Proper Loading for Solar Panels

As the "Green" movement progresses and energy prices go increasingly higher, more and more homeowners and commercial developers are looking to utilize photovoltaic panels (solar panels) to help get them "off the grid." It may seem that designing for solar panels is as easy as finding out how much the panels weigh, and adding point loads to their roof trusses either in the design phase, or in a repair. Unfortunately, it is not always this simple. Some applications of solar panels do lay flat on the top chord of supporting trusses and thus, create a uniform load and not point loads, however this simple case is not the subject of this article. Typically, a key selling point that a solar panel installer has is that he/she can minimize roof penetrations, thus reducing the possibility of roof leaks. While this may help reduce the likelihood of leaks, it can often create large point loads on the supporting trusses.

Before explaining some of the intricacies of how solar panels interact with roof trusses, you should be aware that if you are sending a repair or seal to MiTek that is the result of the installation of solar panels, your engineer at MiTek will ask that an independent engineer or qualified persons specify the loading for the panels. It is up to the independent engineer or qualified designer to determine if the resultant loads shall be considered as point loads or uniform loads, as well as the magnitude of those loads.

In residential applications, one typically has a pitched roof in which solar panels are mounted parallel to the roof pitch. If the roof has a low slope, the gravity loads of the solar panels can be magnified as the solar panel may hold snow, thus causing point loads from snow rather than a uniform load. The same holds true for wind loading as the wind uplift is accumulated through the solar array and directed to the posts that support the solar panel. Also, depending on the roof geometry, the solar panel may act as a sail and catch wind from under the panel thus creating very high uplift loads.

In many commercial applications, solar panels are put on flat roofs. In order to achieve higher efficiency, the photovoltaic panels will be posted to the roof such that the panels are at a pitch that will be angled toward the sun. With this geometry, snow can accumulate on the solar array, but can also slide off of the panel thus creating a drift on the low side of the panel. Also, wind can create many different loading scenarios.

Yet another concern that can come into play is that solar panels are often attached to trusses with lag screws that must land in the center of a 1.5" wide top chord. Depending on the diameter of the connector, a repair may be required due to the section loss of the wood in the top chord. MiTek recommends that all connections of solar panels be made into blocking that is run between trusses. This not only prevents the drilling of trusses, but also distributes any point loads between two trusses, thus decreasing the severity of any repairs.

All in all, the design and/or repair of roof trusses while adding solar panels is not something that is to be taken lightly. There are a lot of loading scenarios that should be examined. As always, if you have any questions about the topics covered in this article, give your MiTek engineer a call and he/she will be glad to help you out!