



Zep System II

Supplemental Installation Techniques



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1.0 > Supplemental Overview

This guide provides additional techniques and hints for installing Zep System II PV mounting systems not found in the Zep System II Installation Manual. It is not intended to replace the installation manual and should be read after reading the installation manual in its entirety. For questions about this document or any other technical aspect of Zep System II, please call Technical Support at (415) 479-6900, available to answer questions from 9-5 PST.

2.0 > Roof Attachment Solutions

NOTE: It is the responsibility of the designer/installer to ensure that the structure upon which the array is being mounted is structurally sound and that all roof attachments have been properly evaluated to meet withdrawal strength based on the system design, site location and application. Roofing materials that show wear and are near the end of their service life (less than 5 to 7 years of life remaining) should be carefully evaluated prior to the installation of a solar electric system. In some cases, it may be prudent to re-roof the structure or at least the roof section where the modules will be mounted prior to the installation of the solar electric system.

Zep System II can be installed on most types of sloped roofs. When deciding on the type of attachment solution to employ, it is important to understand that rail-free systems (as well as shared rail systems) include a mounting foot that is in line with the module edge along one axis of the array. For example, when installing Zep with a north-south drop-in action (see below), the Leveling Feet will always fall along the east-west seams. Accordingly, east-west drop-in arrays will include Leveling Feet along the north-south seams. This fact ultimately means that the attachment solution chosen needs to provide some flexibility along at least one axis in most situations.

2.1 > Composition (Asphalt Shingle) Roof Applications

Zep System II can be installed on any composition shingle roof using the Zep Solar Comp Mount flashing or by mounting the Leveling Feet directly to the roof. The Zep Solar Comp Mount (which is produced by QuickMount PV for Zep) provides flexibility to mount the Leveling Feet anywhere along the course of shingles while virtually eliminating the need to cut the shingles. Other flashing systems (i.e. Eco Fastener, TTI, etc.) or standoffs with flashings can be used with Zep System II as well, but more care must be taken to ensure that the measurements between flashings are precise.



2.2 > Metal Roof Applications

Corrugated Metal

Zep Solar is currently developing attachment solutions for corrugated metal. In the meantime, we recommend using small sections of Unistrut to span two to three peaks of the corrugation (depending on the wind load requirements) and attach to purlins or rafters. Ensure there is galvanic separation between dissimilar metals.

Trapezoidal Metal

Depending on the thickness of the metal used in the trapezoidal profile, you can either use an off the shelf product like the Schletter Fix 2000 or use Unistrut to span across the peaks and attach appropriate hardware to both ends of the span. When using products like the Schletter Fix 2000, attach the Leveling Foot directly to the attachment and ensure there is galvanic separation between all dissimilar metals.

Metal Standing Seam

Off the shelf products such as S-5! Clamps (<http://www.s-5.com/clamps/index.cfm>) can be used to attach the Zep System II Leveling Feet to most standing seam roofs, eliminating the need for additional roof penetrations. For applications where the S-5! Clamps are not appropriate, the Leveling Feet can be attached directly to the pans of the standing seam roofs where they meet the rafters. As always with metal roofs, ensure there is galvanic separation between dissimilar metals.

2.3 > Tile Roof Applications

Zep System II can be installed on a variety of tile profiles and materials including curved and flat tiles, concrete, terracotta, and slate tiles.

Standoffs

Zep Solar has co-developed a custom version of the QuickMount PV Flat and Curved Tile flashings which incorporates a special swing arm to provide greater flexibility when attaching the Leveling Feet along the north south dimension of the roof (<http://www.quickmountpv.com/products/curved-tile-mount.html>).

Off-the-shelf standoffs can also work well. In this case we recommend using an all-metal flashing and adding a Unistrut flat plate fitting to the top of the standoff that will allow for greater flexibility when installing the Leveling Feet.



Hanger Bolts

Drill-through solutions such as hanger bolts can also work well. If using hanger bolts, we recommend using the EJOT bolt with the adapter sheets, also allowing for greater flexibility. (http://www.ejot.com/ejot.de/Fastening_Systems_for_Solar_Installations--4357.htm)

Tile Hooks

Zep Solar will soon be offering a unique tile hook that will eliminate the need to cut tiles in most applications and speed up the installation process. In the meantime, you can use off-the-shelf tile hooks in combination with Unistrut running North-South. This method reduces the number of penetrations and allows for the Zep Leveling Feet to attach anywhere along the N-S dimension.

Tile Removal

In cases where aesthetics are critical or where clay tile or lightweight tile is used, we recommend removing the tiles from the roof and re-roofing with composition shingles. After the Zep System is installed on the Composition shingles (see above for recommended methods), lay the tiles around the array for a building integrated appearance.

Wood shake roof

Zep System II can be installed on a wood shake roof using the QuickMount PV Shake Mount flashing. The installation technique is similar to that of the Zep Comp Mount.

2.4 > Flat Roof Applications

Zep System II is not currently appropriate for flat roof applications. Please review Zep System III for our product designed for flat roof applications.

3.0 > Installing on Steep Pitched Roofs

3.1 > Fall Protection

Working on roofs in general, and especially working on steep roofs, includes inherent risk and can lead to injury and death. Worker safety and fall protection are critical responsibilities of the installer/technician. Please consult the Occupational Safety and Health Administration (OSHA) construction standards for further details.



3.2 > Staging

Modules and equipment should be staged to ensure security and safety and to allow installers easy access to modules and hardware. Modules should be located far enough away from the work area that hardware or tools dropped by an installer cannot hit the staging area or damage a module.

3.3 > First Row Techniques

Start by installing flashings and/or standoffs or hooks per the manufacturer's installation manual. Then proceed to follow the Zep System II installation instructions using the attachments as anchors for the PV modules prior to installation.

When mounting the array directly to a comp roof (without flashings), consider installing all of the modules on the front row one at a time (instead of interlocking the first two, then attaching to the roof). To do this, you should install two (2) feet per module on the front row of feet.

4.0 > Drop-in and Pivot Lock Techniques

4.1 > Tolerance Takeup

Zep System II provides 0.200" of tolerance takeup at each seam parallel to the Interlocks. The seams perpendicular to the Interlocks provide up to 1" of takeup (since you have flexibility with exactly where you attach the Interlock in that direction). The 0.200" takeup mentioned above is derived from the fact that most PV modules include dimensional tolerances of about ± 0.100 ".

When installing an array it is important to ensure proper module alignment as each module is mounted. Luckily, with Zep this is very easy to do! When installing the front row, care should be taken to get the modules reasonably straight. Then, for all subsequent rows, we recommend that you drop the module all the way in and immediately check to see how it aligns before attaching the Leveling Foot to the roof. If you find some misalignment, it can easily be fixed now by lifting the module back up and pulling or pushing the module to seat it in the correct spot on the tongues below.

4.2 > Top down installation

In some instances, it may be desirable to install modules closest to the ridge first and then continue to install the remaining modules towards the gutter. In those instances, the lower edge of the top



row of modules should be installed with Interlocks and Leveling Feet such that the Zep key faces up roof and the Zep tongues face down roof. Once this is achieved, the next row of modules may be dropped “up” from below as you work your way down the roof. The finished array will look exactly like a standard top-down drop-in array except that everything has been rotated 180°.

4.3 > East-West Drop-in

In situations where the attachments are made to structural members that run east-west on the roof such as with purlins and battens, we recommend installing the array in the East-West direction (i.e., the first modules installed are in a column along the east or west edge of the roof). All hardware is then installed along the north-south seams of the modules and modules are dropped in from the east to the west or vice versa. All other instructions are the same as the standard drop in method (north-south).

4.4 > Helpful Hints

If the Module is “popping” off the Zeps when attempting the drop-in and pivot procedure, adjust the height of one or more of the Leveling Feet to ensure the Module is dropping in on a single plane. Once adjusted such that both Leveling Feet are at the same height, the Drop in procedure will be much smoother.

5.0 > Wire Management Techniques

NOTE: Please refer to the PV module manufacturer’s instructions for details regarding the wiring requirements for the particular PV modules that you are using.

The Zep System has been designed to increase the speed and enhance the safety of PV array wiring systems. As discussed in the Zep System II Installation Manual, Zep Wire Clips are inserted into the Zep Groove as each module is being installed.

5.1 > Series Wiring

When wiring two modules in series across their long sides or end-to-end (across their short sides), we recommend utilizing a first Zep Wire Clip to secure each wire as close as possible to its module j-box. A second clip can then be connected to the wire and slid down the Zep Groove until all of the slack is out of the wire. This technique enables you to eliminate drooping wires without tugging on the wire’s connection point to the module j-box (which could cause a failure).



In some cases it may be advantageous to “touch up” the wire management after the array has been installed. With the Zep Wire Clip this task is made easy by simply using a screw driver or other reasonably flat tool to sneak between the modules and gently tap the Wire Clip to slide it along the groove, thereby removing slack from the wires.

5.2 > Home Runs

Home run wiring may be routed in existing clips that you've already installed for series wiring (by utilizing the vacant portion) or by installing new clips.

5.3 > Wire Management if Module Leads are too Short

Currently there are some Zep Compatible modules on the market (such as Canadian Solar CS-6P) that include output cables that are too short to reach the long side Zep Groove when wiring end-to-end. In cases like this, we recommend that you install one wire clip in the short side Zep Groove in a location close to the module J-box. Once both modules being wired together have been fully mounted, then use a screw driver or other reasonably flat tool to slide the clip (as discussed above). However, please exercise extreme caution when performing this task since it is not possible in this case to include a second clip that is acting like a strain relief. Thus, one end of the wiring will be pulling on the module J-box (there is no avoiding this condition since the wires are too short).

5.4 > Home run routing

Wire transitioning options (transitioning wire types & roof combiner boxes, ie Soladeck, Zep Groove mounted solutions, etc.)

5.5 > Grounding Array During Installation

Since Zep System II automatically bonds module frames together as they are being installed, increased safety can be realized by connecting a Ground Zep to the first module, then running it to the grounding system for the building. All modules in the array will now be grounded before they have been electrically connected together, reducing the risk of injury.



6.0 > Field Installation of Micro-inverters and DC to DC Converters

6.1 > Enphase® Micro-inverters™

The Enphase inverters should be mounted as per the Enphase installation manual. The flange of the module frame will take the place of the rails. McMaster-Carr is a reliable source for all hardware recommended in this document. There are two methods that Enphase recommends for grounding: (1) use of a grounding washer between the Enphase inverter and the metallic mounting structure (PV Module flange in the case of Zep Compatible Modules) or (2) use of #6 bare copper conductor run through the ground lug of each inverter and back to the inverter. In the case of (1), Zep Solar recommends the use of stainless steel screw and washer and keeping the nut between the Enphase mount and the designated locations on the Module flange. Check with your local building department to determine which method is acceptable prior to installing.

6.2 > SolarEdge®

Zep is currently working with SolarEdge to develop a simple way to use SolarEdge products with Zep Compatible modules. In the mean time, please call us if you would like to use this product with Zep.

7.0 > Staggered Modules

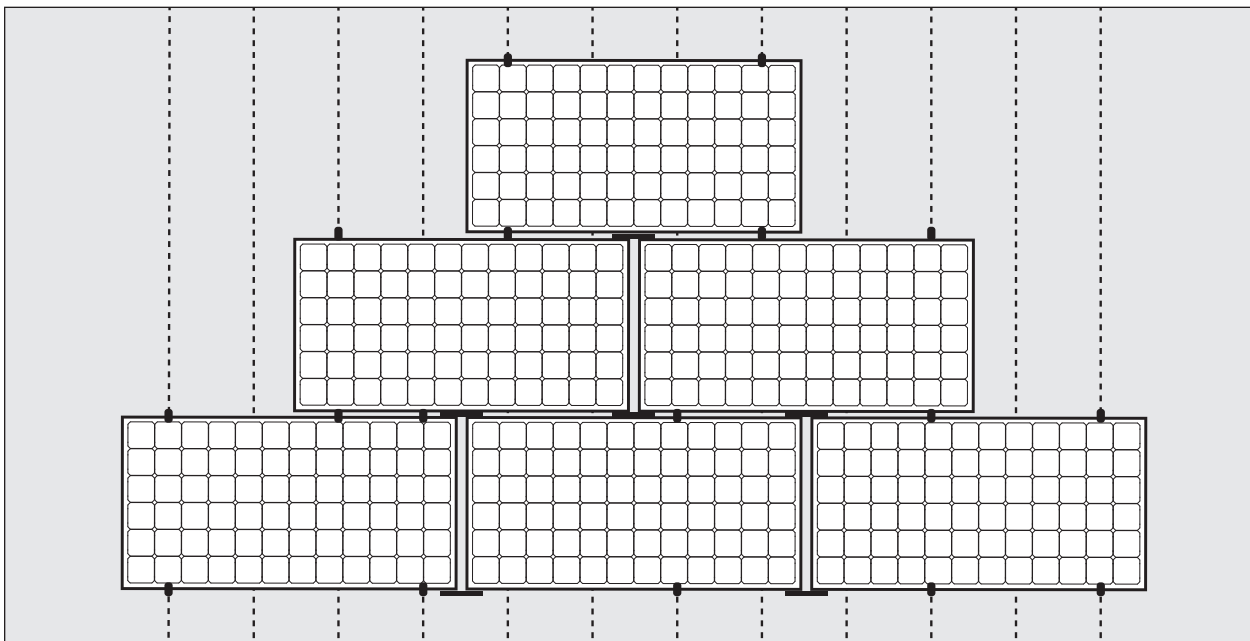


Figure 7.0 — Staggered Modules



Where PV arrays are installed on hip roofs, it may be desirable to stagger modules such that they are following the ridgeline of the roof. It is possible to stagger modules using Zep System II as long as the maximum foot spacing and maximum cantilever distances are in compliance . Interlocks must be installed at every north-south seam of the modules (as with standard installation procedures) and will therefore land on the middle of the module in some cases. (See Fig. 7.0 for reference)

8.0 > Installing Around Obstructions

Make sure that the foot spacing/cantilever rule is obeyed and each module is connected to other modules by at least 1 other Interlock for grounding purposes. (See Fig. 8.0 for reference)

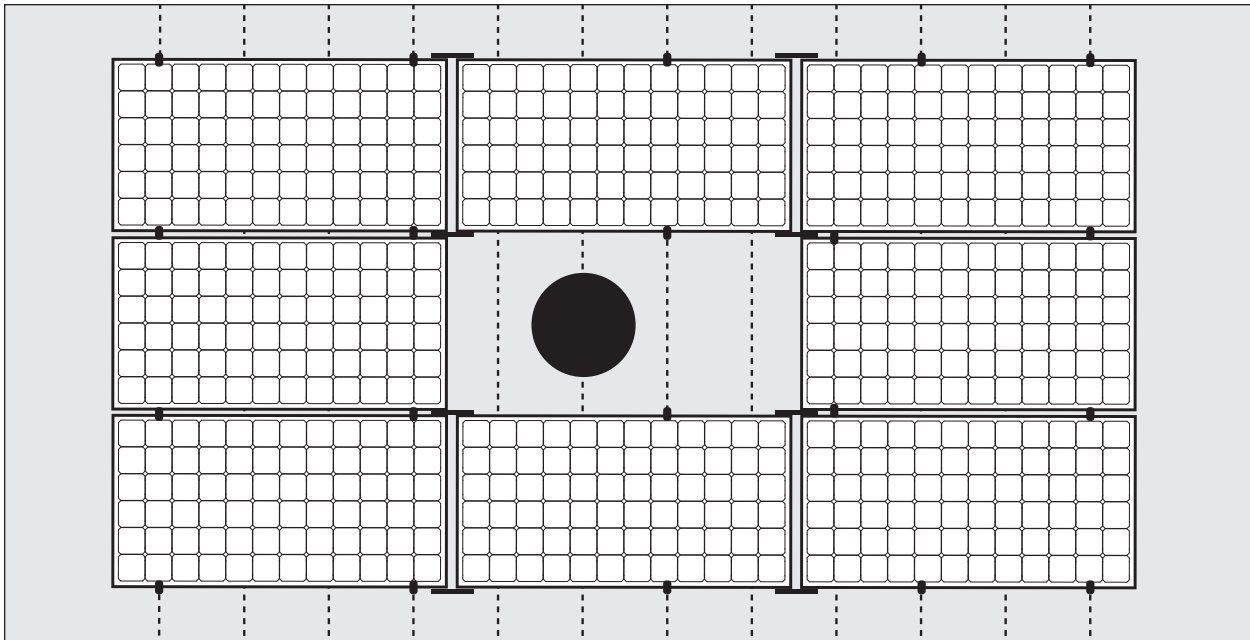


Figure 8.0 — Installing Around Obstructions

9.0 > Miscellaneous

9.1 > Single Column Installations and Grounding

Whenever modules are installed in a single column, an Interlock should be added in the middle of the Module up the column or along the North-South seam to properly ground all the modules to the rest of the array.



9.2 > Recommended Sealant

Geocel 2300.

9.3 > Cantilever Violation Remedies (sliding array, blocking, etc.)

Often times just moving the array a few inches in the EW direction will satisfy the cantilever rule and remove conflicts with interlocks. If this is not possible, blocking needs to be used so that the load from the Leveling Foot is properly transferred to the roof substructure.

9.4 > Attaching Leveling Feet to the End of a Module

At the end of a row, if a foot cannot be mounted to the end of the module because the distance to the rafter is too low (<2"), then it can be mounted on the side as shown by making sure that it obeys the maximum cantilever rule.

9.5 > Walking on Modules

Although modules are capable of handling loads imposed by walking, it is generally not recommended to walk on them. If you cannot avoid walking, please walk on the frames closest to the Leveling Feet.

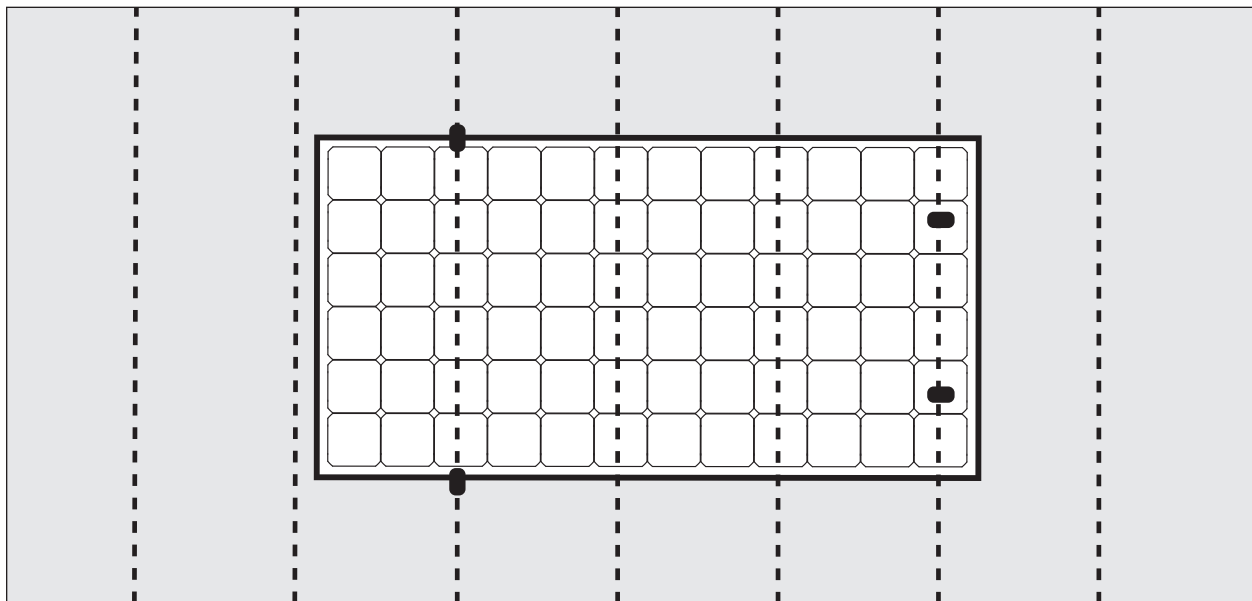


Figure 9.5—Walking on Modules