

2012 IRC

**Purpose**

To assist and encourage private generation of electricity through usage of solar power, while assuring that such generation does not create electrical, structural, fire or life safety hazards.

**Scope**

This Construction Tip Sheet may only be used for single-family, two-family and townhome buildings, as defined by the International Residential Code.

**Definitions**

PV means Photo-Voltaic

NEC means National Electrical Code

**Permit and Installation Requirements**

PV panel installations require a building permit unless exempted in this section. All PV installations require an electrical permit. Some jurisdictions also require electrical plan review.

**Except for the cities of Snoqualmie and Woodinville**, the installation of roof mounted PV solar panels meeting all of the following criteria will not require a building permit:

- Total dead load of panels, supports, mountings, raceways and all other appurtenances weigh no more than three pounds per square foot.
- The total PV solar panel system weight will not exceed 1,000 pounds.
- Panels are to be mounted no higher than 18" above the surface of the roofing to which they are affixed. Except for flat roofs, no portion of the system may exceed the highest point of the roof. Panels on flat roofs cannot exceed the maximum height allowed for the building unless approved by the local jurisdiction.
- Supports for solar panels are to be installed to spread the dead load across as many roof-framing members as needed to ensure that no point loads in excess of fifty pounds are created.
- Attachment to the roof will be as specified by the mounting system manufacturer.
- All signage and markings required by NEC 690 shall be a phenolic or metallic plate or other similar material engraved in block letters at least 1/4" high and suitable for the environment and application. The letters and the background shall be in contrasting colors. Screws or rivets shall be used to affix an identification plate to the equipment or enclosure.
- The installation must still comply with all land use and other applicable codes even if a building permit is not required.

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GENERAL INFORMATION:

- Obtain an electrical permit before starting construction.
- This tip sheet is intended to provide a policy for MBP jurisdictions.
- Additional information can be found at your local building department.

### **Additional Signage and marking Requirements**

In addition to the signage and markings required in NEC 690 an Identification Plate is needed to provide emergency responders with appropriate warning regarding the solar electric system and must comply with the following:

- Identification Plate text: "WARNING: PHOTOVOLTAIC POWER SOURCE"
- Red background, white lettering
- Minimum 3/8" letter height, all capital letters
- Arial or similar font, non-bold
- Reflective, weather resistant material
- The marking should be placed on the exterior of structure adjacent to the meter and within the main service disconnect. If the main service disconnect is operable with the service panel closed, then the marking should be placed on the outside cover.

### **Electrical Permits and Inspections**

Electrical permits and inspection approvals are required for all PV installations that connect to the building's electrical system. Some electrical jurisdictions require an electrical plan review prior to the permit issuance. Be sure to check with your local jurisdiction to determine if electrical plan review is required. If a plan review is not required, the following information must be provided to the electrical inspector at the time of the electrical inspection:

- A wiring diagram showing all photovoltaic equipment, devices, wire type and size, over-current protection and grounding.
- Electrical calculations used to determine voltage and current within the photovoltaic system.
- Information/specifications for all equipment (array, inverter, modules including operating and maximum voltages/currents/power, etc.).

### **Firefighter Access**

PV systems are a serious concern for the fire service in that they limit access for roof operations and, even when disconnected from the building electrical system, remain energized during daylight hours. The following recommendations are made to help mitigate these concerns:

#### **Access**

- A pathway should be constructed along all roof edges, peaks, and valleys for firefighter access.
- The pathway should be not less than 36" wide measured from the edge of the solar array. (See attached figures 1-4 for examples of firefighter pathways).
- When solar arrays are installed on roofs, there should be a minimum of 36" of clearance at the ridgeline to allow for smoke ventilation.
- This guideline does not apply to non-habitable structures without concealed attic/roof spaces. Examples of non-habitable structures include, but are not limited to, parking shade structures, carports, solar trellises, etc.

### **References/Sources**

*Solar Guide for Residential Buildings* - City of Portland, OR  
*Installation of Roof Mounted Solar Panels*, revised June 17, 2009 – Clackamas County, OR  
*Solar Energy Systems Guide*, revised August 19, 2009 – City of Seattle, DPD  
*Solar Photovoltaic Installation Guideline (Final Draft)*, April 2008, California Dept of Forestry & Fire Protection, Office of the State Fire Marshal

**EXAMPLES OF SOLAR ARRAY FIREFIGHTER PATHWAYS**

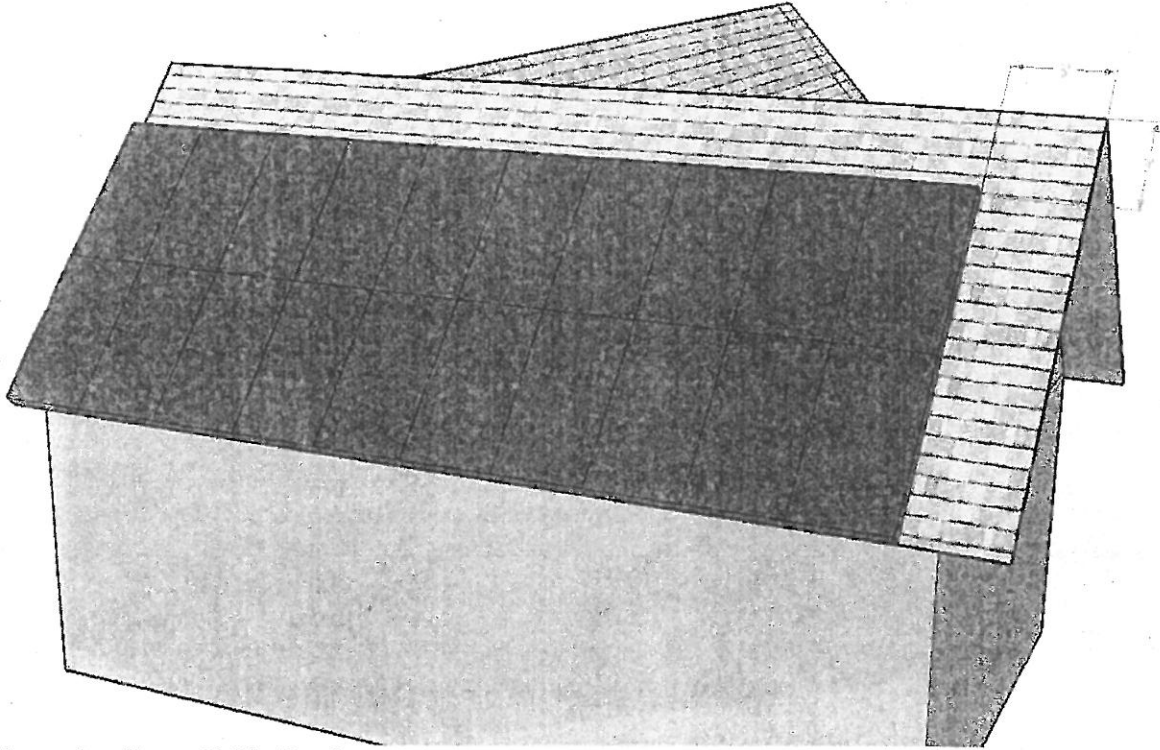


Figure 1 – Cross Gable Roof

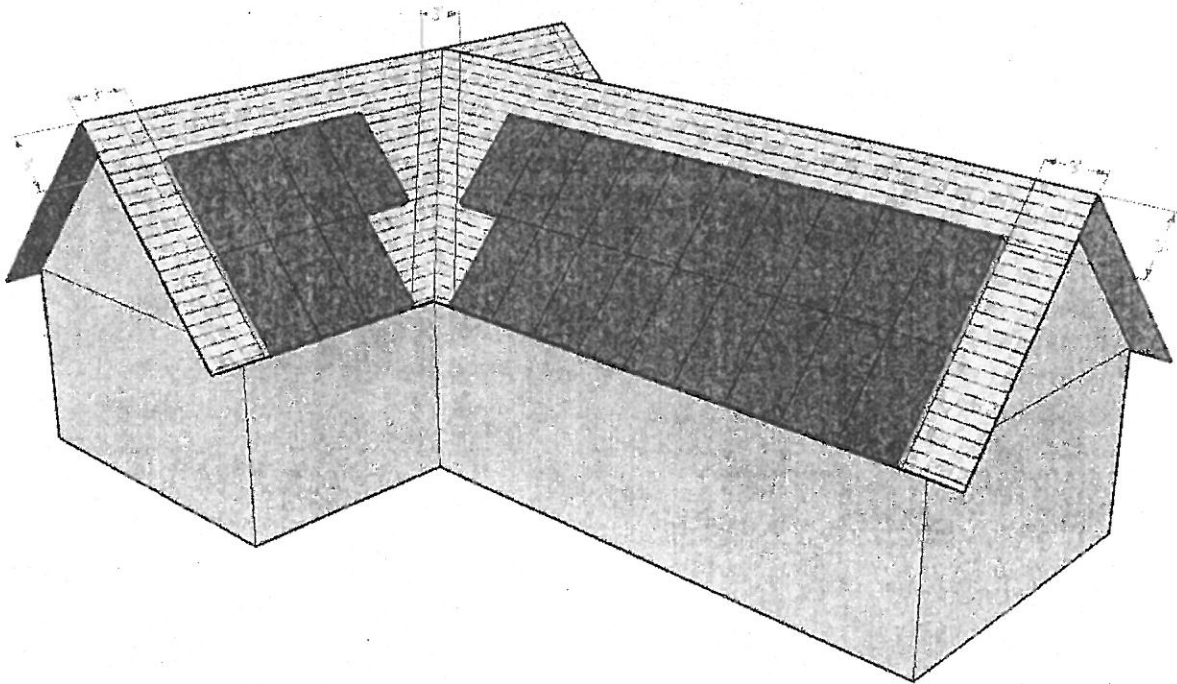


Figure 2 – Cross Gable with Valley

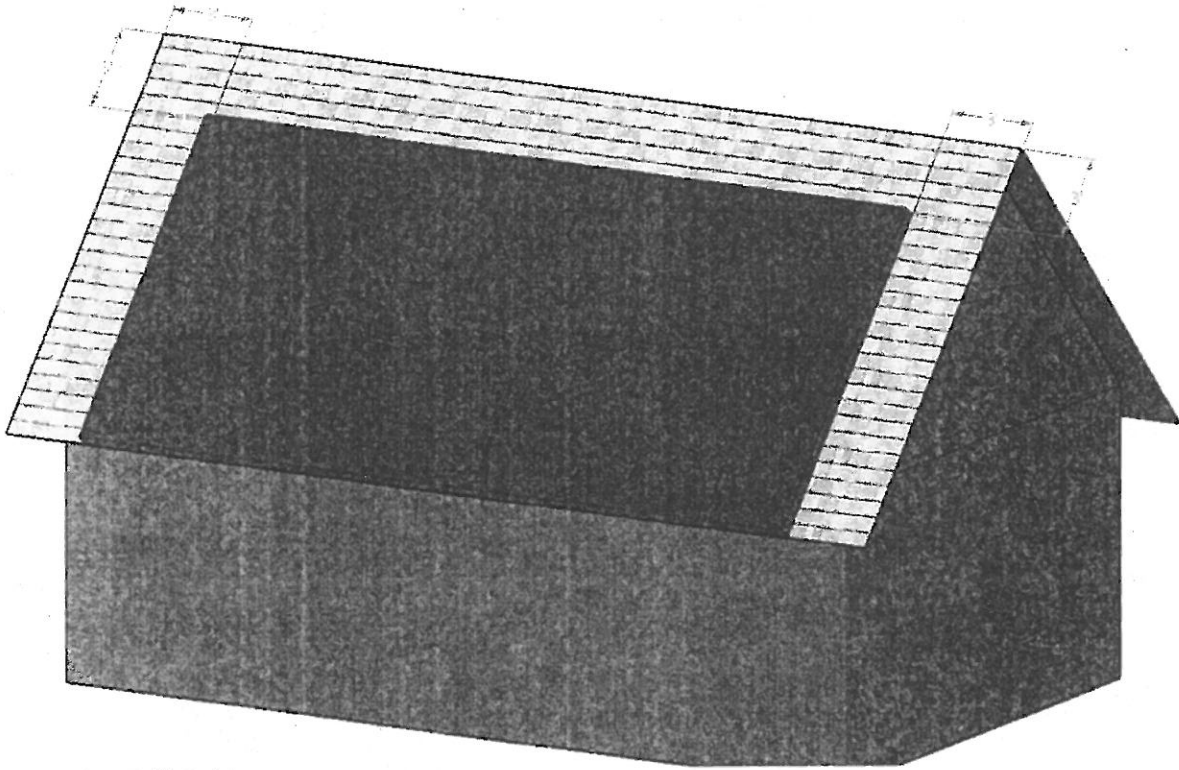


Figure 3 – Full Gable

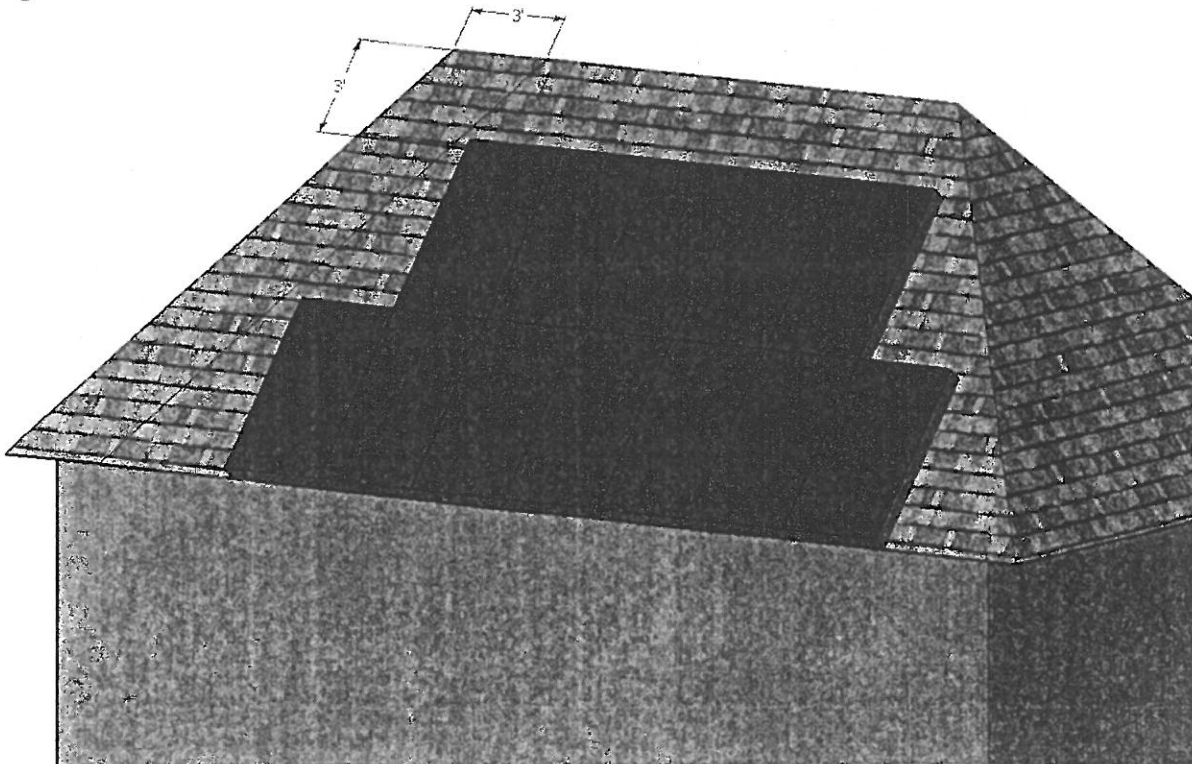


Figure 4 – Full Hip Roof

# EXPEDITED PERMITTING CHECKLIST FOR RESIDENTIAL PHOTOVOLTAIC SYSTEMS: ROOFTOP-MOUNTED

## -----TO BE COMPLETED BY CITY STAFF-----

Building Permit Required? <input type="checkbox"/> Yes <input type="checkbox"/> No Staff Initials _____	Date:Click here to enter text.	Qualifies for Electrical OTC? <input type="checkbox"/> Yes <input type="checkbox"/> No Staff Initials _____	Date:Click here to enter text.
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## -----TO BE COMPLETED BY APPLICANT-----

### 1 Project Information

Project Applicant:	Click here to enter text.
Site Owner Name:	Click here to enter text.
Project Address:	Click here to enter text.
PV system description:	Click here to enter text.

### 2 Determine if your project needs a building permit (check all that apply):

	Yes	No
1. PV system is designed and proposed for a detached single-family house.	<input type="checkbox"/>	<input type="checkbox"/>
2. PV system is designed for rooftop of a house in general compliance with applicable codes.	<input type="checkbox"/>	<input type="checkbox"/>
3. Mounting system is engineered and designed for PV.	<input type="checkbox"/>	<input type="checkbox"/>
4. Rooftop is made from lightweight material such as shingles.	<input type="checkbox"/>	<input type="checkbox"/>
5. PV system has been pre-approved by electrical permitting agency.	<input type="checkbox"/>	<input type="checkbox"/>
6. To address uplift, panels are mounted no higher than 18" above the surface of the roofing to which they are affixed. Except for flat roofs, no portion of the system may exceed the highest point of the roof.	<input type="checkbox"/>	<input type="checkbox"/>
7. Total dead load of panels, supports, mountings, raceways, and all other appurtenances weigh no more than one of the following. If <b>YES</b> , indicate which: <input type="checkbox"/> No more than three and one-half (3.5) pounds per square foot (PSF) <input type="checkbox"/> Frameless panels on at least 3/12 pitch roof weighing no more than four and one-half (4.5) PSF <input type="checkbox"/> Frameless panels on at least 5/12 pitch roof weighing no more than five (5.0) PSF	<input type="checkbox"/>	<input type="checkbox"/>
8. Supports for solar panels are installed to spread the dead load across as many roof-framing members as needed to ensure that at no point loads in excess of fifty (50) pounds are created.	<input type="checkbox"/>	<input type="checkbox"/>
9. Attachment to the roof is specified by the mounting system manufacturer.	<input type="checkbox"/>	<input type="checkbox"/>
10. Method and type of weatherproofing roof penetrations are provided.	<input type="checkbox"/>	<input type="checkbox"/>
11. Home is code compliant to setbacks and height, or code allows expansion of nonconformity for solar panels.	<input type="checkbox"/>	<input type="checkbox"/>
12. Panels are mounted no higher than the roof ridge or apex of roof (applies only to pitched roofs).	<input type="checkbox"/>	<input type="checkbox"/>
Comments:	Click here to enter text.	



If you answered yes to all of the above questions, no separate building permit is required.

### 3 Determine if your project qualifies for an Over-the-Counter electrical permit

**(check all that apply):**

Electrical contractors can apply for an Over-The-Counter (OTC) permit where the PV system meets the requirements listed in this Checklist and use a template electrical diagram provided by the City. All projects plans and supporting documentation must be provided on-site for the inspector. Project will be subject to a field inspection.

	Yes	No	N/A
1. PV modules, utility-interactive inverters, and combiner boxes are identified for use in PV systems.	<input type="checkbox"/>	<input type="checkbox"/>	
2. The AC interconnection point is on the load side of service disconnect. See NEC 690.64(B).	<input type="checkbox"/>	<input type="checkbox"/>	
3. The system meets all current NEC, City, and Washington Cities Electrical Code requirements.	<input type="checkbox"/>	<input type="checkbox"/>	
4. For Split-Buss panels the AC interconnection must be one of the six service disconnects.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>5. Maximum load added to the panelboard is based on the rating of the panelboards bus/main OCPD combination and is limited to (check combination that applies):</p> <p><input type="checkbox"/> 225 amp bus/200 amp main OCPD - 13,440 watts, maximum 70 amp inverter OCPD. (optional)</p> <p><input type="checkbox"/> 225 amp bus/225 amp main OCPD - 8,640 watts, maximum 45 amp inverter OCPD. (optional)</p> <p><input type="checkbox"/> 200 amp bus/200 amp main OCPD - 7,860 watts, maximum 40 amp inverter OCPD.</p> <p><input type="checkbox"/> 150 amp bus/150 amp main OCPD - 5,760 watts, maximum 30 amp inverter OCPD.</p> <p><input type="checkbox"/> 125 amp bus/125 amp main OCPD - 4,800 watts, maximum 25 amp inverter OCPD.</p> <p><input type="checkbox"/> 100 amp bus/100 amp main OCPD - 3,840 watts, maximum 20 amp inverter OCPD.</p> <p><input type="checkbox"/> <b>Other- Electrical Permit with Plan Review Required</b></p> <p><i>Note 1: Listed un-altered factory main/bus combination. Alteration of the panelboard main OCPD will require plan review.</i></p> <p><i>Note 2: The circuit conductors and overcurrent devices shall be sized to carry not less than 125 percent of the maximum currents as calculated in 690.8(A). The rating or setting of overcurrent devices shall be permitted in accordance with 240.4(B) and (C).NEC 690.8(B)(1)</i></p> <p><i>Note 3: If a panelboard employs a snap switch rated 30 amperes or less in any branch circuit, it cannot be rated more than 200 amperes unless there is a supply side overcurrent protection at 200 amperes or less within the panelboard. This requirement does not apply to panelboards equipped with circuit breakers. Section 408.36(A) of the NEC.</i></p>			
<p>6. I have attached the following Electrical Template and Site Plan:</p> <p><input type="checkbox"/> Standard Electrical Diagram- 6 Strings or Less</p> <p><input type="checkbox"/> Standard Electrical Diagram- 4 Strings or Less</p> <p><input type="checkbox"/> Standard Electrical Diagram- Micro Inverter</p> <p><input type="checkbox"/> <b>None of the above- Electrical Permit with Plan Review Required</b></p>			
Comments:	Click here to enter text.		



If you answered yes to all of the above questions and are using a template diagram provided by the City, your project qualifies for over the Over-the-Counter electrical permit.

**4 Submit this Checklist, the Electrical OTC Application Form, and Template**  
**Electrical Drawing and Site Plan to:** Permit Processing, Bellevue Development Services Center

 **I attest that all information in this checklist is accurate to the best of my knowledge.**

Applicant Signature: Click here to enter text.	Date: Click here to enter text.
Applicant Name (Please Print): Click here to enter text.	





## Code Change Alert:

# Permitting of Solar Photovoltaic Systems in Washington State

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### Background

Historically, the permitting requirements for rooftop solar photovoltaic (PV) systems in Washington State have varied widely from jurisdiction to jurisdiction. Requirements for full engineering reports and stamped drawings for simple systems has resulted in an additional \$500 to \$2,500 per system for engineering-related expenses, construction delays of up to 8 weeks, and a deterrent to solar installations in some jurisdictions. In an effort to reduce unnecessary permitting costs and to support the growing solar industry in Washington, the Northwest Solar Communities, a coalition of industry stakeholders, jurisdictions, non-profits, and state entities, developed an expedited process for standard rooftop mounted, residential PV systems. The objective was to establish a permit process that is simple, fast, and cost effective for both reviewing jurisdictions and permit applicants, and several jurisdictions across the state have taken steps to implement streamlined processes. In order to implement a standard, predictable process statewide, the Washington State University Energy Program worked with the Northwest Solar Communities team to develop and submit an amendment to the International Residential Code for solar photovoltaic systems. The amended code was approved as an emergency rule as described below.

### Emergency Rule Regarding Rooftop Solar Photovoltaic Installations

On June 13, 2014 the Washington State Building Code Council approved an emergency rule-making order to allow installation of standard solar photovoltaic systems on residential rooftops without the need for an engineering report. The effective date of the emergency rule is July 1, 2014. Under the rule, the following section is added to the Washington amendments to the International Residential Code:

#### **WAC 51-51-2300 Section M2302—Photovoltaic solar energy systems.**

**M2302.2 Requirements.** The installation, inspection, maintenance, repair and replacement of photovoltaic systems and all system components shall comply with the manufacturer's instructions, sections M2302.2.1 through M2302.2.3, NFPA 70, and the IFC as amended by Washington State.

**M2302.2.1 Roof-mounted panels and modules.** Where photovoltaic panels and modules are installed on roofs, the roof shall be constructed to support the loads imposed by such modules.

**EXCEPTION:** The roof structure shall be deemed adequate to support the load of the rooftop solar photovoltaic system if all of the following requirements are met:

1. The solar photovoltaic panel system shall be designed for the wind speed of the local area, and shall be installed per the manufacturer's specifications.
2. The ground snow load does not exceed 70 pounds per square foot.
3. The total dead load of modules, supports, mountings, raceways, and all other appurtenances weigh no more than four pounds per square foot.

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4. Photovoltaic modules are not mounted higher than 18 inches above the surface of the roofing to which they are affixed.
5. 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.

Roof-mounted photovoltaic panels and modules that serve as roof covering shall conform to the requirements for roof coverings in Chapter 9. Where mounted on or above the roof coverings, the photovoltaic panels and modules and supporting structure shall be constructed of noncombustible materials or fire-retardant treated wood equivalent to that required for the roof construction.

### Recommended Building Permit Process – Over the Counter

To support implementation of the emergency rule, a checklist template is available for adoption by jurisdictions having authority throughout the state. This checklist is provided as an example process that complies with the new code change requirements and is not required for jurisdictions to adopt. The checklist identifies the minimal structural characteristics that the proposed solar photovoltaic system must satisfy in order to be deemed to comply with engineering requirements. If all of the checklist criteria are met and a site plan is provided, the building permit can be issued over-the-counter (on-line or in person) without providing an engineer's stamped drawing, and the inspector in the field can easily verify the system design.

As an alternative to the over-the-counter process, jurisdictions may opt to exempt solar photovoltaic systems that satisfy the checklist criteria from building permit requirements. For example, the City of Bellevue passed an ordinance amending the Bellevue City Code to eliminate the permit requirement for standard rooftop solar PV installations. See:

<http://www.bellevuewa.gov/Ordinances/Ord-6113.pdf> and  
[http://www.ci.bellevue.wa.us/solar\\_photovoltaic\\_systems\\_permitting.htm](http://www.ci.bellevue.wa.us/solar_photovoltaic_systems_permitting.htm)

### Recommended Building Permit Fees

Jurisdictions should establish fees that are reasonably necessary to cover the costs of administering and enforcing the provision of this rule. In order to obtain statewide consistency, the following methods are provided as a suggestion in developing the cost structure for a local jurisdiction.

1. **Fixed fee.** For systems that qualify for the over-the-counter building permit process, it is recommended that a flat fee be charged for the permit. The amount of the fee should be calculated so that it is sufficient to cover the cost of checklist review and a single inspection. For example, the City of Edmonds has implemented a flat fee of \$135 for over-the-counter residential solar installations. (<http://edmondswa.gov/additional-links/rooftop-solar-installations.html>)
2. **Valuation based fee.** For systems that do not qualify for the over-the-counter building permit process, it is recommended that a valuation-based fee be charged for the permit. Costs for building permits are often based on the total project cost, assuming that the

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cost of the project accurately represents the scale of the project and the level of permit review required. However, with a rooftop solar photovoltaic installation, the equipment costs are much higher than with conventional projects of similar scope. It is therefore recommended that the permit fee for a rooftop solar photovoltaic system be calculated based on a valuation of the structural components and labor only. The value of the electrical components, including the solar modules and inverters, is subtracted from the overall valuation because these elements are not looked at as part of the structural inspection.

### Recommended Electrical Permit Process

In addition to building permit requirements, solar photovoltaic systems will require some level of electrical permitting in order to be installed. For jurisdictions that use their own electrical reviewers and inspectors, a checklist is available to use in determining when a solar photovoltaic system qualifies for an over-the-counter electrical permit. The over-the-counter checklist includes a set of electrical one-line diagram templates and is intended to simplify the application process and minimize the need for detailed plan review. If all of the checklist criteria are met and one-line diagrams are provided, the electrical permit can be issued over-the-counter (on-line or in person) and the inspector in the field can easily verify the system design. The checklist and templates are provided as an example process and are not required for jurisdictions to adopt. The Department of Labor and Industries will also accept the electrical diagram templates for their review and the over-the-counter process created here does not change their authority.

### For more information

To obtain electronic versions of the templates that can be modified for jurisdiction use or for questions related to the code change, contact:

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