



City of Grass Valley Building Department

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Nevada County Building Department

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"Partnering to Improve Consistency & Customer Service"

Residential Solar Photovoltaic (PV) System

Plan Submittal Requirements

[Click Here](#) to Apply for Permit & Submit Plans

- Plans must be legible and drawn to scale in blue or black ink on clear unlined paper. Minimum Size is 8.5" x 11" Maximum Size is 24" X 36". Plans should be prepared with lettering of sufficient contrast to be readable when scanning. Photocopies or prints may be submitted.
- Cover Sheet with the following information: Owner's Name & Contact Info. | Site Address | Assessor's Parcel Number (APN) | North Arrow | Sheet Index | Statement of Compliance (CA Codes) | Plan Preparers Name, Address & Signature | Project Scope of Work | Legend of Symbols || Abbreviations and Notations Used in the Drawings.
- **Site Plan** showing the location of the structure, north arrow, equipment, disconnects, inverters and any other related components of the PV system. *(Cover sheet and site plan may be part of the same sheet if complete and legible; common for small residential lots)*
- Array configuration indicating placement of equipment and modules on the roof including junction boxes and other related electrical equipment. Configuration shall also show required fire clearances per the 2019 CA Fire and Residential Codes *(see back of checklist for complete requirements).*
- Electrical Single Line Diagram including:
 - Amperage size and location of the main electrical panels and subpanels
 - Grounding/bonding conductor sizes/types for structure (main ground, water bonding, gas bonding, etc)
 - Equipment grounding conductor size, type and location for circuits and module/rack grounding
 - Combiner/junction box locations
 - AC/DC disconnect types, sizes and locations
 - Conduit sizes/types from the array to the power source
 - Inverter string sizing or micro inverter branch circuit details
 - Conductor wiring types and sizes, system and solar panel
- Required signage for panels, disconnects, conduits, junction boxes, etc. Permanent labels with red background and white lettering resistant to fading pursuant to CA Electrical Code Article 690.
- Provide cut sheets for all PV equipment and mounting systems including but not limited to: PV modules, rack mounting system with complete details, mounting brackets, grounding hardware, module fire rating and inverters.
- PV system mounting hardware shall meet minimum Nevada County Structural Design Criteria including snow loading requirements depending on project location. Minimum roof mount support spacing shall be as follows unless separate design is submitted by CA licensed engineer:
 - 0-40 lb snow load: 4ft o.c. spacing
 - 41-70 lb snow load: 2ft o.c. spacing
 - Over 70 lb snow load: Project shall be designed by CA licensed engineer

Ground Mount Solar Projects:

- Items 1-7 as shown above including a more detailed Site Plan showing: Array Size | Setbacks to Structures/Property Lines | Location of All Existing Structures on the Site | Location of New Underground Utilities, etc.
- PV system mounting hardware and foundations shall meet minimum Nevada County Structural Design Criteria including snow loading requirements depending on project location. Foundations shall meet general engineered practices; where there is less than a 50lb snow load, general engineered foundation/support tables and calculations may be used if the calculations include the applicable snow loading. If snow load data is not given in the general calculation and/or the project is subject to a snow load of 50lbs or more the structural components shall be wet stamped and signed by a CA licensed engineer.

**See Last Page of Checklist for Amended Solar Requirements in the California Building Standard Codes
Effective January 1, 2020**

Solar PV Requirements in the California Fire, Electrical & Residential Codes

Wiring/Circuit Installations:

- Direct current (DC) conduit, enclosures, raceways, cable assemblies, junction boxes, combiner boxes and disconnects shall be labeled per the following:
 - Labels shall be reflective, water resistant and can withstand the environment; lettering shall be a minimum 3/8" in height with white on red background.
 - Labels shall state, "WARNING: PHOTOVOLTAIC POWER SOURCE".
 - Labels shall be placed at every service disconnect; also on every DC conduit, raceways, enclosures, etc at 10ft o.c. and within 1ft of turns, bends and penetrations.
- Conduit, raceways and wiring systems shall be run as close as possible to ridges, hips, valleys, etc; they shall also be installed in such a manner to limit trip hazards and maximize ventilation opportunities. DC wiring in enclosed spaces shall be installed in metallic conduit; conduit shall be run along the bottom of load bearing members.
- PV source and output circuits inside a building shall be routed along building structural members where the members can be observed (accessible attics, etc). If circuits are embedded in areas (not accessible) that are not covered by PV modules, those areas shall be clearly marked indicating their locations.
- DC circuits ran inside a building 80 volts or greater shall be protected by a listed arc-fault circuit interrupter. To be considered outside it shall be direct buried, in metallic conduit, and/or metallic cables trays.
- Where multiple inverters are installed and not grouped a clear location directory shall be provided at each AC & DC disconnect location.
- FMC 3/4" or smaller, MC conduit 1" or smaller or exposed wiring installed across ceiling joists or floor joists shall be protected by guard strips.
- Rapid shutdown device required for DC system circuits in or on buildings with specific requirements if located in or outside the array boundary. 30v within 30 seconds if outside of array boundary and 80v within 30 seconds if within array boundary. See new labelling requirements for rapid shutdown as of January 1, 2020 (see details at end of handout).
- Rapid shutdown initiation device shall be located on the exterior labelled "RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM" with white or red minimum 3/8" in height lettering.
- Roof mounted DC system manually operated load break disconnect required at combiner boxes or within 6ft of combiner boxes.
- Disconnects required for energy storage devices where more than 5ft from connected equipment or where circuits pass through a wall/partition.
- Size of supply side connections comply with CEC 705.12(B)(2).
- Supply side connections require overcurrent protection within 10ft from the service conductor connection.

Roof Access & Pathways (effective July 1, 2018):

- Not less than two minimum 36" wide pathways on separate roof planes from the lowest edge of the roof to the ridge with one pathway on the street or driveway side of the roof.
- 36" wide pathways shall be maintained to access emergency escape and rescue openings.
- Buildings without fire sprinklers installed:
 - ≤ 33% of solar array roof coverage: 18" clear from panels on both sides of roof ridge
 - > 33% of solar array roof coverage: 36" clear from panels on both sides of ridge
- Buildings with fire sprinklers installed:
 - ≤ 66% of solar array roof coverage: 18" clear from panels on both sides of roof ridge
 - > 66% of solar array roof coverage: 36" clear from panels on both sides of roof ridge

Exceptions:

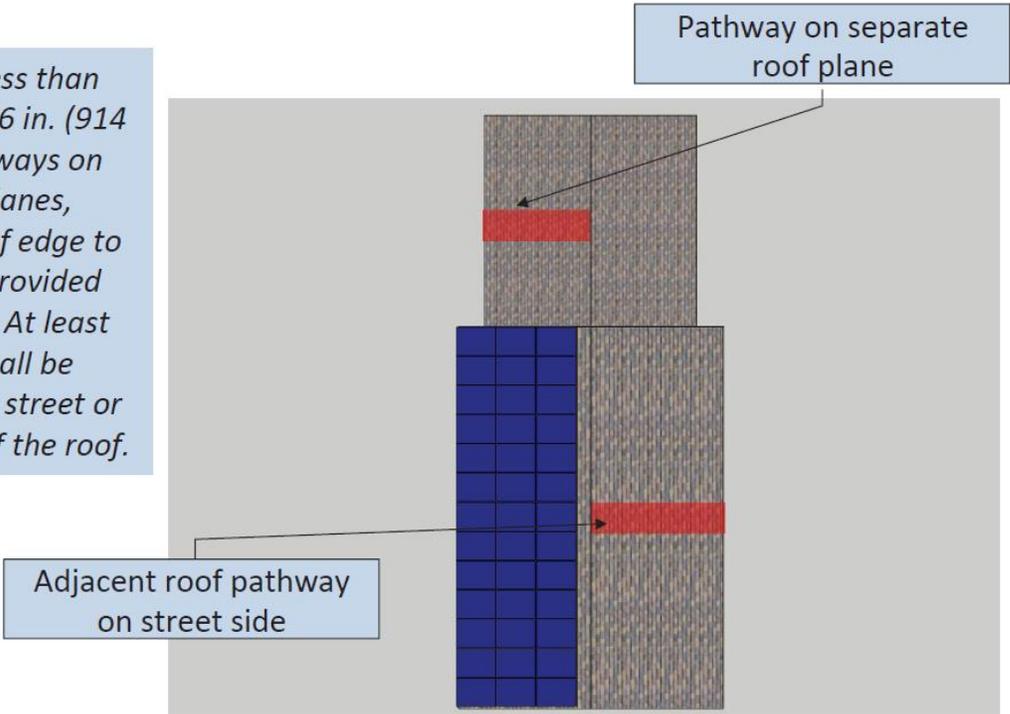
- *Roofs with a slope of less than or equal to 2:12 or when the Fire Chief approves alternative ventilation methods or determines vertical ventilation techniques will not be used.*
- *Detached non-habitable garages, barns, shade structures, and carports.*

- Roof access shall be available that doesn't require placement of ladders over windows, doors, etc and located at strong points of the building construction that allow unobstructed access.
- Ground Mount Arrays: A minimum 10ft clear "brush-free" area around the array shall be provided.

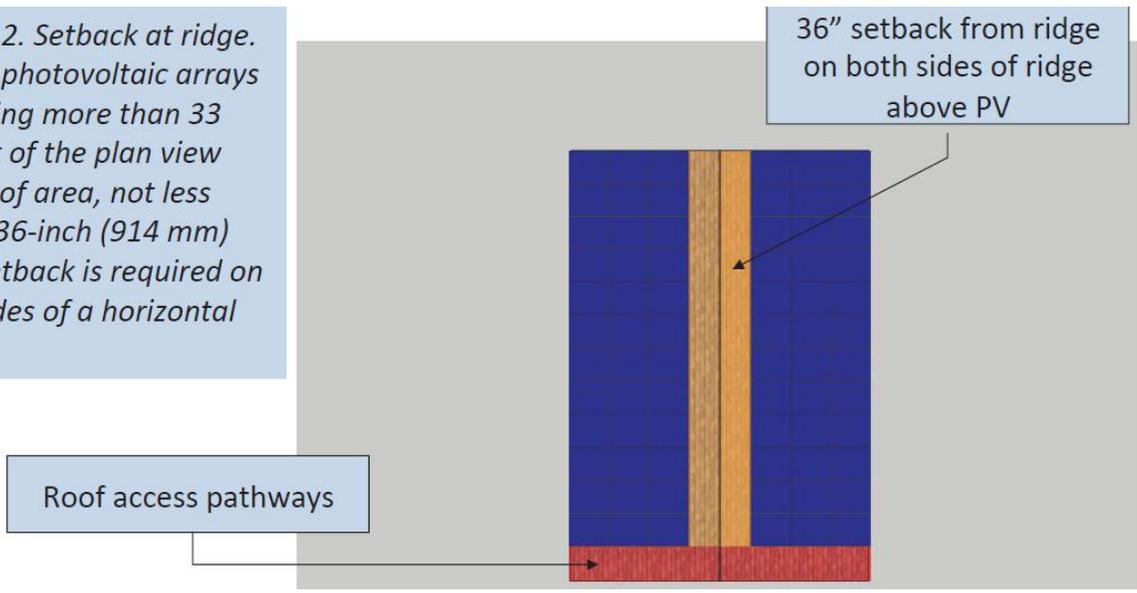
Fire Rating:

- Modules shall be tested, listed and identified with the fire classification based on the specific type of building construction. (See California Building Code (CBC) Table 1505.1 for specific classification requirements)

R324.6.1. Not less than two minimum 36 in. (914 mm) wide pathways on separate roof planes, from lowest roof edge to ridge, shall be provided on all buildings. At least one pathway shall be provided on the street or driveway side of the roof.

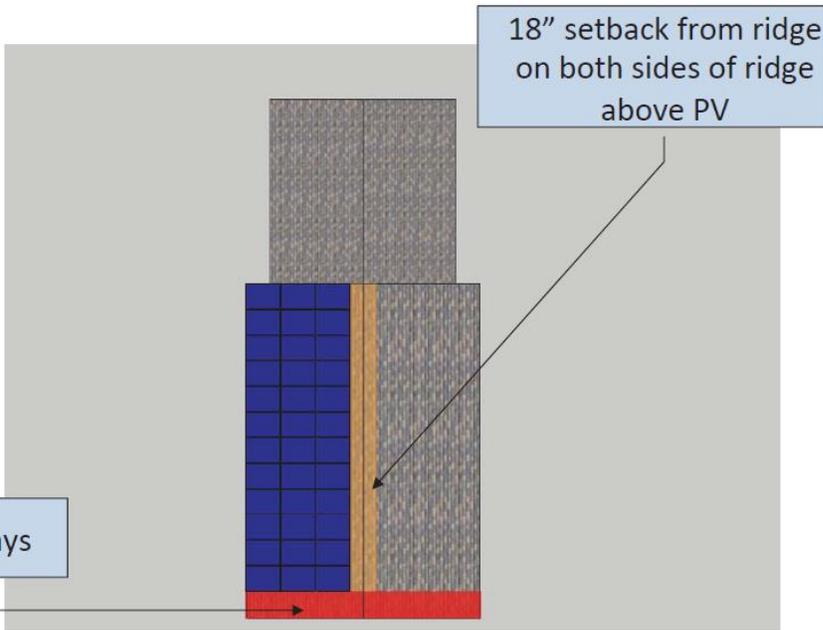


R324.6.2. Setback at ridge. [...] For photovoltaic arrays occupying more than 33 percent of the plan view total roof area, not less than a 36-inch (914 mm) clear setback is required on both sides of a horizontal ridge.

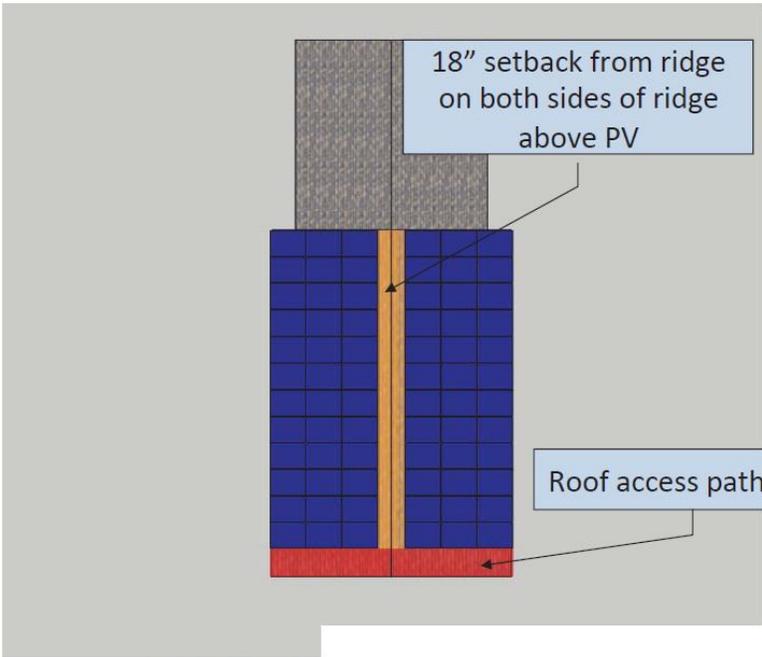


R324.6.2. Setback at ridge. For photovoltaic arrays occupying not more than 33 percent of the plan view total roof area, not less than 18-inch (457 mm) clear setback is required on both sides of a horizontal ridge. [...]

Roof access pathways



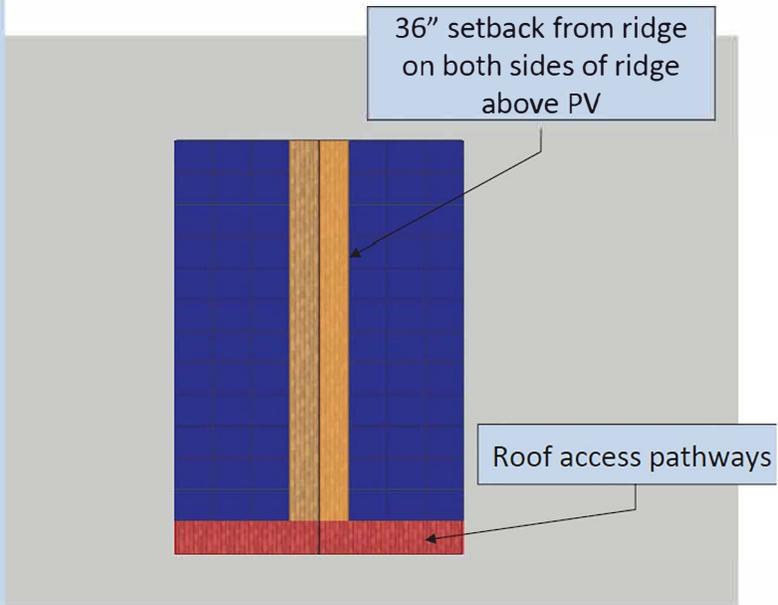
R324.6.2.1. Alternative setback at ridge. Where an automatic sprinkler system is installed within the dwelling in accordance with NFPA 13D or Section P2904, setbacks at ridges shall conform with one of the following:
1. For photovoltaic arrays occupying not more than 66 percent of the plan view total roof area, not less than an 18-inch (457 mm) clear setback is required on both sides of a horizontal ridge.



R324.6.2.1. Alternative setback at ridge. Where an automatic sprinkler system is installed within the dwelling in accordance with NFPA 13D or Section P2904, setbacks at ridges shall conform with one of the following:

[...]

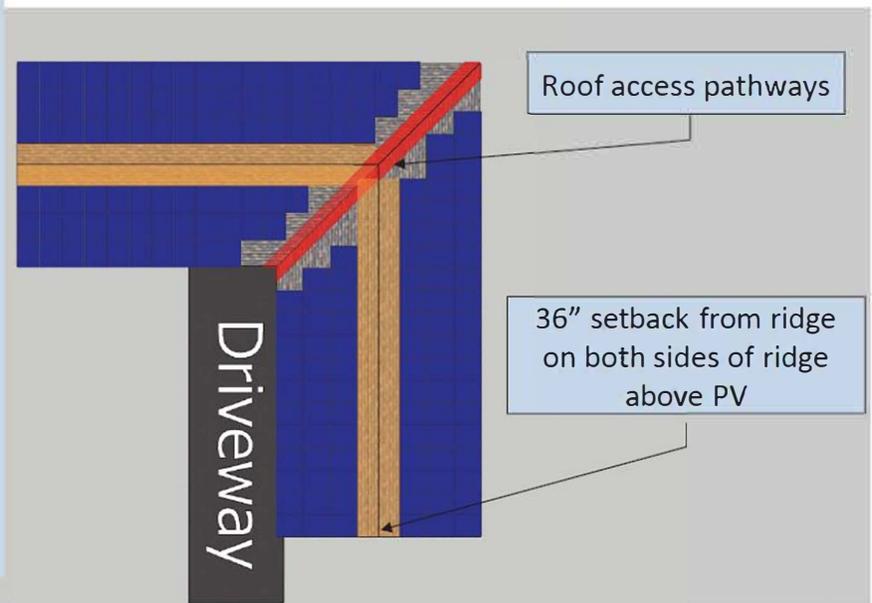
2. For photovoltaic arrays occupying more than 66 percent of the plan view total roof area, not less than a 36-inch (914 mm) clear setback is required on both sides of a horizontal ridge.



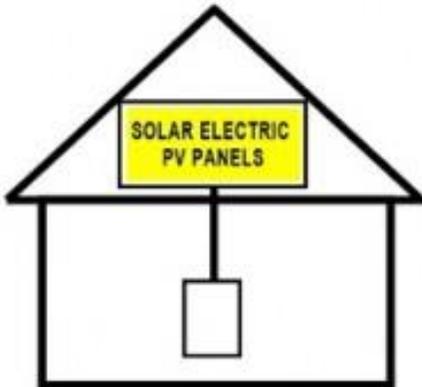
R324.6.1 Pathways.

[...]

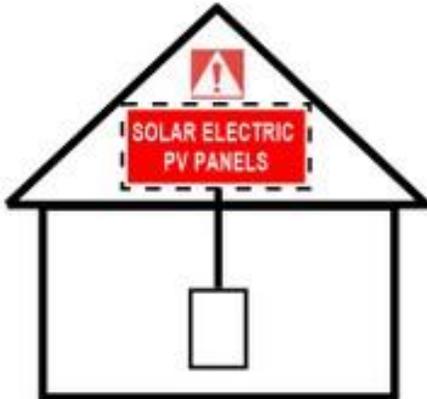
For each roof plane with a photovoltaic array, at least one 36 in. (914 mm) wide pathway from lowest roof edge to ridge shall be provided on the same roof plane as the photovoltaic array, or on an adjacent roof plane, or straddling the same and adjacent roof planes.



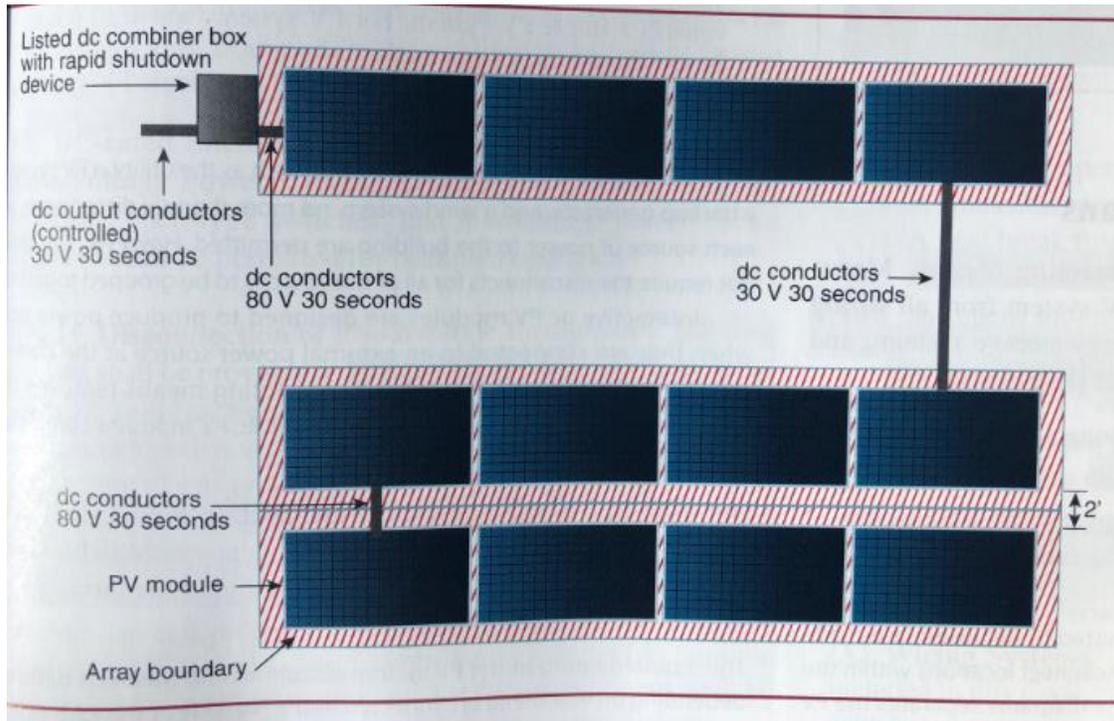
Shutting Down Array & Conductors

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN	
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUTDOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN ARRAY	

Shutting Down Conductors Only

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN	
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION, TO SHUTDOWN CONDUCTORS OUTSIDE THE ARRAY. CONDUCTORS WITHIN ARRAY REMAIN ENERGIZED IN SUNLIGHT	

Rapid Shutdown Example



Solar Signage Changes From “Inverter Output” to “Power Source Output”



2" x 4"