## Summary Table – IFC Solar Provisions

## Prepared for Solar Technical Advisory Group

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**Please Note:** The comments and observations in this outline are my own. Other solar professionals on the advisory group may have observations or comments that differ from my own. I have provided this outline as a way to start our discussion about the issues present in the solar provisions of the 2012 IFC.

**General Notes:** The marking and DC conductor location requirements should not pose much difficulty for solar installers. The commercial requirements for ventilation and access pathways also should not be a problem for the solar industry if limited to large solar roof top installations. However, the access, pathway, and ventilation requirements, and permit requirements are unduly burdensome when applied to residential structures with sloped roofs. In my opinion the CA Solar PV Guidelines and the IFC Solar Provisions did not adequately consider the impacts of these code provisions to these types of small scale installations.

Additional Note – Fighting fires from residential rooftops: The solar TAG members are likely aware that many fire jurisdictions in Washington State have chosen not to fight fires from the roofs of burning buildings. The best practices literature also notes that modern trusses also fail quickly when exposed to fire. These trusses are designed for all situations, except for fire.

There is an underlying assumption of the CA Guidelines and the IFC that firefighters need to access all roofs in the event of a fire. I believe we can provide reasonable access to residential and commercial roofs with code provisions simpler and easier to implement than are currently contained in the IFC section 605. This task becomes even more important and similar code provisions are being incorporated into other international codes.

Code Reference	Summary	Significance and Impacts to Solar PV
605.11.1 Marking.	Materials used shall be	DC circuits cannot be shut off
Marking is required on interior and	reflective, weather resistant and	when the sun is shining and
exterior direct-current (DC) conduit,	suitable for the environment.	may be energized by spot
enclosures, raceways, cable		lights used during night time
assemblies, junction boxes,	Shall contain the words	fire fighting operations.
combiner boxes and disconnects.	"WARNING: PHOTOVOLTAIC	
	POWER SOURCE."	This section not a problem
		for solar PV installers.
	Shall be placed adjacent to the	Generally these labeling
	main service disconnect.	requirements should not be
		unduly burdensome for PV
	Marking shall be placed every 10	industry to comply with.
	feet, within 1 foot of turns or	
	bends and within 1 foot above	
	and below penetrations of	

WARNING     ELECTRICAL SHOCK HAZARD     DO NOT TOUCH TERMINALS.     TERMINALS ON BOTH LINE AND     LOAD SIDES MAY BE ENERGIZED     IN THE OPEN POSITION	roof/ceiling assemblies, walls or barriers.	
DC VOLTAGE IS ALWAYS PRESENT WHEN SOLAR MODULES ARE EXPOSED TO SUNLIGHT		
<image/>	Conduit, wiring systems, and raceways for DC 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 to take 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. Conduit shall run along the bottom of load bearing members.	This section is focused on reducing trip hazards for firefighters accessing a roof. Standards somewhat subject. Not necessary for sloped roofs? Sloped residential roofs commonly have no surface mounted conduit on the roof, as it is ugly. Conduit runs typically are directed through eaves or run through attics. Surface mount conduit runs are more of an issue for flat commercial roofs. Alternative: If one clear accessible pathway is provided on one roof surface, are these provisions even necessary for sloped roofs? While these standards seem common-sense, they are also somewhat subjective. Conduit run locations are often determined by the installation crew during construction. This section could create unduly burdensome permit processes for residential solar installations on sloped roofs?
605.11.3 Access and pathways - Exceptions.	<ul> <li>Prohibition: Residential PV systems shall not be greater than 150 feet x 150 feet.</li> <li>Exception from peak setback: Fire official can allow solar Depaked with the set the set to the se</li></ul>	Max residential system size not a problem for solar installers. The max 150' dimension should not be a problem. It is hard to imagine a residential roof larger than

Above: shading on site often makes the peak roof area the best location on the home for solar production.	the roof ridge where an alternative ventilation method has been provided or where vertical ventilation techniques will not be employed.	Practical difficulty for solar PV installers: The fire official exemption is subjective and creates a burdensome process if the setback provisions are not revised. The top of the roof is the best location for solar modules – least shaded. There are typically always alternative ventilation method locations. This code should ensure that there is an alternative location. Alternative: If access to peak is deemed necessary for code, require one accessible
Above: if back side of roof is accessible, why not allow south side to be fully utilized for solar array.		pathway to be preserved on any roof. The access provisions could be greatly simplified and made easier to administer.
605.11.3.2.4 Residential building smoke ventilation – Peak Setback	Panels/modules installed on residential buildings shall be located no higher than 3 feet below the ridge in order to allow for fire department smoke ventilation operations.	<ul> <li>Practical difficulty for solar installers:</li> <li>1. The peak is the best location for solar modules – least shade.</li> <li>2. On a hip roof, could leave virtually no viable solar options.</li> <li>3. Usually the other side of the roof is available for peak access.</li> <li>4. 3 ft. peak setbacks could create ice dam problems in the winter in higher elevations and in eastern Washington.</li> <li>Suggested alternative:</li> </ul>
605.11.3. – Residential Hip Roofs	Residences with Hip Roofs	Ensure one accessible route to the peak on a non-solar roof. Burdensome requirement
•	Requirements: a 3-foot-wide	for solar PV: Hip roofs by

	clear access pathway from the eave to the ridge on each roof slope where solar panels 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.	their nature provide less area for a solar installation. Requiring a 3' foot pathway to the peak on one side of the roof as shown in the photo would eliminate 4 modules, or 40% of the system. There is normally access to the peak on the other 3 roof planes.
	<b>Exception:</b> not required for roofs with slopes of 2:12 or less.	Suggested alternative: Ensure one accessible route to the peak on a non-solar roof.
605.11.3.2.3 Residential buildings with roof hips and valleys.	Solar panels/modules installed on residential buildings with roof hips and valleys shall be located no closer than 18 inches to a hip or a valley where panels 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 that is of equal length, the panels shall be permitted to be placed directly adjacent to the hip or valley.	<ul> <li>Practical difficulty for solar installers: Roofs with hips and valleys are smaller in area. These setbacks further reduce the available solar area.</li> <li>Suggested alternative: Focus on creating one accessible roof route rather than require access routes on all roofs.</li> </ul>
	<b>Exception:</b> These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.	
605.11.3.1 Residential 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.	Burdonsome for solar PV installers: If the access provisions will be applied to all roofs, this section further limits the part of a roof a solar PV system may be located on. Suggested alternative: If at least one access pathway is designated to the roof peak then this section less of a problem.
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 access pathways from the eave to the ridge on each roof slope where panels/modules are located.	<ul> <li>Practical problems for solar</li> <li>PV: <ol> <li>2 pathways</li> <li>significantly reduces</li> <li>available solar area</li> </ol> </li> <li>If north side of roof <ul> <li>available, why would it</li> <li>not suffice for access</li> </ul> </li> </ul>

	<b>Exception:</b> This requirement shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.	<ul> <li>What constitutes a single ridge?</li> <li>This section is unduly burdensome and could be difficult to interpret.</li> </ul>
605.11.3.3 Other than residential buildings. – Access Provisions	Exception: Where it is determined by the fire code	Practical difficulties for solar installers: The 6' or 4'
Sullaings. Access Hovisions	official that the roof configuration is similar to that of a one- or two- family dwelling, the residential access and ventilation shall be permitted to be used.	perimeter requirement is unduly burdensome for small commercial installations. Many businesses, especially in rural areas are in residential scale buildings.
	605.11.3.3.1 Access. There shall be a minimum 6-foot- wide clear perimeter around the edges of the roof	<b>Alternative:</b> establish a threshold above which greater access provisions are required. Flat roofs have
Above: Jarge commercial	<b>Exception:</b> Where either axis of the building is 250 feet or less	greater need for specified
installations are in a different class	there shall be a minimum 4-foot-	and smaller commercial
than residential systems and	wide clear perimeter around the	buildings could have a single
IFC are more applicable	edges of the roof.	roof.
605.11.3.3.2 Non-residential	1. The pathway shall be over	This section not a problem
Pathways.	<ul> <li>areas capable of supporting the live load of fire fighters accessing the roof.</li> <li>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.</li> <li>3. Shall be a straight line not less than 4 feet clear to skylights or ventilation hatches.</li> <li>4. Shall be a straight line not less than 4 feet clear to roof standpipes.</li> <li>5. Shall provide not less than 4 feet clear around roof access hatch with at least one not less than 4 feet clear pathway to parapet or roof edge.</li> </ul>	for solar installers. Provided the threshold is not set too low, these requirements should not pose a problem for large commercial solar installations. The CA guidelines are more on target for these kinds of structures.

605.11.3.3.3 Smoke ventilation – Nonresidential buildings.	<ol> <li>Arrays shall be no greater than 150 feet by 150 feet in distance in either axis in order to create opportunities for fire department smoke ventilation operations.</li> <li>Smoke ventilation options between array sections shall be one of the following:</li> <li>A pathway 8 feet or greater in width.</li> <li>A 4-foot or greater in width pathway and bordering roof skylights or smoke and heat vents.</li> <li>A 4-foot or greater in width pathway and bordering 4-foot by 8-foot "venting cutouts" every 20 feet on alternating sides of the pathway.</li> </ol>	This section not a problem for solar installers. Provided the threshold is not set too low, these requirements should not pose a problem for large commercial solar installations. The CA guidelines are more on target for these kinds of structures.
<image/>	Ground-mounted photovoltaic arrays shall comply with marking and DC conductor location requirements. Setback requirements shall not apply to ground-mounted, free- standing photovoltaic arrays. A clear, brush-free area of 10 feet (3048 mm) shall be required for ground-mounted photovoltaic arrays.	<ul> <li>10' setback creates practical difficulty for solar homeowners, homeowner associations, and zoning codes. The 10 ft. vegetation setback is a bit mysterious. Homeowners may want to screen the backside of the solar array from view. Live plants are not a threat of fire. A PV system is not really a threat of ignition. The CA guidelines are not clear regarding the purpose of this section. Zoning codes or homeowner associations may require screening of back side of solar array.</li> <li>Also, "brush" is not defined by the code. Plants over 3' in height? What is the setback applicable to???</li> <li>Alternative: Solar PV is no more a threat to catch fire than any other structure or piece of equipment. 10 ft. setback is arbitrary does not seem necessary.</li> </ul>