



CITY OF BOULDER Planning and Development Services

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PHOTOVOLTAIC AND SOLAR HOT WATER SYSTEM PERMIT SUBMITTAL CHECKLIST

Incomplete information may result in a delay in the approval of your project.

Standard sized (less than 10kW) systems are reviewed and approved over the counter.

Residential permits typically require one permit per site

PV and/or solar thermal systems on separate commercial buildings generally require separate permits

REQUIREMENTS FOR PLAN SUBMITTAL

This checklist **must** be attached to the application materials submitted for a permit.

Collate application materials into two separate identical sets.

Plans shall be submitted in **minimum size of 11" X 17"**.

Completed Residential or Commercial Permit Application Form (1 copy)

Electrical Permit Application for Photovoltaic System

Mechanical Permit Application for Solar Hot Water System

Include Building Permit Application and include the name of the City of Boulder licensed general contractor if framing or structural changes are required.

2 sets of construction documents. Construction documents include but are not limited to:

2 site plans and/or floor plans showing proposed equipment locations

Site Plan – Equipment Outside the Building.

Show location of all disconnects.

Show the location of all modules.

Show the location of all batteries

Show the location of inverters.

Show the location and connection of all GEC –
(Grounding Electrode Conductors)

Provide dimensions of clearances around all equipment.

Provide dimensions between equipment and structures.

Provide dimensions from equipment to property lines.

Floor Plan – Equipment Inside the building

Show the location of all disconnects.

Show the location of all modules.

Show the location of all batteries.

Show the location of all inverters.

Show the location and connection of all GEC -
(Grounding Electrode Conductors)

Provide dimensions of clearances around all equipment.

Show the location of the equipment within the structure.

Label the room in which the equipment is located.

2 sets of elevation drawings indicating relationship of the array to the plane of the roof.

Tilt-up arrays may require a separate administrative review (Minor Modification), supplemental engineering, and a Solar Shadow Analysis if the shadow of the array leaves the roof or goes over a parapet wall. For an over-the-counter permit, plans need to indicate in plan view and elevation, that the edges of the panels stay within the confines of the rake edge, and are above the eave and below the ridge of the roof, **AND** that the system is in compliance with the City's solar shadow ordinance.

2 sets of manufacturer's cut sheets and listing information on PV equipment:

inverter, panels, and disconnect including weight of equipment (see engineer's letter requirements below)

2 sets of electrical plans and a one-line diagrams that indicate:

- (Plans bearing the seal and signature of a Colorado-licensed engineer are required for a photovoltaic solar energy system 10 kW or greater in size, or installed to an electrical service sized 400 amps or greater.)
- the number of, and wattage of modules, detail conductor sizes, wire lengths, insulation types, conduit sizes, fuses, circuit breaker ratings, inverter ratings, AC & DC disconnect rating and ground fault protection device(s).
- Provide existing and new panel amperage ratings (Buss ratings) and detail over-current protection in compliance with NEC 690.9(A).

- Specify the PV module's nameplate short-circuit current and open-circuit voltage relative to the work performed, and module series fuse ratings, inverter output current rating.
- Provide calculations used to determine wire sizes, fuse and breaker type and sizing; include temperature deration factors per the NEC Table 690.31(C). Roof-mounted systems should use the worst case scenario for ambient temperature of 56-60 degrees C. See NEC Tables 310.15 (B)(2)(a); (B)(3)(a) & (B)(3)(c).
- Provide calculations to show that the PV system voltage does not exceed the maximum rated DC inverter input voltage or that of the connected equipment.
- Plans shall include all grounding on the one-line diagram. Show the grounding electrode system per NEC 690.47. Show calculations used to size equipment grounding conductor per NEC 690.43 & 690.45
- Plans shall show location of all disconnecting means, equipment and panels with reference to house and service equipment. Clearly identify where the wiring is on the interior or the exterior of the building. PV system disconnecting means shall be grouped together per NEC 690.14(C)(5).
- Provide UL Standard 1703 manufacturer's specifications for the module installation and grounding requirements. The manufacturer's specifications shall be dated after May 1, 2012

A letter bearing the seal and signature of a Colorado licensed engineer from the rack manufacturer confirming that the racking system meets/exceeds requirements of the Building Code (relating to uplift, snow loads, dead & live loads, etc.) and specifically how the rack will be attached to the house, including, but not limited to: the location, number, and type of attachment points, the number of fasteners per attachment point, and the specific type(s) of fasteners (size, diameter, length, minimum embedment into structural framing, etc).

A Colorado licensed structural engineer's evaluation regarding the capacity of the existing roof structure to support the additional loads imposed by the solar photovoltaic system. The engineer must reference the required wind and snow loads for the site. If the panels project above the ridge line of the roof, this must also be part of engineer's evaluation. If the engineer determines that structural modifications are required; the plans shall include details showing how the existing structure will be altered to support the additional loads imposed by the system. If the engineer determines that the existing structure will support the additional imposed loads with no structural modifications, a letter bearing the engineer's seal and signature shall be submitted with the application stating this conclusion. In all cases, the plans, evaluations, and letters shall bear the seal and signature of the structural engineer licensed by the State of Colorado. If framing modifications are required, a General Contractor licensed in the City of boulder with the appropriate class of license is required to perform the work.

A roof plan showing existing mechanical vents/intakes and existing plumbing vents. Solar panels, racking and associated equipment are not allowed to cover or conceal or cover plumbing or mechanical terminations.

Solar photovoltaic power systems shall meet the provisions of sections 605.11 through 605.11.3.2.3 of the City of Boulder Fire Code.

The items listed below are for informational purposes only.

NEC Article 690.11, PV System AFCI Protection (DC):

"This new section was added to Article 690 to require a listed (dc) arc-fault circuit interrupter for PV systems with dc source circuits, dc output circuits, or both. The new AFCI requirement is limited to PV systems with a maximum system voltage of 80 volts or greater. PV systems can be subject to extreme environmental conditions such as wind, rain, snow, ice, and temperature extremes. These systems deteriorate over time and eventually develop insulation failures or internal PV module conductor fault conditions. In PV systems, these fault currents, including arcing faults, are direct current (dc) and are far more difficult to interrupt than ac faults because of the non-time varying (non-zero crossing) nature of dc currents. Series arcing faults resulting from a failure in the intended continuity of a conductor, connection, module, or other system component are most prevalent and may occur anywhere in the dc system . . . there is evidence that arcing faults on PV systems have caused fires . . ." IAEI, NEC 2011 Analysis of Changes

Boulder has adopted the 2012 editions of the ICC family of Codes.

Online access to the codes <http://publicecodes.cyberregs.com/icod/index.htm>

Check local amendments to the 2012 codes at <http://www.colocode.com/boulder2/title10.htm>