths as required by 2013 CRC Section R331.4.2 and 2013 CFC 605.11.3.2. Note: Regardless of roof design, PV panels shall be no closer than 3’ to a ridge; see illustrative diagram on next page for examples. Access to residential photovoltaic system shall be in accordance with:
   i. 2013 CRC Section R331.4.2.1 for structures with hip roofs,
   ii. 2013 CRC Section R331.4.2.2 for structures with a single ridge,
   iii. 2013 CRC Section R331.4.2.3 for structures with roof hips and valleys.
   iv. Exception: Roofs with slopes of 2:12 or less.

7. Inspection requirements:
   a. Grounding method of solar panels must follow manufacturer’s specific listing. Documentation must be provided to field inspector at time of inspection.
   b. The systems shall be ready for inspection with all boxes open and ladders tied off:
   c. The permit and approved plans and specifications shall be readily available at the time of inspection;
   d. A qualified individual must be present to accompany the inspector during the inspection;
   e. Any changes to approved plans must be reviewed and approved by the Building & Safety Division prior to scheduling the inspection.
ROOF CLEAR ACCESS PATH REQUIREMENTS

Diagram 1: Cross Gable Roof

Diagram 2: Cross Gable with Valley

Diagram 3: Full Gable

Diagram 4: Full Hip Roof

EXAMPLE 1

EXAMPLE 2

EXAMPLE 3

EXAMPLE 4

NOTE: IF ROOF SURFACE IS NOT LEVEL OR NOT ACCESSIBLE BEHIND A WALL THEN A 3 FEET ACCESS PATH IS REQUIRED AGAINST THE WALL.

NOTE: THE PATH LAYOUT MUST PROVIDE ACCESS TO THE CROSS GABLE.

NOTE: IF PAGES ONLY ON ONE ROOF SURFACE THEY ARE NOT REQUIRED.

NOTE: IF PANELS ONLY ON ONE ROOF SURFACE THEY PANELS DP NOT REQUIRED ON THIS SIDE.

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