Product Bulletin:

Ice Rail for Solar Structures

Overview

Solar canopies or solar carports are an attractive alternative to rooftop solar installations, particularly for highly visible institutional and commercial installations. Solar canopies and particularly canopies in parking lots can be favorably oriented and sized to accommodate large commercial and utility scale solar arrays but a key consideration is snow and ice removal from around and underneath the solar canopies. This product bulletin addresses the considerations regarding snow and ice, including the options for adding an ice rail at the lower eave to prevent shedding snow or ice.

Application

If designed and installed properly, Solar Canopies provide 20 to 25 years of no or low maintenance service as solar structures. They are "green" structures in that they not only elevated solar supports but provide shade to parking lots which are otherwise heat sinks during the summer. Solar canopies or equivalently solar carports generally do not have a roof system under the solar panels. The solar modules act as the roof but by design, they are not intended to be waterproof and instead allow water and dappled sunlight to harmlessly pass through. In this respect, solar canopies do not materially impact the permeability or rain run-off of parking lots. And there are other benefits as well. The structures qualify as part of the Investment Tax Credit and the open roof area allows modules to operate more efficiently at lower temperature during the summer. But for solar installation within the snow-belt, there is concern among owners about the potential for shedding snow.

Design and Considerations for Snow Removal

The standard clearance for most parking canopies including solar canopies is 8'-6". This allows ample clearance for most all vehicles while still providing some protection from the elements, namely snow, sun and rain. Solar canopies are typically tilted at about 5 degrees toward a southern azimuth so the upper eave is considerably higher, often over 12' or 13'.

During a heavy snow, it is not unusual to see less snow build-up on the canopies relative to the ground. As an elevated structure, wind will naturally swirl around the roof and drifting / accumulation is less likely to occur.

More important, when the sun comes out and with southern orientation, the modules heat up relatively quickly which causes the snow to melt. Typically, a watery interface will occur between the module surface and snow cover causing the mass to slide.

Since the modules are typically installed with a 1" gap (between adjacent modules) the fully or partially melted snow will shed harmlessly through the array. Unlike rooftop installation where the roof under the modules allows the snow to key in and refreeze, the snow clears easily from solar canopies without forming icicles. Moreover, the gap between modules acts as a snow block and does not allow the snow to shed or avalanche off the entire roof. Accordingly, only the module nearest the low eave is typically prone to shedding snow or ice.

5 degree slope, (standard) 8'-6" clearance structures 1 day after 22" snowfall

Ice Formation

Ice storms are particularly dangerous and can cause problems on trees, power lines, buildings, ledges, roofs, cell towers or just about any structure including solar canopies. Depending upon conditions, ice can and will form on just about any structure. And when it melts, it typically sheets off the building surfaces within a narrow time period during a thaw. In some cases, sidewalks have to be closed as a precaution against falling ice and there is no building code provision to govern this. While rare, solar canopies are no exception. There may be times when ice can form on the surface of solar modules and sheet off in thin layers.

Ice Rail

Structural Solar LLC addresses this need by manufacturing and installing an Ice Rail. The design intent is to create a lightweight and attractive rail that when installed is slightly higher than the surface of the solar module at the lower eave. Connections are slotted and allow the rail to be adjusted up or down for individual preference and without shading the module. Moreover, there is a gap between the lowest

module and the rail which allows snow to shed normally off the lowest module. However, if a sheet of ice shears off the module surface, it will hit the rail, fracture and fall below in pieces.

The rail is aluminum and matches the finish of the other adjacent solar rails. Photos of the solar rail are shown below. The can be installed as part of the initial project or retrofitted to existing Structural Solar Canopies.

Photos