

CHAPTER 3  
INSTALLATION REQUIREMENTS

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SECTION 301  
GENERAL

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301.1 Scope. The provisions of this chapter shall govern the installation of photovoltaic (PV) components including location, materials and structural support. Where the installation of PV systems is not covered by this chapter the installation shall be in compliance with the applicable provisions of the Oregon ~~Structural Specialty Building~~ Code as defined in ORS 455.020.-

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Exception: Where applicable provisions are specified, compliance with the Oregon Residential Specialty Code (ORSC) shall satisfy the requirements of this section when the PV system is installed on;

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1.1 Detached one and two family dwellings and townhouses classified as Group R-3, and Group U Occupancies; and

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1.2 Residences used for family daycare or foster care in accordance with ORS Chapters 418, 443 and 657A; and

1.3 Detached Congregate residences (each accommodating 10 persons or less) and detached lodging houses containing not more than five guest rooms.

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SECTION 302  
DEFINITIONS

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302.1 General. The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

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ACCESSIBLE ROOF PLANE. A roof plane that has an eave not more than ~~25-20~~ feet (7620 mm) above grade with ~~adequate space on the ground an~~ for staging f adjacent a Firefightersing Staging Areaactivities.

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CONVENTIONAL LIGHT-FRAME WOOD CONSTRUCTION. A type of construction whose primary structural elements are formed by a system of repetitive wood-framing members in accordance with OSSC Section 2308 or the ORSC as applicable.

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CUTOUT An area adjacent to a pathway for use by firefighters to cut a vent if needed. Cutouts shall not be less than 30 inches (762 mm) in any dimension.

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FIREFIGHTERS STAGING AREA A level area on the ground that is not less than 3 feet wide and extends not less than 8 feet from the structure-.

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HABITABLE SPACE a space in a building for living, sleeping, eating or cooking.

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NON-OCCUPIED ACCESSORY STRUCTURE A structure normally not occupied such as a parking garage, shed, or agricultural building.

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PATHWAY. Unobstructed route provided within or around the array to provide unimpeded access for firefighting purposes.

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RACKING. A system of components that directly supports the PV modules and transfers the applied loads to the building structure or ground-supported structure.

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SELF BALLASTED SYSTEM A PV array and racking/supporting structure that is not permanently attached to the solar roof.

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SOLAR ROOF. A roof plane on which a solar array is installed.

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VENT CUTOUTS.....?

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SECTION 303  
MINIMUM STANDARDS AND QUALITY

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303.1 General. Photovoltaic (PV) components, racking, support structures and attachments shall be in accordance with the provisions of this chapter. PV systems shall be designed and installed in accordance with this code and the manufacturer's installation instructions

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303.2 Type of Construction. PV systems, including supporting structure, shall comply with the requirements of OSSC Chapter 6 for the buildings structures applicable required to be of non-combustible type of construction or the ORSC as applicable.

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303.3 Material standards. Photovoltaic modules shall be listed and labeled certified in accordance with UL1703 and shall be installed in accordance with the manufacturer's installation instructions.

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303.4 ~~Photovoltaic modules~~ Fire classification. Rooftop ~~installed-mounted photovoltaic-PV~~ systems that are adhered or attached to the roof covering or photovoltaic modules/shingles installed as roof coverings shall have the same fire classification as the roof assembly required by be labeled to identify their fire classification in accordance with the testing required in OSSC Section ~~1505.1505.1~~ 1.

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~~303.4.1 Testing. Rooftop installed photovoltaic systems that are adhered or attached to the roof covering shall be labeled to identify their fire classification in accordance with the testing required in OSSC Section 1505.1.~~

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~~303.4.2 Wind resistance. Photovoltaic PV modules/shingles shall be tested in accordance with procedures adapted from ASTM D 3161. Photovoltaic PV modules/shingles shall comply with the~~

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classification requirements of Table 303.4.2 for the appropriate maximum basic wind speed. Photovoltaic PV modules/shingle packaging shall bear a label to indicate compliance with the procedures adapted from ASTM D 3161 and the required classification from Table 303.4.2. Rooftop mounted PV systems shall be designed for wind loads for component and cladding in accordance with OSSC Chapter 16 using an effective wind area based on the dimensions of a single unit frame.

Table 303.4.2  
CLASSIFICATION OF ASPHALT SHINGLES PER ASTM D 3161

MAXIMUM BASIC WIND SPEED FROM FIGURE 1609	CLASSIFICATION REQUIREMENT
85	A, D or F
90	A, D or F
100	A, D or F
110	F
120	F
130	F
140	F
150	F

303.5 Weather protection. ~~Frames, braces and attaching devices~~ All components of the PV system exposed to the weather shall be constructed of materials approved for exterior locations and protected from corrosion or deterioration.

303.5.1 Roof Decks. Roof decks shall be covered with approved roof coverings secured to the building or structure in accordance with the provisions of this chapter. Roof coverings shall be designed and installed in accordance with this code and the manufacturer's installation instructions such that the roof covering shall serve to protect the building or structure.

~~(There was a request to add provisions for flashing and sealing penetrations)~~  
1503.2 Flashing. Flashing shall be installed in such a manner so as to prevent moisture entering the wall and roof through joints in copings, through moisture-permeable materials and at intersections with parapet walls and other penetrations through the roof plane.

303.6 Certification Requirements. PV Systems shall comply with one of the following:

1. Certified to UL 1703 by a Nationally Recognized Testing Laboratory and installed in accordance with the manufacturers installation instructions.
2. Designed by an Oregon Licensed Engineer or Architect.
3. Field evaluation by an Approved Field Evaluation Firm.
4. Approval by the Authority Having Jurisdiction.

SECTION 304  
LOCATION

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**Submitted by Robert Rice 1/26/10**  
**Reviewed by subcommittee on 2/11/10 and 2/18/10**

304.1 General. The location of Photovoltaic (PV) components, racking, support structures and attachments shall be in accordance with the provisions of this chapter.

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304.2 Zoning requirements. The installation of PV systems shall comply with the requirements of the zoning requirements of the Authority Having Jurisdiction (AHJ).

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304.3 Flood Hazard Areas. Installation of PV systems within flood hazard areas, as defined by the AHJ, shall comply with the OSSC or ORSC Section R324 as applicable.

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304.4 Building Egress. PV systems shall not be installed in locations that would restrict, or otherwise prevent the use of, the required means of egress and emergency escape and rescue. The means of egress shall comply with Chapter 10 of the OSSC or ORSC Section R310 and R311 as applicable.

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304.5 Light and Ventilation. PV systems shall not be installed in locations that would restrict the required light and ventilation. Light and ventilation shall comply with OSSC Chapter 12 or ORSC Section R303 as applicable.

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304.6 Rooftop Vent and Drain Clearances. PV systems shall not be installed in locations that would restrict the function of plumbing or mechanical vents, skylights, drains or other rooftop features.

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304.7 Mechanical Equipment Clearances. PV systems shall be installed with clearances to mechanical equipment consistent with the Oregon Mechanical Specialty Code.

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304.8 Roof Drainage. PV systems shall not be installed in a manner that would obstruct roof drainage. Roof valleys shall be unobstructed for 12 inches (305 mm) each side of the lowpoint.

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304.9 Fire Fighter Access and Escape. To provide access and escape for Fire Fighters, the location of roof-mounted PV modules shall comply with the requirements of this section.

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304.9.1 General Pathway locations. All PV installations shall include a 36 inch **wide** (914 mm) pathway maintained along **three sides of the solar roof. The bottom edge of a sloped roof shall not be used as a pathway. all roof edges and peaks ridges. All pathways shall be** measured from the edge of the roof **or ridge** to the solar array or any portion thereof.

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Exceptions:

1. Arrays installed on one and two family dwellings may comply with the following provisions based on roof design:

A. A- Where the solar roof is sloped **and accessible** and there is an adjacent accessible roof plane: **a single pathway not less than 36 inches (914 mm) wide shall be provided from the eave to the ridge of an accessible solar roof. Not less than 12 inches (305 mm) of the pathway shall be structurally supported by being located directly above the building cavity or by other suitable means. A single**

pathway not less than 12 inches (305 mm) wide shall be provided along the solar roof ridge line to allow ladder hooks from the adjacent accessible roof plane.

- B. Where the solar roof is sloped and not accessible and there is an adjacent accessible roof plane a single pathway not less than 12 inches (305 mm) wide shall be provided along the solar roof ridge line to allow ladder hooks.
- C. Where the solar roof is sloped and accessible and there is an adjacent non-accessible roof plane a single pathway not less than 36 inches (914 mm) wide shall be provided from the eave to the ridge of an accessible solar roof. Not less than 12 inches (305 mm) of the pathway shall be structurally supported by being located directly above the building cavity or by other suitable means. A single pathway not less than 36 inches (914 mm) wide shall be provided along the solar roof ridge line to allow ladder hooks from the adjacent accessible roof plane..
- D. Where the solar roof is sloped and not accessible and there is an adjacent non-accessible roof plane a single pathway not less than 36 inches (914 mm) wide shall be provided from the eave to the ridge of an accessible solar roof. Not less than 12 inches (305 mm) of the pathway shall be structurally supported by being located directly above the building cavity or by other suitable means. A single pathway not less than 12 inches (305 mm) wide shall be provided along the solar roof ridge line to allow ladder hooks from the adjacent accessible roof plane.

~~A single pathway not less than 36 inches (914 mm) wide shall be provided from the eave to the ridge of an accessible solar roof. Not less than 12 inches (305 mm) of the pathway shall be structurally supported by being located directly above the building cavity or by other suitable means. A single pathway not less than 12 inches (305 mm) wide shall be provided along the solar roof ridge line to allow ladder hooks from the adjacent accessible roof plane.~~

- ~~B. Where the solar roof is sloped and accessible with no adjacent roof plane:~~

~~A single pathway not less than 36 inches (914 mm) wide shall be provided from the eave to the ridge of an accessible solar roof. Not less than 12 inches (305 mm) of the pathway shall be structurally supported by being located directly above the building cavity or by other suitable means. A single pathway not less than 36 inches (914 mm) wide shall be provided along the solar roof ridge line with not less than 12 inches (305 mm) on either side.~~

- ~~E. C.~~ A solar roof that is flat shall have at least one pathway not less than 36 inches (914 mm) wide extending from an accessible edge to the opposite side of the roof with a second pathway running perpendicular to it that is not less than 36 inches (914 mm) wide and running the full length of the roof.

[Insert figures here](#)

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Submitted by Robert Rice 1/26/10  
Reviewed by subcommittee on 2/11/10 and 2/18/10

A placard shall be posted at the ac service disconnecting means that accurately designates the location of all combiner box disconnects, inverters, dc raceways and the method of identification used for dc raceways. The placard shall be legible, durable and suitable for the environment.

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Raceways containing dc conductors that are run through the roof and into the building shall be located not less than 18 inches (457 mm) below the roof decking.

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Every combiner box shall be installed with a visible dc disconnect. The disconnect shall be integral to or immediately adjacent to the combiner box. Disconnects shall be located adjacent to a pathway for accessibility.

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The disconnect shall be marked "Array disconnect 1 of X". Letters shall be a minimum 1" in height, suitable for the environment and red in color.

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A placard shall be posted at the ac service disconnecting means that accurately designates the location of all combiner box disconnects, inverters, dc raceways and the method of identification used for dc raceways. The placard shall be legible, durable and suitable for the environment.

304.9.7 Alternate Installations. In accordance with section 104.11, an alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

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Nothing in this section prevents the use of a Site Specific Interpretation or an Alternate Method Ruling as provided OAR xxx and OAR xxx to address site specific issues.

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SECTION 305  
STRUCTURAL

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305.1 General. Photovoltaic (PV) components, racking, support structures and attachments shall be in accordance with the provisions of this section.

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305.2 Module Attachment. Photovoltaic modules shall be attached in accordance with the manufacturer's installation instructions and the OSSC ~~or shall be designed in accordance the OSSC certification.~~

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305.3 Racking. Racking shall comply with this section.

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305.3.1 ~~Weather Exposure~~ Building Penetrations, Frames, braces and attaching devices exposed to the weather shall be constructed of materials approved for exterior locations and protected from

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~~corrosion or deterioration.~~ All roof penetrations shall be flashed or sealed so as to prevent moisture entering the wall and roof.

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305.3.2 Structural Support and Connection. Racking and racking supports shall be positively attached to the structural components through the use of screws, bolts, j-bolts, or other approved means in accordance with manufacturer's specifications or be designed in accordance with the OSSC. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Racking and racking supports shall be mounted to structural components and shall not be attached to wall or roof coverings, trim or structural sheathing as a means of structural support.

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Exception:

1. Attachment to standing seam metal roofs w/ connectors per mfr installation instructions... need to expound w/ some criteria in accordance with the following ... per Jerry's language.
2. Certified non-penetrating or minimally penetrating systems shall be permitted when installed in accordance with the manufacturer's installation instructions.
3. Sheathing or blocking per Jerry.

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~~305.3.3 Connection to structural members. Racking and racking supports shall be positively attached to the structural components through the use of screws, bolts, j-bolts, or other approved means in accordance with manufacturer's specifications or be designed in accordance in accordance with the OSSC. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal.~~

305.3.2.1 Roof mounted racking. Roof-mounted supporting structures shall be certified in accordance with section 303.6.1, and all parts thereof, shall be designed in accordance with accepted engineering practice, constructed and installed to safely support all loads, including dead loads, snow loads, wind loads and seismic loads as prescribed by the OSSC or in accordance with section 305.3.3.1.14.

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305.3.2.2 Ground mounted racking. Ground-mounted supporting structures, and all parts thereof, shall be designed, constructed and installed to safely support all loads, including dead loads, flood loads, snow loads, wind loads and seismic loads as prescribed by the OSSC.

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The bottom of panels shall be at least 18 inches (457 mm) clear from ground level.

~~305.4.3.1.1~~ Prescriptive Installations. Roof installation on conventional light-frame construction that installations that comply with this section shall qualify as a prescriptive installation and shall not require design if all of the following criteria are met:

1. Roof structure: The supporting roof framing shall be conventional light framed wood construction with pre-engineered trusses or roof framing members at 24 (610 mm ) inch spacing maximum that comply with the applicable allowable span in charts of OSSC

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~~Section 2308.10-Table 305.4.1~~ for the specific loads including snow loads not exceeding ~~xx~~ 50 psf and wind loads that do not exceed 100 MPH or 110 MPH in exposure B.

Exception: Roof framing in compliance with ~~the provisions of Section 802 or 804 of the ORSC~~ the applicable allowable span in Table 305.4.2 for the specific loads including snow loads not exceeding 70 psf and wind exposure is limited to exposures A, B and C shall satisfy the requirements of this section when the PV system is installed on;

1.1 Detached one and two family dwellings and townhouses classified as Group R-3, and Group U Occupancies; and

1.2 Residences used for family daycare or foster care in accordance with ORS Chapters 418, 443 and 657A; and

1.3 Detached Congregate residences (each accommodating 10 persons or less) and detached lodging houses containing not more than five guest rooms.

2. Roof materials. Roofing material shall be standing seam metal, single layer wood shingle or shake, or not more than two layers of composition shingle.

~~3. 3-~~ Loading: ~~Collectors-Modules~~ are either directly attached to the roof framing or are mounted to continuous rails that are attached directly to the roof framing. These attachments must be anchored to roof framing at a spacing no greater than 48 inches (1219 mm) on center maximum in any direction where snow loads do not exceed 25 psf and 24 inches on center maximum in any direction where snow loads exceed 25 psf. Installation shall comply with Figure 305.3.3.1.14(1) or 305.3.3.1.14(2). ~~Maximum load shall not exceed xx pounds (xx kg) of combined dead plus live or snow load at each support.~~ The combined weight of the PV modules and racking shall not exceed 4.5 pounds per square foot (xxx kPa). See Figure 305.3.3.1.14(1).

Exception:

1. Attachment to standing seam metal roofs in accordance with the following ... per Jerry's language.
2. Certified non-penetrating or minimally penetrating systems shall be permitted when installed in accordance with the manufacturer's installation instructions.
3. Sheathing or blocking per Jerry

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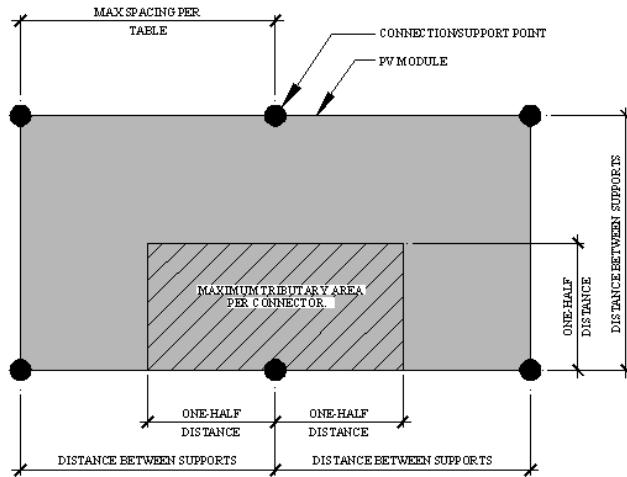
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Maximum Allowable Square Foot Area of Module per Support

Snow Load	30	50	70
Max. SF	6.7	4.0	2.9

Equivalent spacing of connectors each side of module (inches)

Snow Load	30	50	70
3 ft Wide	53	32	23
4 ft Wide	40	24	17

1. PSF values shown are based on xxx pounds max per connection. Values are permitted to be interpolated.
2. For snow loads above 70 psf connections to roof shall be designed in accordance with the OSSC

Figure 305.3.3.1.1(1)

4. Height: Maximum panel height above roof shall be 18" from top of panel to roof surface and in accordance with Figure 305.3.3.1.1(1). For installations where the panels will not be mounted flush with the roof, a building elevation showing the height of the installation will

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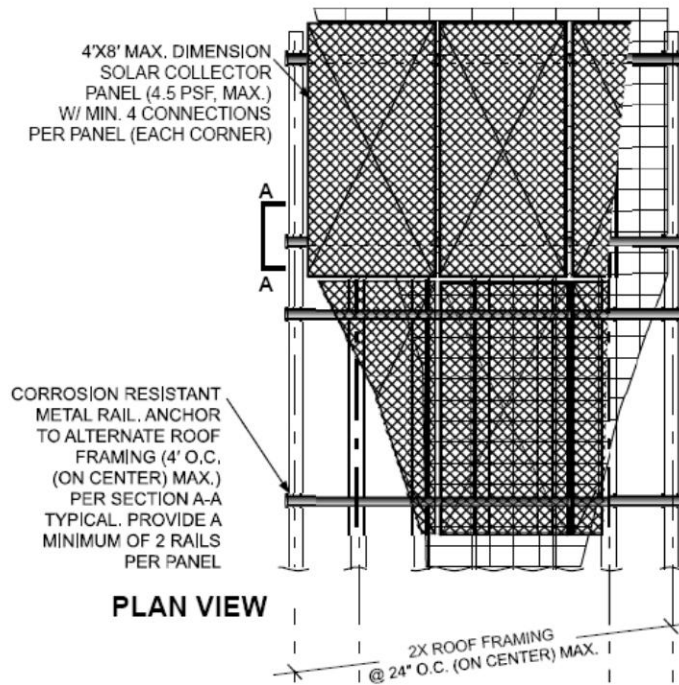
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be required. The elevation must be to scale and show the height of the building and the height of the solar installation but need not show other building details, unless a Design Review will be required.

5. Submittal Requirement. (Include a fill-in-the-blank form to be submitted stating rafter size/spacing/span, panel weight (psf), etc.)

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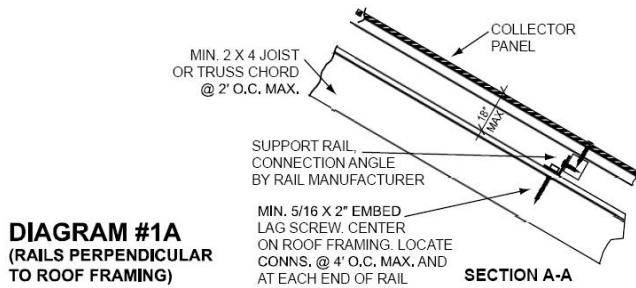


Figure 305.3.3.1.1(1) Installation – Rails perpendicular to framing members

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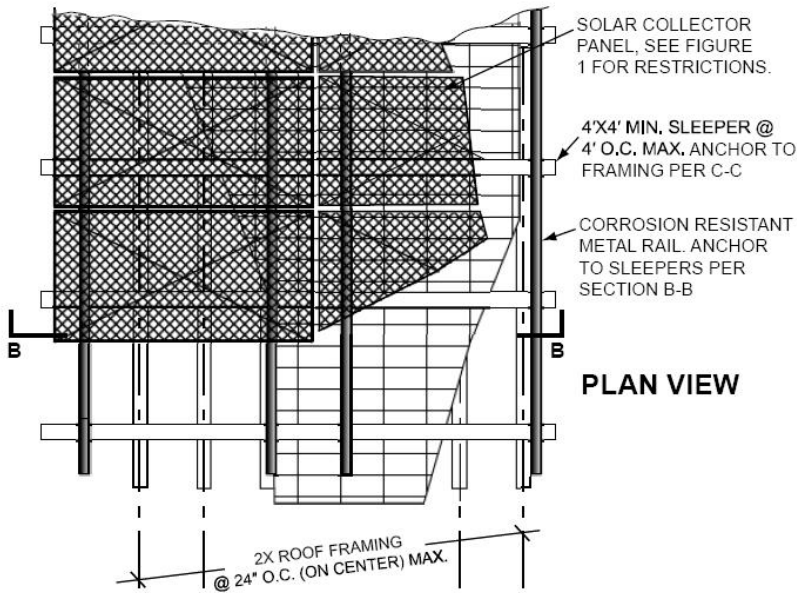


Figure 305.3.3.1.1(2) Installation – Rails parallel to framing members

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~~305.3.3.2 Ground mounted racking. Ground mounted supporting structures, and all parts thereof, shall be designed, constructed and installed to safely support all loads, including dead loads, flood loads, snow loads, wind loads and seismic loads as prescribed by the OSSC.~~

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~~The bottom of panels shall be at least 18 inches (457 mm) clear from ground level.~~

UL 1703-02 Flat-Plate Photovoltaic Modules and Panels – with revisions through April 2008

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End of Chapter 3

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Protection: Any portion of the solar-PV system installed where it may be subjected to mechanical damage shall be guarded against such damage by being installed behind barriers such as bollards, fences, or other approve means or when located within a garage be elevated a minimum of 48” above finished garage floor or located out of the normal path of a vehicle.

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For reference, section 305 is formatted as follows:

305.1 GENERAL

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305.2 MODULE ATTACHMENT

305.3 RACKING

305.3.1 WEATHER EXPOSURE

305.3.2 STRUCTURAL SUPPORT

305.3.3 CONNECTION TO STRUCTURAL MEMBERS

305.3.3.1 ROOF MOUNTED RACKING

305.3.3.1.1 ROOF INSTALLATION ON CONVENTIONAL LIGHT  
FRAME CONSTRUCTION

1. Roof structure
2. Roof materials
3. Loading
4. Height
5. Submittal Requirements

305.3.3.2 GROUND MOUNTED