

CHAPTER 3 INSTALLATION REQUIREMENTS

SECTION 301 GENERAL

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 Code..

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;

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.

SECTION 302 DEFINITIONS

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.

~~**ACCESSIBLE ROOF PLANE.** A roof plane that has an eave not more than 25 feet (7620 mm) above grade with adequate space on the ground for staging firefighting activities.~~

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.

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

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

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

RIDGELINE . The horizontal line formed by the juncture of two sloping roof planes.

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

**SECTION 303
MINIMUM STANDARDS AND QUALITY**

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

303.2 Type of Construction. PV systems, including supporting structure, shall comply with the requirements of OSSC Chapter 6 for the buildings applicable type of construction or the ORSC as applicable.

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

303.4 Photovoltaic modules. Rooftop installed photovoltaic systems that are adhered or attached to the roof covering or photovoltaic modules/shingles installed as roof coverings shall be labeled to identify their fire classification in accordance with the testing required in OSSC Section 1505.1.

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

303.4.2 Wind resistance. ~~Photovoltaic modules/shingles shall be tested in accordance with procedures adapted from ASTM D 3161. Photovoltaic modules/shingles shall comply with the classification requirements of Table 303.4.2 for the appropriate maximum basic wind speed. Photovoltaic 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. *Clarification Needed*~~

**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 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.

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.

SECTION 304 LOCATION

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

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

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.

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.

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.

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.

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

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.

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

304.9.1 General Pathway locations for systems larger than 1,000 square feet in module area

A. All PV installations **greater than 1,000 square feet in module area** shall include a 36 inch (914 mm) *pathway* maintained along all roof edges and peaks measured from the edge of the roof to the solar array or any portion thereof.

B. Systems that include a solar array section that is larger than 150 feet (mm) measured in length or width shall have additional intermediate *pathways*. Intermediate *pathways* shall be provided for every 150 feet (45720 mm) of array measured in any one direction and including offset modules or angled installations. The maximum square footage of an array shall not exceed 22,500 ft². (2090 m²) without the installation of an intermediate *pathway*. Intermediate *pathways* shall be a minimum of 36 inches (914 mm).

Changes Submitted by OREP/Solar Industry 2/10/10

C. All *pathways* shall have vent cut-outs located along the axis of the *pathway*. No point on the *pathway* shall be more than 25 feet (7620 mm) from a vent cut-out. Vent cut-outs shall not be less than 30 inches (762 mm) in any dimension.

D. Townhouses separated in accordance with OSRC xx (contiguous roofs) may be treated as one structure and comply with the provisions of section 304.9.2 of this section where the units are under common ownership or an access easement is provided.

304.9.2 General Pathway locations for systems less than or equal to 1,000 square feet in module area. Arrays installed with an area less than or equal to 1,000 square feet shall include a 12” pathway maintained along the ridgeline and one 36” pathway at some location on the roof.

Exceptions :

1. Where the solar roof occupies greater than 45% of the total building roof area, pathways must be maintained that comply with 304.9.1A
2. Where the solar roof or an adjacent roof plane has a pitch less than 4/12, a 12” pathway at the ridgeline shall not be required.
3. Where an approved anchor and emergency egress system is permanently installed, a 36” pathway shall not be required.

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

~~A. Where the *solar roof* is sloped 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 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.~~

~~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.~~

4. *Pathways* are not required on non-*habitable* accessory structures provided they are separated from *habitable* structures by a 10 feet (3048 mm) minimum separation distance or by a minimum two-hour firewall.

304.9.3 Prohibited Locations. *Pathways* shall not be located in valleys.

304.9.6 Electrical Component Location. Disconnects, j-boxes, combiner boxes or gutters shall not be located in any required *pathway* or cut-out. Raceways that cross a required *pathway* shall be bridged to avoid tripping hazards. Raceways shall be visible marked with the words “dc Conductors” in a manner suitable for the environment. The marking methods may include signage similar to signage used to designate water lines, natural gas lines, or other plumbing or mechanical lines. 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.

Exception: for systems less than or equal to 1,000 square feet in module area.

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. 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.

Exception: for systems less than or equal to 1,000 square feet in module area.

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.

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.

SECTION 305 STRUCTURAL

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

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

305.3 Racking. *Racking* shall comply with this section.

305.3.1 Weather Exposure. Frames, braces and attaching devices exposed to the weather shall be constructed of materials approved for exterior locations and protected from corrosion or deterioration.

305.3.2 Structural Support. *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.

Exception: *Alternative attachment methods shall be permitted if supported by P.E. stamped-structural calculations or by prescriptive path of the local jurisdiction*

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 with the OSSC. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal.

305.3.3.1 Roof mounted racking Roof-mounted supporting structures, 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 305.3.3.1.1.

305.3.3.1.1 Roof installation on conventional light-frame construction. 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 charts of OSSC Section 2308.10 for the specific loads including snow loads not exceeding xx psf.

Exception: Roof framing in compliance with the provisions of Section 802 or 804 of the ORSC shall satisfy the requirements of this section when the PV system is installed on;

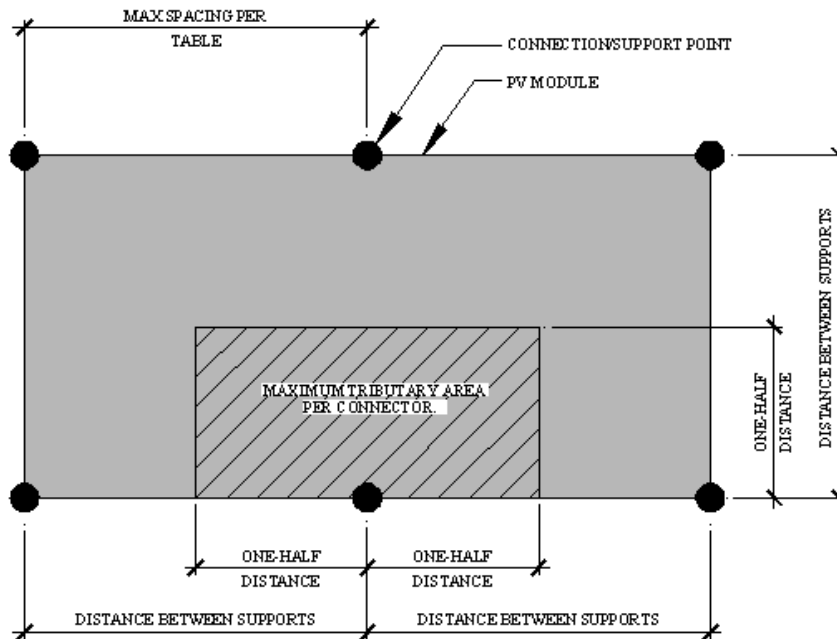
1.1 Detached one and two family dwellings and townhouses classified as Group R-3, and Group U Occupancies; and

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. Loading: Collectors 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. Installation shall comply with Figure 305.3.3.1.1(1) or 305.3.3.1.1(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 305.3.3.1.1 (1).



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 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.

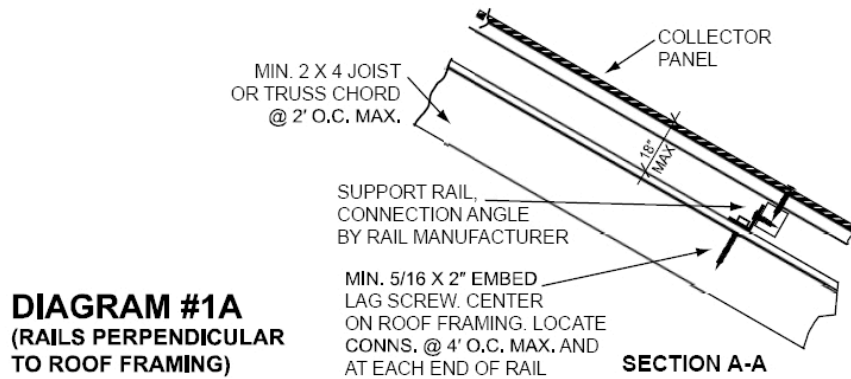
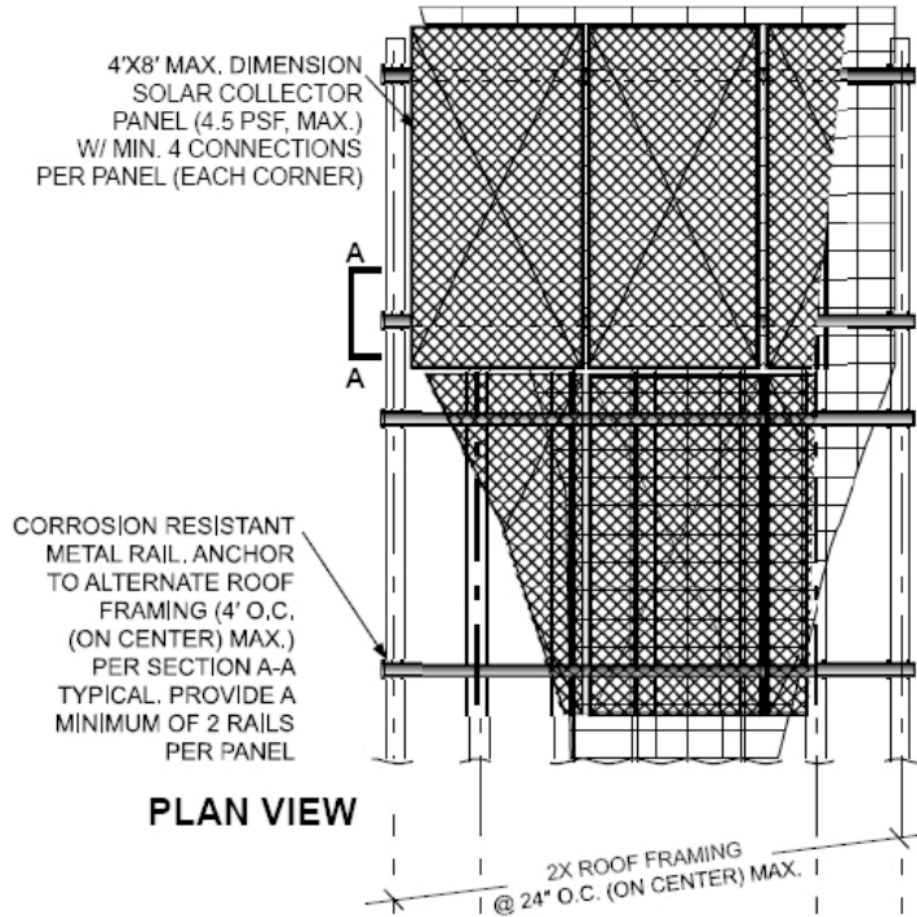


Figure 305.3.3.1.1(1) Installation – Rails perpendicular to framing members

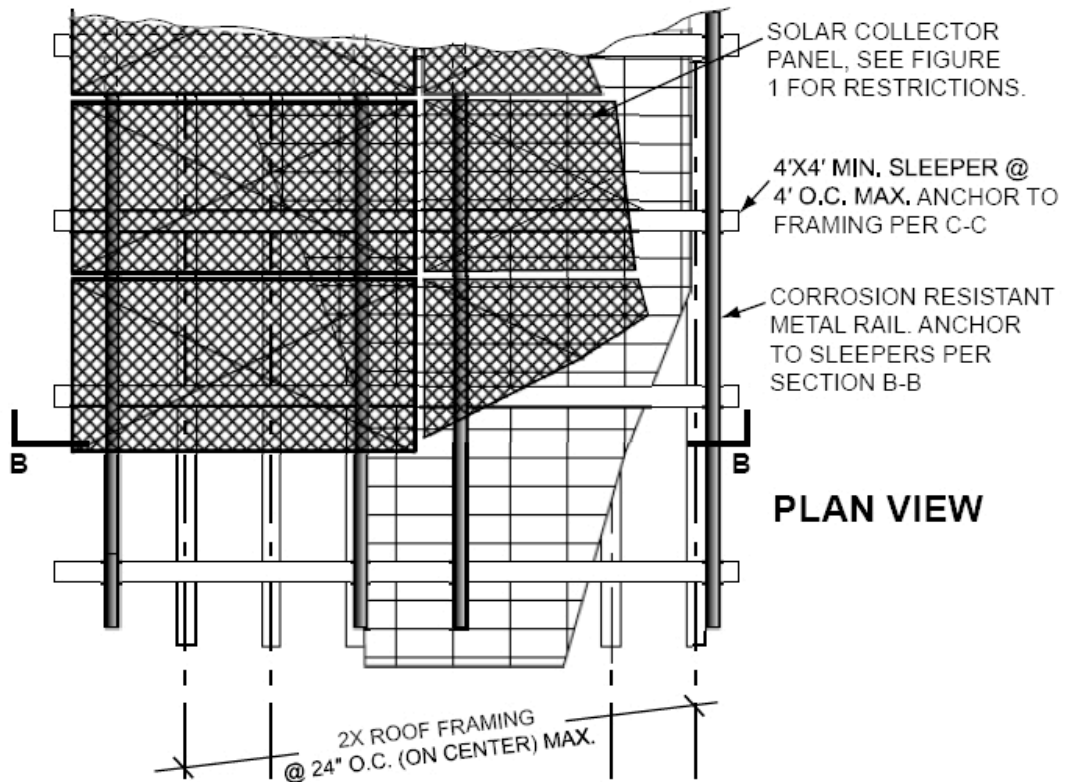


Figure 305.3.3.1.1(2) Installation – Rails parallel to framing members

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.

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

End of Chapter 3