

# 2015 IRC Approved amendments-Solar

## RM98

### SECTION 324 SOLAR ENERGY SYSTEMS

R324.1 General. Solar energy systems shall comply with the provisions of this section.

R324.2 Solar thermal systems. Solar thermal systems shall be designed and installed in accordance with Chapter 23 and the International Fire Code.

R324.3 Photovoltaic solar energy systems. Photovoltaic energy systems shall be designed and installed in accordance with this section, the International Fire Code and NFPA 70. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

R324.3.1 Rooftop mounted photovoltaic systems. Rooftop mounted photovoltaic panel systems installed on or above the roof covering shall be designed and installed in accordance with Section 908.

R324.3.1.1 Roof live load. Roof structures that provide support for photovoltaic panel systems shall be designed for applicable roof live load. The design of roof structures need not include roof live load in the area(s) covered by photovoltaic panel systems. Portions of roof structures not covered by photovoltaic panels shall be designed for roof live load. Roof structures that provide support for photovoltaic panel systems shall be designed for live load  $L_R$  for the load case where the photovoltaic panel system is not present.

R324.3.2 Building integrated photovoltaic systems. Building integrated photovoltaic systems that serve as roof coverings shall be designed and installed in accordance with Section 905.

R324.3.2.1 Photovoltaic shingles. Photovoltaic shingles shall comply with Section R905.16.

R324.4 Ground mounted photovoltaic systems. Ground mounted photovoltaic systems shall be designed and installed in accordance with Section R301.

R324.4.1 Fire Separation distances. Ground mounted photovoltaic systems shall be subject to the fire separation distance requirements determined by the local jurisdiction

## RM97

John Smirnow and Joseph H. Cain, P.E, representing Solar Energy Industries Association (SEIA), request Approval as Modified by this Public Comment.

Modify the proposal as follows:

R324.3.1.1 Roof live load. Roof structures that provide support for photovoltaic panel systems shall be designed for applicable roof live load. The design of roof structures need not include roof live load in the area(s) covered by photovoltaic panel systems. Portions of roof structures not covered by photovoltaic panels shall be designed for roof live load. Roof structures that provide support for photovoltaic panel systems shall be designed for live load  $L_R$  for the load case where the photovoltaic panel system is not present.

## RM98

**Proponent:** Lorraine Ross, Intech Consulting Inc., representing The Dow Chemical Company  
(delete section M2302 and replace with below)

### **SECTION R902 ROOF FIRE CLASSIFICATION**

**R902.3 Building integrated photovoltaic product.** Building integrated photovoltaic products installed as the roof covering shall be tested, listed and labeled for fire classification in accordance with Section R902.1.

**R902.4 Rooftop mounted photovoltaic panels and modules.** Rooftop mounted photovoltaic panels and modules installed on or above the roof covering shall be tested, listed and identified with a fire classification in accordance with UL 1703. Class A, B or C photovoltaic panels and modules shall be installed in jurisdictions designated by law as requiring their use or where the edge of the roof is less than 3 feet (914 mm) from a lot line.

### **SECTION R905 REQUIREMENTS FOR ROOF COVERINGS**

**R905.16 Photovoltaic modules/shingles.** The installation of photovoltaic modules/shingles shall comply with the provisions of this section.

**R905.16.1 Material standards.** Photovoltaic modules/shingles shall be listed and labeled in accordance with UL 1703.

**R905.16.2 Attachment.** Photovoltaic modules/shingles shall be attached in accordance with the manufacturer's installation instructions.

**R905.16.3 Wind resistance.** Photovoltaic modules/shingles shall be tested in accordance with procedures and acceptance criteria in ASTM D 3161. Photovoltaic modules/shingles shall comply with the classification requirements of Table R905.2.4.1(2) for the appropriate maximum basic wind speed. Photovoltaic modules/shingle packaging shall bear a label to indicate compliance with the procedures in ASTM D 3161 and the required classification from Table R905.2.4.1(2).

### **SECTION R908 ROOFTOP MOUNTED PHOTOVOLTAIC PANEL SYSTEMS**

**R908.1 General.** The installation of photovoltaic panel systems that are mounted on or above the roof covering shall comply with the provisions of this code, the *International Fire Code* and *NFPA 70*.

**R908.1.1 Material standards.** Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703.

**R908.1.2 Structural requirements.** Rooftop mounted photovoltaic panel systems shall be designed to structurally support the system and withstand applicable loads in accordance with Chapter 3. The roof upon which these systems are installed shall be constructed to support the loads imposed by such systems in accordance with Chapter 8.

**R908.1.3 Installation.** Rooftop mounted photovoltaic systems shall be installed in accordance with the manufacturer's instructions. Roof penetrations shall be flashed and sealed in accordance with this chapter.

**Reason:** Currently, provisions for solar energy systems are sprinkled throughout the International Residential Code. Furthermore, there are also significant gaps, many of which were debated and approved in the 2015 *International Building Code* development process. This proposed change consolidates and organizes these provisions, with necessary section revisions, and section additions, in an easily used format that also sets the stage for easy integration of code requirements for new solar energy technology and applications as they emerge in the market. The following is an explanation of each new and revised section pertinent to the newly proposed Section R324 Solar Energy Systems:

**1. Chapter 2 New Definitions Section R202:**

Four definitions are added for BUILDING INTEGRATED PHOTOVOLTAIC (BIPV) PRODUCT, PHOTOVOLTAIC MODULE, PHOTOVOLTAIC PANEL and PHOTOVOLTAIC PANEL SYSTEM. All of these definitions are necessary and were approved for inclusion in the 2015 *International Building Code*.

**2. Chapter 2 Revised Definition Section R202:**

A revised definition for PHOTOVOLTAIC SHINGLES is proposed, which was also approved for inclusion in the 2015 *International Building Code*.

**3. Add new SECTION R324 SOLAR ENERGY SYSTEMS:**

Chapter 3 is entitled Building Planning and therefore is an appropriate place to list the general provisions for installation of solar energy systems on buildings within the scope of the *International Residential Code*. Newly proposed Section 324 contains general provisions for solar energy systems and then, with subsections, serves as pointers to specific code requirements for solar energy systems based on type and location. This section is based upon requirements generally found in Chapter 23 which this proposal also revises. See below for details.

Setting up this section will also allow easy inclusion for new solar energy system types and locations. For example, if there are building integrated photovoltaic wall systems, a new subsection can be created, with an appropriate reference to Chapter 7.

**4. Revise Section R902 Roof Classification:**

This section has been renamed Fire Classification in order to clarify the subject of the section. Two new sections have been added to clearly identify the fire classification requirements for both building integrated photovoltaic products that serve as the roof covering and rooftop mounted photovoltaic panel systems. There is also a change to clarify Section 902.1, where the word "area" was changed to "jurisdiction" because there has been interpretation that the word "area" referred to is a place on the roof itself rather than a geographic area, such as the Urban Wildfire Interface Zone or other jurisdictional requirements for fire classified roofs. Section 902 is in place to prevent fire from spreading from rooftop to rooftop.

**5. Revise Section R902.16 Photovoltaic Shingles:**

This section, along with the revised definition for photovoltaic shingles, has been editorially revised to match comparable changes approved in the 2015 *International Building Code*.

**6. Add new section R908 ROOFTOP MOUNTED PHOTOVOLTAIC PANEL SYSTEMS:**

This new section outlines specific requirements for rooftop photovoltaic panel systems installed on or above roof coverings. As shown, material standards, structural requirements and installation details for these systems is detailed.

**7. Revise CHAPTER 23 and delete Section M2302 PHOTOVOLTAIC SOLAR ENERGY SYSTEMS:**

Chapter 23 is renamed as SOLAR THERMAL ENERGY SYSTEMS which limits the chapter to solar thermal energy systems only as identified in newly proposed R324.

**8. Delete Section M2302 PHOTOVOLTAIC SOLAR ENERGY SYSTEMS:**

As shown in Item 7, Chapter 23 is limited to solar thermal energy systems only. Therefore, Section M2302 PHOTOVOLTAIC SOLAR ENERGY SYSTEMS is deleted. Photovoltaic energy systems are electrical in nature. Placing requirements for these systems in the Mechanical part of the code is illogical and was only added in the 2012 International Residential Code because there was no other available place. This proposal sets up a new section R324 in Chapter 3 Building Planning for all solar energy systems with pointers to the type of system that will be used on the building. Provisions for photovoltaic energy systems currently in Section M2302 have been moved as appropriate to the newly proposed R324 SOLAR ENERGY SYSTEMS.

## SECTION R202 DEFINITIONS

**BUILDING INTEGRATED PHOTOVOLTAIC PRODUCT.** A building product that incorporates photovoltaic modules and functions as a component of the building envelope.

**PHOTOVOLTAIC MODULE.** A complete, environmentally protected unit consisting of solar cells, optics and other components, exclusive of a tracker, designed to generate DC power when exposed to sunlight.

**PHOTOVOLTAIC PANEL.** A collection of modules mechanically fastened together, wired, and designed to provide a field-installable unit.

**PHOTOVOLTAIC PANEL SYSTEM.** A system that incorporates discrete photovoltaic panels, that converts solar radiation into electricity, including rack support systems.

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## 2015 IBC Approved amendment-Solar

### S72-12

**1603.1.8.1 (NEW), 1607.12.5 (NEW), 1607.12.5.1 (NEW), 1607.12.5.2 (NEW), 1607.12.5.3 (NEW), 1607.12.5.4 (NEW)**

**Proponent:** Edwin Huston, National Council of Structural Engineers Associations (NCSEA), representing NCSEA Code Advisory Subcommittee – General Requirements Subcommittee (huston@smithhustoninc.com)

**Add new text as follows:**

**1603.1.8.1 Solar Photovoltaic (PV) Panels/Modules.** The Roof/PV live load used in the design of Solar PV Panels shall be indicated on the construction documents.

**1607.12.5 Solar Photovoltaic (PV) panels/modules.** Solar PV panels/modules shall be designed in accordance with Sections 1607.12.5.1 through 1607.12.5.4, as applicable.

**1607.12.5.1 Roof/PV live load.** The roof/PV live load is a 20 psf uniform load. Unless each Solar PV panel/module is clearly and permanently marked “Do not walk on this surface – not intended for maintenance access or pedestrian traffic”, and appropriate maintenance access paths are provided a non-concurrent 300 pound concentrated load as set forth in Table 1607.1 shall also be applied. The individual Solar PV panels/modules shall be designed to withstand the Roof/PV live load, in combination with other applicable loads.

**1607.12.5.2 PV panels/modules.** Solar PV panels/modules designed to be installed over and supported by a roof, shall have the structural supports of the roof designed to accommodate the full dead load, including the Solar PV panels/modules dead load; the Roof/PV live load in the areas of the Solar PV panels/modules in combination with other applicable loads. The roof area underneath any Solar PV panels/modules shall also be designed for load combinations including roof live load, in combination with other applicable loads, without the Solar PV panels/modules.

**1607.12.5.3 PV panels/modules installed as an independent structure.** Solar PV panels/modules that are independent structures and do not have accessible /occupied space underneath are not required to accommodate a roof/PV live load, provided they are marked as required in Section 1607.12.5.1, and the area under the structure is restricted to keep the public away. All other loads and combinations per Section 1605 shall be accommodated.

Solar PV panels/modules that are designed to be the roof, and span to structural supports, and have accessible/occupied space underneath shall have the panels/modules and all supporting structure designed to support a Roof/PV live load, as defined in section 1607.12.5.1 in combination with other applicable loads. Solar PV panels/modules in this application are not permitted to be classified as “not accessible” per 1607.12.5.1.

**1607.12.5.4 Ballasted systems.** Solar PV panels/modules installed on a roof as a ballasted system need not be rigidly attached to the roof or supporting structure. Ballasted systems shall be designed and installed only on roofs with slopes of ½” per foot or less. The structural supports of the roof under a ballasted system shall be designed, or analyzed, per section 1604.4; checked in accordance with Section 1604.3.6 for deflections; and checked in accordance with Section 1611 for ponding. The ballasted system shall be designed to resist sliding and uplift resulting from lateral and vertical forces as required by Section 1605, using a coefficient of friction determined by acceptable engineering principles.

**Reason:** This new section is bringing in requirements for Solar PV panels that is currently absent in the code.

**Cost Impact:**

*Public Comment 1:*

**Joseph H. Cain, P.E., SolarCity Corporation, representing self and John Smirnow, Solar Energy Industries Association (SEIA), requests Approval as Modified by this Public Comment.**

**Further modify the proposal as follows:**

**1603.1.8.1 Solar photovoltaic (PV) panels or modules Photovoltaic panel systems.** The dead load of solar PV panels or modules rooftop mounted photovoltaic panel systems, including accessories rack support systems, shall be indicated on the construction documents.

**1607.12.5 Solar photovoltaic (PV) panels or modules Photovoltaic panel systems.** Solar PV panels or modules Roof structures that provide support for photovoltaic panels systems shall be designed in accordance with Sections 1607.12.5.1 through 1607.12.5.4, as applicable.

*(Portions of proposal not show remain unchanged)*

**Commenter’s Reason:** This change is intended to clarify the requirements using language that correlates with newly revised and approved terms while using language that can be easily understood by all users of the code. These revisions are provided in response to comments from the Structural Committee as part of their approval as modified of S72-12. Sections 1603.1.8.1 and 1607.12.5 are revised for clarity, using newly defined term “photovoltaic panel system,” as approved in S5-12. Language is revised to clarify that this section applies to roof loads for design of the roof structure, not to the design of photovoltaic panels or modules themselves.

*Public Comment 5:*

**Joseph H. Cain, P.E., SolarCity Corporation, representing self and John Smirnow, Solar Energy Industries Association (SEIA), requests Approval as Modified by this Public Comment.**

**Further modify the proposal as follows:**

**1607.12.5.4 Ballasted photovoltaic panel systems.** Solar PV panels/ or modules installed on a roof as a ballasted system need not be rigidly attached to the roof or supporting structure. Ballasted systems shall be designed and installed only on roofs with slopes of ½” 1 inch per foot or less. The structural supports of the roof under a Roof structures that provide support for ballasted photovoltaic panel systems shall be designed, or analyzed, in accordance with Section 1604.4; checked in accordance with Section 1604.3.6 for deflections; and checked in accordance with Section 1611 for ponding. The ballasted system shall be designed to resist sliding and uplift resulting from lateral and vertical forces as required by Section 1605, using a coefficient of friction determined by acceptable engineering principles. In sites where the Seismic Design Category is C or above, the system shall be designed to accommodate seismic displacement determined by nonlinear response-history analysis or shake-table testing, using input motions consistent with ASCE 7 lateral and vertical seismic forces for non-structural components on roofs.

**1613.5 Ballasted photovoltaic panel systems.** Ballasted, roof-mounted photovoltaic panel systems need not be rigidly attached to the roof or supporting structure. Ballasted non-penetrating systems shall be design and installed only on roofs with slopes of 1 inch per foot or less. Ballasted non-penetrating systems shall be designed to resist

sliding and uplift resulting from lateral and vertical forces as required by Section 1605, using a coefficient of friction determined by acceptable engineering principles. In structures assigned to, Seismic Design Category C, D, E or F, ballasted non-penetrating the systems shall be designed to accommodate seismic displacement determined by nonlinear response-history analysis or shake-table testing, using input motions consistent with ASCE 7 lateral and vertical seismic forces for non-structural components on roofs.

*(Portions of proposal not show remain unchanged)*

**Commenter's Reason:** This change is intended to clarify the requirements using language that correlates with newly revised and approved terms while using language that can be easily understood by all users of the code. These revisions are provided in response to comments from the Structural Committee as part of their approval as modified of S72-12. Section 1607.12.5.3 is revised for clarity, using newly defined term "photovoltaic panel system," as approved in S5-12. Language is revised and re-ordered to clarify those statements in the first paragraph apply to all ballasted photovoltaic panel systems, and the statements in the second paragraph apply only to those ballasted systems that are "non-penetrating," and do not have anchorage to the roof structure. The second paragraph is relocated to new Section 1613.5, under Section 1613 Earthquake loads, as it is not appropriate under Section 1607.12 Roof loads.

## STATE BUILDING CODE COUNCIL

Log # 14-E07 proposed amendment to the IRC 2014/15

### R404.2 Solar Readiness.

**R404.2.1 General.** A *solar zone* shall be provided for R-3 occupancies as defined by the *International Residential Code* on the roof of the building, in accordance with this section and the *International Fire Code*.

**EXCEPTION.** A *solar zone* is not required where shadow studies indicate that the roof area will be more than 25 percent in shadow on September 21 at 10am, 11am, 12pm, 1pm, and 2pm solar time.

**R404.2.2 Minimum Area.** The minimum area of the *solar zone* shall be 30 percent of the roof area. The roof area shall be calculated as the gross roof area less the area covered by skylights, occupied roof decks and planted areas. The *solar zone* is permitted to be comprised of smaller separated sub-zones, each at least 5 feet wide in the narrowest dimension.

**R404.2.3 Obstructions.** The *solar zone* shall be free of pipes, vents, ducts, equipment, skylights and other obstructions, except solar photovoltaic or solar hot water system components within the *solar zone*.

**R404.2.4 Shading.** The *solar zone* shall be set back from any existing or new object on the building or site that is located south, east, or west of the *solar zone* a distance at least two times the object's height above the nearest point on the roof surface. Such objects include but are not limited to taller portions of the building itself, parapets, chimneys, antennas, rooftop equipment, and trees. No portion of the *solar zone* shall be located on a roof slope greater than 2:12 that faces within 45° of true north.

**R404.2.5 Access.** Areas contiguous to the *solar zone* shall provide access pathways and provisions for emergency smoke ventilation as required by the *International Fire Code*.

**R404.2.6 Structural integrity.** The *solar zone* shall accommodate future solar photovoltaic or solar hot water at an assumed dead load of 5 pounds per square foot in addition to other required live and dead loads, and the as-designed dead load and live load for the *solar zone* shall be clearly marked on the record drawings. Where solar photovoltaic or solar hot water systems are installed in the solar zone, structural analysis shall be based upon calculated loads, not upon these assumed loads.

**R404.2.7 PV interconnection.** A capped roof penetration sleeve shall be provided adjacent to the solar zone to accommodate future solar photovoltaic system conduit. Dedicated wall space for a future inverter shall be located within 3 feet of the electrical service panel. Dedicated wall space for a future net meter shall be located within 3 feet of the utility meter.

**R404.2.8 Electrical service reserved space.** The main electrical service panel shall have a reserved space to allow installation of circuit breakers for future solar electric installation and shall be labeled "For Future Solar Electric". The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location, and shall include one 20-ampere circuit for each 200 square feet of required *solar zone* area.

**R404.2.9 PV Construction documents and posted certificate.** The construction documents, and a permanent certificate posted within 3 feet of the electrical distribution panel or water heater, shall indicate the following:

- a. *Solar zone* boundaries and total area;
- b. Location for future inverters and metering equipment; and
- c. Route for future wiring between the *solar zone* and the inverter, and between the inverter and the main service panel.

**Definition: Solar zone.** A clear area or areas reserved solely for current and future installation of photovoltaic or solar hot water systems.

## STATE BUILDING CODE COUNCIL

Log # 14-E 05 proposed amendment to the IRC 2014/15

**R105.2 Work exempt from permit.** *Permits* shall not be required for the following. Exemption from *permit* requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this *jurisdiction*.

(add a new item to the list)

11. Roof mounted photovoltaic (PV) solar modules meeting all of the following criteria:

11.1. The design wind speed for the area in which the modules are installed does not exceed 90 mph.

11.2. Total dead load of modules, supports, mountings, raceways and all other appurtenances weigh no more than one of the following:

11.2.1 Four pounds per square foot

11.2.2 Frameless modules on at least 3/12 pitch roof weighing no more than four and one-half pounds per square foot

11.2.3 Frameless modules on at least 5/12 pitch roof weighing no more than five pounds per square foot.

11.3. Modules are not mounted higher than 18" above the surface of the roofing to which they are affixed.

11.4. Modules on pitched roofs do not exceed the highest point of the roof unless approved by the local jurisdiction.

- 11.5. Modules on flat roofs do not exceed the maximum height allowed by the local zoning and building code for the building on which they are installed unless approved by the local jurisdiction.
- 11.6. Supports for solar modules are to be installed to spread the dead load across as many roof-framing members as needed, so that no point load exceeds 50 pounds.
- 11.7. Attachment to the roof must be as specified by the mounting system manufacturer.
- 11.8. Fire department access aisles must comply with the International Fire Code with Washington State amendments.
- 11.9. All required electrical permit(s), review and inspection(s) must be obtained from the Authority Having Jurisdiction to administer the electrical code.

Log # 14-E 02 proposed amendment to the IRC 2014/15

**R105.2 Work exempt from permit.** *Permits* shall not be required for the following. Exemption from *permit* requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this *jurisdiction*.

11. Roof mounted photovoltaic (PV) solar modules meeting all of the following criteria:

- a. The design wind speed for the area in which the modules are installed does not exceed 90 mph.
- b. The ground snow load does not exceed 70 pounds per square foot.
- c. Total dead load of modules, supports, mountings, raceways and all other appurtenances weigh no more than four pounds per square foot.
- d. Modules are not mounted higher than 18 inches above the surface of the roofing to which they are affixed.
- e. Modules on pitched roofs do not exceed the highest point of the roof unless approved by the local jurisdiction.
- f. Modules on flat roofs do not exceed the maximum height allowed by the local zoning and building code for the building on which they are installed unless approved by the local jurisdiction.
- g. Supports for solar modules are to be installed to spread the dead load across as many roof-framing members as needed, so that no point load exceeds 50 pounds.
- h. Attachment to the roof must be as specified by the mounting system manufacturer.
- i. Fire department access aisles must comply with the International Fire Code.
- j. All required electrical permit(s), review and inspection(s) must be obtained from the Authority Having Jurisdiction to administer the electrical code.

**STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 2012 EDITION OF THE INTERNATIONAL FIRE CODE  
WAC 51-54A-0605  
Electrical equipment, wiring and hazards.**

**605.11 Solar photovoltaic power systems.** Installation, modification, or alteration of solar photovoltaic power systems shall comply with this section. Due to the emerging technologies in the solar photovoltaic industry, it is understood fire code officials may need to amend prescriptive requirements of this section to meet the



requirements for firefighter access and product installations. Section 104.9 Alternative materials and methods of this code shall be considered when approving the installation of solar photovoltaic power systems. Solar photovoltaic power systems shall be installed in accordance with Sections 605.11.1 through 605.11.4, the International Building Code and NFPA 70.

**EXCEPTION:** Detached, nonhabitable Group U structures shall not be subject to the requirements of Sections 605.11.2 through 605.11.3.3.3.

**605.11.1 Marking.** Marking is required on interior and exterior direct-current (DC) conduit, enclosures, raceways, cable assemblies, junction boxes, combiner boxes and disconnects.

**605.11.1.1 Materials.** The materials used for marking shall be reflective, weather resistant and suitable for the environment. Marking as required in Sections 605.11.1.2 through 605.11.1.4 shall have all letters capitalized with a minimum height of 3/8 inch (9.5 mm) white on red background.

**605.11.1.2 Marking content.** The marking shall contain the words "PHOTOVOLTAIC POWER SOURCE."

**605.11.1.3 Main service disconnect.** The marking shall be placed adjacent to the main service disconnect in a location clearly visible from the location where the disconnect is operated.

**605.11.1.4 Location of marking.** Marking shall be placed on interior and exterior DC conduit, raceways, enclosures and cable assemblies every 10 feet (3048 mm), within 1 foot (305 mm) of turns or bends and within 1 foot (305 mm) above and below penetrations of roof/ceiling assemblies, walls or barriers.

**605.11.2 Locations of DC conductors.** Conduit, wiring systems, and raceways for photovoltaic circuits shall be located as close as possible to the ridge or hip or valley and from the hip or valley as directly as possible to an outside wall to reduce trip hazards and maximize ventilation opportunities. Conduit runs between sub arrays and to DC combiner boxes shall be installed in a manner that minimizes the total amount of conduit on the roof by taking the shortest path from the array to the DC combiner box. The DC combiner boxes shall be located such that conduit runs are minimized in the pathways between arrays. DC wiring shall be installed in metallic conduit or raceways when located within enclosed spaces in a building.

**605.11.3 Access and pathways.** Roof access, pathways, and spacing requirements shall be provided in accordance with Sections 605.11.3.1 through 605.11.3.3.3.

**EXCEPTIONS:**

1. Residential structures shall be designed so that each photovoltaic array is no greater than 150 feet (45,720 mm) by 150 feet (45,720 mm) in either axis.
2. Panels/modules shall be located up to the roof ridge where an alternative ventilation method approved by the fire code official has determined vertical ventilation techniques will not be employed.

**605.11.3.1 Roof access points.** Roof access points shall be located in areas that do not require the placement of ground ladders over openings such as windows or doors, and located at strong points of building construction in locations where the access point does not conflict with overhead obstructions such as tree limbs, wires, or signs.

**605.11.3.2 Residential systems for one- and two-family dwellings.** Access to residential systems for one- and two-family dwellings shall be provided in accordance with Sections 605.11.3.2.1 through 605.11.3.2.4.

**EXCEPTIONS:**

1. Residential dwellings with an approved automatic fire sprinkler system installed.
2. Residential dwellings with approved mechanical or passive ventilation systems.
3. Where the fire code official determines that the slope of the roof is too steep for emergency access.

4. Where the fire code official determines that vertical ventilation tactics will not be utilized.
5. These requirements shall not apply to roofs where the total combined area of the solar array does not exceed thirty-three percent as measured in plan view of the total roof area of the structure, where the solar array will measure 1,000 sq. ft. or less in area, and where a minimum eighteen inches unobstructed pathway shall be maintained along each side of any horizontal ridge.

**605.11.3.2.1 Residential buildings with hip roof layouts.** Panels/modules installed on residential buildings with hip roof layouts shall be located in a manner that provides a 3-foot-wide (914 mm) clear access pathway from the eave to the ridge on each roof slope where panels/modules are located. The access pathway shall be located at a structurally strong location on the building capable of supporting the live load of fire fighters accessing the roof.

**Exception:** These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.

**605.11.3.2.2 Residential buildings with a single ridge.** Panels/modules installed on residential buildings with a single ridge shall be located in a manner that provides two, 3-foot-wide (914 mm) access pathways from the eave to the ridge on each roof slope where panels/modules are located.

**Exception:** This requirement shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.

**605.11.3.2.3 Residential buildings with roof hips and valleys.** Panels/modules installed on residential buildings with roof hips and valleys shall be located no closer than 18 inches (457 mm) to a hip or a valley where panels/modules are to be placed on both sides of a hip or valley. Where panels are to be located on only one side of a hip or valley, the panels shall be permitted to be placed directly adjacent to the hip or valley.

**EXCEPTION:** These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.

**605.11.3.2.4 Residential building smoke ventilation.** Panels/modules installed on residential buildings shall be located no higher than 18 inches (457 mm) below the ridge in order to allow for fire department rooftop operations.

**605.11.3.3 Other than residential buildings.** Access to systems for occupancies other than one- and two-family dwellings shall be provided in accordance with Sections 605.11.3.3.1 through 605.11.3.3.3.

**Exception:** Where it is determined by the *fire code official* that the roof configuration is similar to that of a one- or two-family dwelling, the residential access and ventilation requirements in Sections 605.11.3.2.1 through 605.11.3.2.4 shall be permitted to be used.

**605.11.3.3.1 Access.** There shall be a minimum 6-foot-wide (1829 mm) clear perimeter around the edges of the roof.

**Exception:** When either access of the building is 250 feet (76 200 mm) or less, there shall be a minimum 4-foot-wide (1290 mm) clear perimeter around the edges of the roof.

**605.11.3.3.2 Pathways.** The solar installation shall be installed to provide designated pathways. The pathways shall meet the following requirements:

1. The pathway shall be over areas capable of supporting the live load of fire fighters accessing the roof.
2. The centerline axis pathways shall be provided in both axes of the roof. Centerline axis pathways shall run where the roof structure is capable of supporting the live load of fire fighters accessing the roof.

3. Shall be a straight line not less than 4 feet (1290 mm) clear to skylights or ventilation hatches.
4. Shall be a straight line not less than 4 feet (1290 mm) clear to roof standpipes.
5. Shall be a straight line not less than 4 feet (1290 mm) clear around roof access hatch with at least one not less than 4 feet (1290 mm) clear pathway to parapet or roof edge.

**605.11.3.3.3 Smoke ventilation.** The solar installation shall be designed to meet the following requirements:

1. Arrays shall be no greater than 150 feet (45 720 mm) by 150 feet (45 720 mm) in distance in either axis in order to create opportunities for fire department smoke ventilation operations.
2. Smoke ventilation options between array sections shall be one of the following:
  - 2.1. A pathway 8 feet (2438 mm) or greater in width.

**605.11.4 Ground-mounted photovoltaic arrays.** Ground-mounted photovoltaic arrays shall comply with Sections 605.11 through 605.11.2 and this section. Setback requirements shall not apply to ground-mounted, free-standing photovoltaic arrays.