



## Alternative Energy Requirements for Photovoltaic Systems

**Note: PRBD Approved stamped plans must be on jobsite or inspection will be rescheduled.**

### Jobsite Plans

Plan review must be done prior to the permit being issued. Plans to include the below items.

#### Utility Approval

Must have approval from the utility company for the system. Any approval documents must be included with the jobsite plans.

#### Site Plan

- North arrow.
- Location of all existing/new service gear and electrical equipment

relative to structures involved in this scope of work.

- Location of all other equipment.
- Routing of all raceways clearly showing interior and exterior.
- Module layout.

*On the site plan, make sure the address matches the utility approval in the previous document. Once we verify that the addresses match, we then review where the modules are being placed (roof of a building, accessory structure, or ground mount) and where the electrical gear will be located. Ensure a North facing arrow is also on the site plan to verify location of mandated disconnects.*

## **Manufacturer's Specifications**

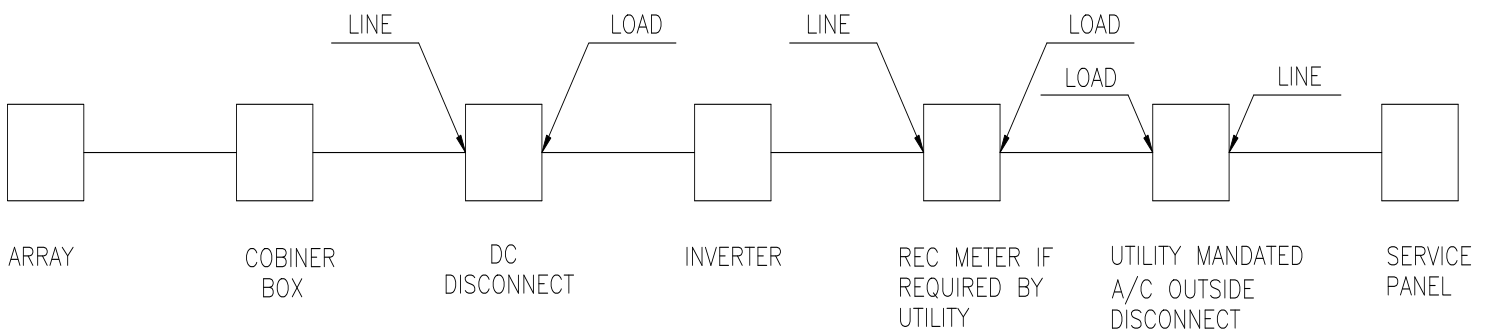
- Module spec sheet.
- Inverter spec sheet.
- Optimizer spec sheet if applicable.
- Document showing the rack and modules have been evaluated together as a system for grounding the modules per 690.43 NEC.

*The manufacturer's specifications document should contain only the listed specs as they pertain to your project. The module, inverter, and optimizer spec sheets can be found on the manufacturer's web site and can be provided with this document. Ensure the equipment spec sheet matches what is on the one-line. In addition to the spec sheets mentioned above, please provide the module compatibility document that complies with 690.43 NEC, commonly found in the installation manual. This document tells us that the racking system, in conjunction with your panels, can be used together as a system for grounding the modules.*

## One-Line Diagram

- Conductor/Conduit size, type, and quantity.
- Bus and over current device size for all panels.
- Must comply with 705.11(B) NEC. Line-side taps must be a minimum of 6 AWG CU or 4 AWG AL. Only three conductors for single phase. (L1, L2, N (grounded conductor)).
- Effective January 1, 2023, pressure connectors and devices for splices and taps installed on service conductors shall be marked “suitable for use on the line side of the service equipment” or equivalent.
- Energy Storage Systems (ESS) must comply with 706.15 NEC. (In dwellings, required disconnects must be located at a readily accessible location outside the building. See 706.15(c) NEC for required labeling).

One-line for basic Utility Interactive Photo Voltaic System: ***Diagram is for illustration purposes only.***



## Mount Type

### Roof mount

- Configurator printout/charts from racking manufacturer or letter from Colorado licensed engineer stating the following:
  - \* Design criteria: Minimum requirements or better accepted.
    - \* Snow Load: 20LB Ground load for up to an elevation of 5300 ft. If above 5300 ft use the snow load table.  
<https://www.prbd.com/pubs/snowloads.pdf>
    - \* Wind Load: 115mph Category B.
    - \* Roof connection spacing requirements. May be different for portrait and landscape orientations.
    - \* Fasteners to be used to connect racking system to roof structure
    - \* **IF ELEVATED ROOF MOUNT** - A letter from a Colorado licensed engineer is required regarding the structural ability of the roof framing to accept the point loads from the system.
    - \* Plumbing vent termination is not allowed to remain under solar installations. Vent termination must be relocated (and possibly resized) in accordance with the Uniform Plumbing Code (UPC) and/or the IRC .

*Many manufacturers have a design tool, often called a configurator, which will produce a report for connection spacing and uplift requirements.*

*The correct design criteria needs to be input for the report to be correct and accepted.*

*Along with the configurator, uplift limitations for the attaching hardware, for example lag bolts, showing the physical connection can withstand the uplift forces. Another option is to provide a*

*Colorado engineer stamped letter for attachment foot spacing and cantilever for all wind load zones 1, 2, and 3. If an engineer letter/plan is provided, no further documentation is required.*

## **Ground Mount**

- Configurator printout, manufacturer design criteria, or letter from Colorado licensed design professional stating the following:
  - \* Design criteria: Minimum requirements or better accepted.
    - \* Snow Load: 20LB Ground load for up to an elevation of 5300 ft. If above 5300 ft use the snow load table.  
<https://www.prbd.com/pubs/snowloads.pdf>
    - \* Wind Load: 115mph Category B.
    - \* Foundation requirements to include depth, diameter, and spacing.
    - \* All ground mount solar installations, using a Screw or Auger type mounting system, must have a Soils Classification report included with the foundation plans uploaded with the plans. Or you may have a Pull-out test completed before PRBD inspection and test results given to the inspector at time of inspection.  
The Soils Classification test must be completed by a registered Colorado Engineer who is capable of performing a Soils Classification test or Pull-out Test per manufacturers instructions. Soil Classification must be uploaded with initial plan set or plans will not-be reviewed. If using a Pull-out test, This must be noted on the foundation plan set showing the screw system.

Any site designed elements require a design stamped by a licensed Colorado Engineer.


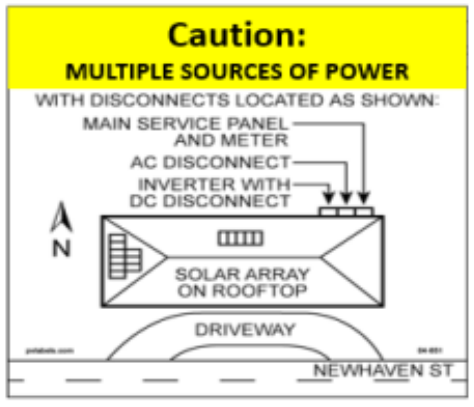

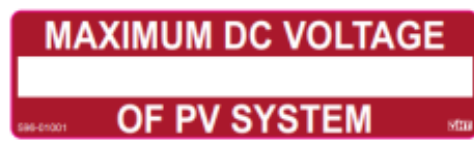

Soils Classification report included with the foundation plans uploaded with the plans. Or “you may have a Pull-out test completed before PRBD inspection and test results given to the inspector at time of inspection.




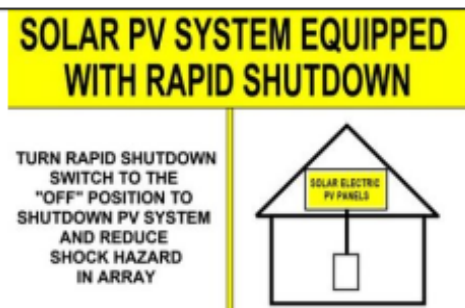


The Soils Classification test must be completed by a registered Colorado Engineer or (not sure – should this be ‘who’ is there an ‘or’) is capable of performing a Soils Classification test or Pull-out Test per manufacturers instructions. Soil Classification must be uploaded with Initial plan set or plans will not-be reviewed.

If using a Pull-out test, This must be noted on the plan set showing the screw system or front page of foundation plans.

## Required Labels

Some DC labels not required for A/C systems

NEC Section	Location of Label	Label Text and Appearance
690.54	All interactive system(s) points of interconnection with other sources shall be marked at an accessible location at the disconnecting means as a power source and with the rated ac output current and the nominal operating ac voltage.	
690.56(B) 690.4(D) 705.10	A permanent plaque or directory shall be installed at each service equipment location, or at an approved readily visible location. The plaque or directory shall denote the location of each power source disconnecting means for the building or structure and be grouped with other plaques or directories for other on-site sources. The plaque or directory shall be marked with the wording "CAUTION: MULTIPLE SOURCES OF POWER." Any posted diagrams shall be correctly oriented with respect to the diagram's location. The marking shall comply with 110.21(B).	
690.13(B) 690.15 705.20	Each PV system disconnecting means shall plainly indicate whether in the open (off) or closed (on) position and be permanently marked:  "PV SYSTEM DISCONNECT"  Or equivalent.	
690.53	A permanent readily visible label indicating the highest maximum dc voltage in a PV system, calculated in accordance with 690.7, shall be provided by the installer at one of the three locations.	
690.31 (D)(2)	Unless the purpose is evident, the following wiring methods and enclosures that contain PV system dc circuit conductors shall be marked: (1) Exposed raceways, cable trays, and other wiring methods (2) Covers or enclosures of pull boxes and junction boxes (3) Conduit bodies in which any of the available conduit openings are unused	

NEC Section	Location of Label	Label Text and Appearance
690.13(B) 690.15(C)	Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means.	 <p><b>WARNING</b> ELECTRICAL SHOCK HAZARD TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION</p>
705.12 (B)(3)(2)	A permanent warning label shall be applied to the distribution equipment adjacent to the back-fed breaker from the inverter.	 <p><b>WARNING</b> INVERTER OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE.</p>
705.12 (B)(3)(3)	Permanent warning labels shall be applied to distribution equipment	 <p><b>WARNING</b> THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR.</p>
690.56 (C)	<p>Buildings with PV systems shall have a permanent label located at each service equipment location to which the PV systems are connected or at an approved readily visible location and shall indicate the location of rapid shutdown initiation devices. The label shall include a simple diagram of a building with a roof and shall include the following words:</p> <p>The title “SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN” shall utilize capitalized characters with a minimum height of 3/8 in. in black on yellow background, and the remaining characters shall be capitalized with a minimum height of 3/16 in. in black on white background.</p>	 <p><b>SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN</b></p> <p>TURN RAPID SHUTDOWN SWITCH TO THE “OFF” POSITION TO SHUTDOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN ARRAY</p> 
	(2) A rapid shutdown switch shall have a label located on or no more than 3 ft from the switch that includes this wording. The label shall be reflective, with all letters capitalized and having a minimum height of 3/8 in., in white on red background.	 <p><b>RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM</b></p>
	(1) <b>Buildings with More Than One Rapid Shutdown Type.</b> For buildings that have PV systems with both rapid shutdown types or a PV system with a rapid shutdown type and a PV system with no rapid shutdown, a detailed plan view diagram of the roof shall be provided showing each different PV system and a dotted line around areas that remain energized after the rapid shutdown switch is operated.	

## Additional Labels

**480.7(G) Identification of Power Sources.** Battery systems shall be indicated by 480.7(G)(1) and (G)(2).

**Facilities with Utility Services and Battery Systems.** Plaques or directories shall be installed in accordance with 705.10 and 712.10.

Exception: This requirement does not apply where a disconnect in 480.7(A) is not required.

**Facilities with Stand-Alone Systems.** A permanent plaque or directory shall be installed in accordance with 710.10.

