

# SILVERBACK INSTALLATION MANUAL

## R-SERIES SOLAR RACKS

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## INTRODUCTION

### THE SILVERBACK SOLAR® RACKING SYSTEM

The Silverback system was designed to simplify the process of building roof-top racking systems. Our bolt-together pre-manufactured system is easy to install and does not require any special skills. Your basic construction experience and this installation manual are all you need. We have reduced the normal learning curve for you by providing all the methods, tricks and tips we have developed over time for installing the Silverback system. When you follow this manual, you will be pleased at how fast and simple this system is.

### THIS MANUAL

This manual is designed to illustrate the basics of installing our Silverback R-Series Racking System. Every job is different and may require variations from procedures and materials shown in this manual. Examples shown are for illustrative purposes and may not match your specific project. Please review your shop drawings to ensure your installation complies with the project's requirements.

### APPLICATION

The Silverback R-Series Racking System is designed to be installed on flat to medium sloped roofs with any type of deck and framing system. However, this system is very versatile, and can be used in a variety of other conditions. It is important to understand that any installation requires engineering calculations by a licensed Professional Engineer to ensure its adequacy for specific conditions that apply.

## SYSTEM OVERVIEW

### COMPONENTS

The following components are for typical installations. Consult your shop drawings for specifics regarding your project and components that may not be included in this manual.

#### ROUND POST SUPPORTS

These are steel stanchions that mount the racking system to the roof structure. Round Posts are typically 12" tall and are used with telescoping sleeves and Slip-on Post Caps.



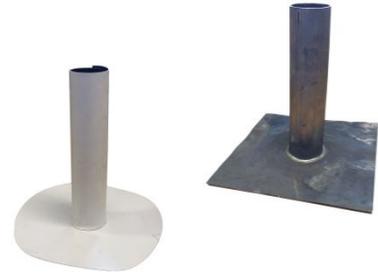
#### SLIP-ON POST CAP

Slip-on Post Caps are installed on top of the telescoping sleeves of the Round Post Supports to provide a watertight anchor point for other components.



ROOF FLASHING

Flashings, available in PVC, TPO and Lead, are optional components from Silverback. Check your order and shop drawings to determine if they were included.



EPDM PIPE COLLAR & SS DRAW BAND

Used to seal flashings to tubing sleeves on the Round Post Supports.



FIELD CONNECTOR

This fitting connects horizontal tubing to Post Caps.



TUBING

Tubing is 2.5" round and may be provided in 16ga or 11ga as required by structural calculations. It is important to carefully review the shop drawings to determine proper locations for each tube.



HAT SECTIONS

Hat Sections are typical steel members used as rails to support the solar modules.



TEK 3 SCREWS

S10 Tek 3 Self-Drilling Screws are the primary fasteners used on Silverback Racking. Tek 3 Screws have a short drilling point and are typically used when fastening to thin metal like tubing and hat sections. Multiple types and lengths of screws may be specified on the same project, so please carefully review your shop drawings.



TEK 5 SCREWS (PART NUMBERS VARY)

Tek 5 Self-Drilling Screws have a long drilling point and are useful for fastening to thick metal like steel joists and wide flange beams. Multiple types and lengths of screws may be specified on the same project, so please carefully review your shop drawings.



## PREPARATION

### MATERIAL HANDLING

When receiving material, check to see that the shipping documents match the shipment. Count the number of packages and quantities within each package to the extent possible. Check for damage at the same time. If damage or other discrepancies are found, write a note to that effect on the bill of lading, and have it signed by the driver.

Tubing and hat sections for large orders may be delivered via flatbed truck in bundles with metal bands. For smaller orders, tubing and hat sections may be in wood crates and delivered via flatbed or enclosed trailer. Fittings and hardware are packaged in heavy cardboard pallet crates. These materials are heavy and will require a fork lift or crane to unload.

- ! Do not lift bundles by the metal bands. Either use a fork lift from underneath, or use straps around the entire bundle.
- ! Do not lift wood crates by the slats or cross members. Either use a fork lift from underneath, or use straps around the entire crate.
- ! When using a fork lift, spread the forks as far as possible to balance the load. Drive slowly when moving long bundles over uneven surfaces to avoid tipping the load.
- ! When using a crane or any other type of hoist, position sling straps so that the space between straps is at least  $\frac{1}{3}$  the length of the bundle. Use sling straps with looped ends, running one end of the strap through the loop at the other end to cinch the bundle when lifted.
- ! When setting loads on the roof, put wood blocks under it to protect the roof and allow space to remove sling straps.
- ! Heavy bundles and crates should be spread out on the roof to avoid overloading the roof structure. Place materials directly over major supports such as beams or trusses.
- ! Bundles of tubing should be positioned parallel to the roof slope so they don't roll down-slope when unbundled.
- ! Use caution when cutting metal bundle straps as tension on the strap may cause it to spring up potentially causing injury.

### MATERIAL STORAGE

If material is going to be stored outdoors for any period of time, we recommend covering it with plastic or tarps. Bundles of tubing and hat section can be left uncovered if the load is raised at one end to allow water to run off.

## TOOLS

The following is a list of recommended tools to perform the installation:

1. 200' tape measure
2. String line
3. 6" "Torpedo" level
4. Construction crayon
5. Ear plugs
6. Safety glasses
7. Heavy duty extension cords
8. Large Vise Grip Clamps
9. Open end and socket wrench set
10. Power drill
11. ½" drive power impact driver
12. Cordless drill/driver gun
13. Self-leveling laser level with tripod.
14. Power skill saw with metal cutting blade
15. Reciprocating saw with metal cutting blade

## REVIEW SHOP DRAWINGS

At this point, it is a good idea to read this entire installation manual in conjunction with reviewing the shop drawings. The shop drawings are very detailed and contain specific information about how to properly install the system that may not be covered in this manual. It is highly recommended to obtain a full size print of the drawings so all of the details and dimensions are readable. The drawings will include one or more section details of the racking frames similar to the examples shown in Figures 1-3.

**Important:** Figures 1-3 are examples of a few common configurations out of the many possible with Silverback R-Series Racking. Consult your shop drawings for details specific to your project.

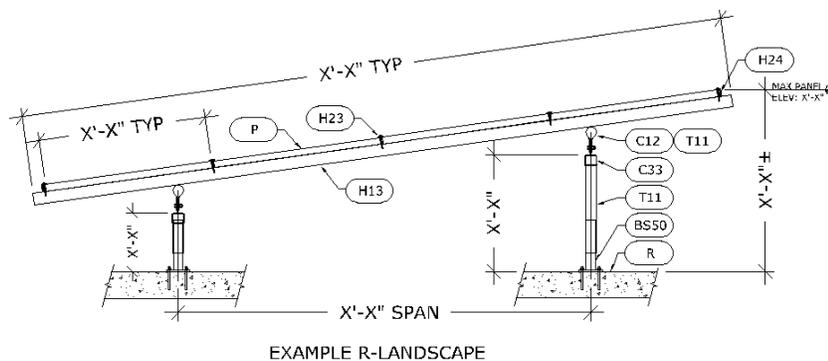
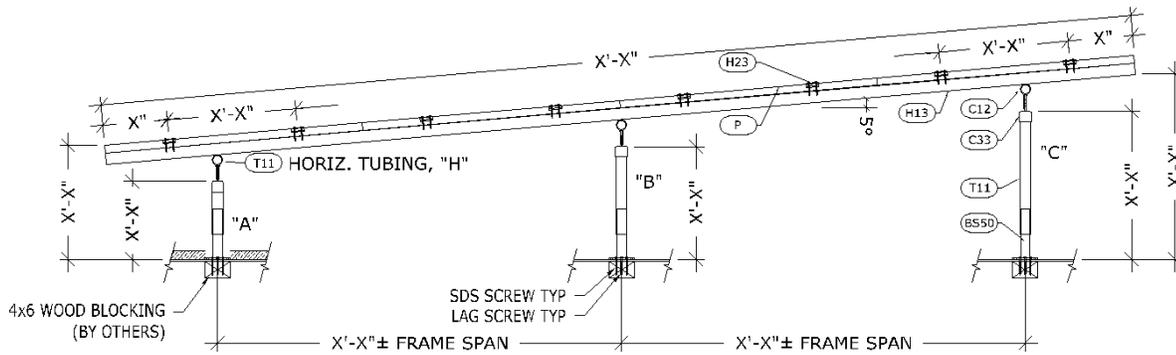
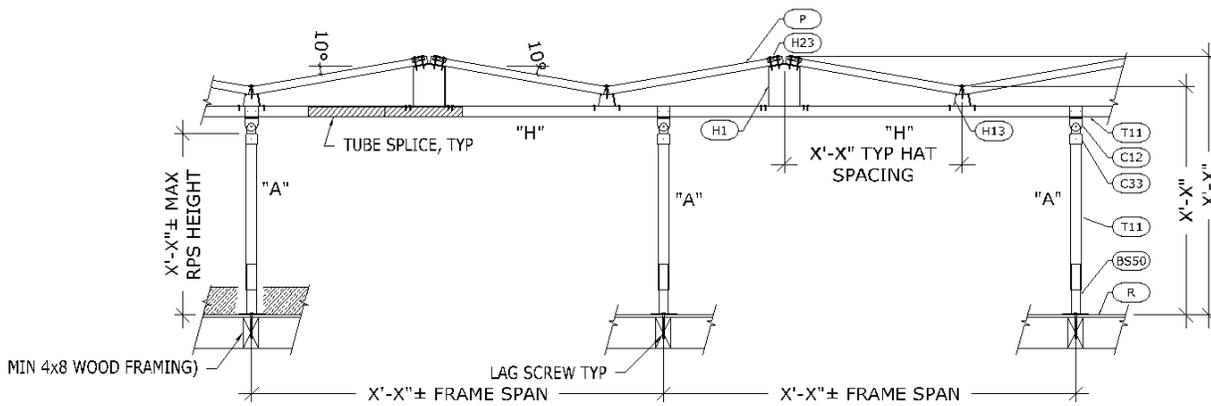


FIGURE 1



EXAMPLE R-PORTRAIT

FIGURE 2



EXAMPLE A-FRAME

FIGURE 3

Frame configurations shown on shop drawings are based on engineering calculations and should be followed exactly. If any parameters cannot be followed, please contact us at 877-765-2759 for assistance. Section details cross reference to the roof plan layout on the drawings. If multiple frame types are included in your project, it is important to ensure you build the frames to specifications in the details and place them in the correct locations in the layout. Please also note the callout bubbles on the details, which reference specification notes. These notes contain important information about the installation, including quantity and type of fasteners required for different components.

## INSTALLATION

This manual covers techniques and procedures for installing a typical Silverback R-Landscape Racking System (similar to the example shown in Figure 1). There are many variables that make each project unique. Please use this manual as a general guideline that covers basic concepts for installing our product. If you have a specific question that is not covered in this manual, or you would like some help with your installation, please feel free to contact us at 877-765-2759.

### STEP 1: INSTALL END FRAME POST SUPPORTS

Referring to array layouts in the shop drawings, place the Post Supports for the first and last frame in each array in their proper location (see Figure 4). Mount the end posts to the roof structure per requirements specified in the shop drawings. Pull a string line between end posts to line up remaining Post Supports. If the distance between corners is too far to use a string, you will need to use a laser level set up in vertical mode.

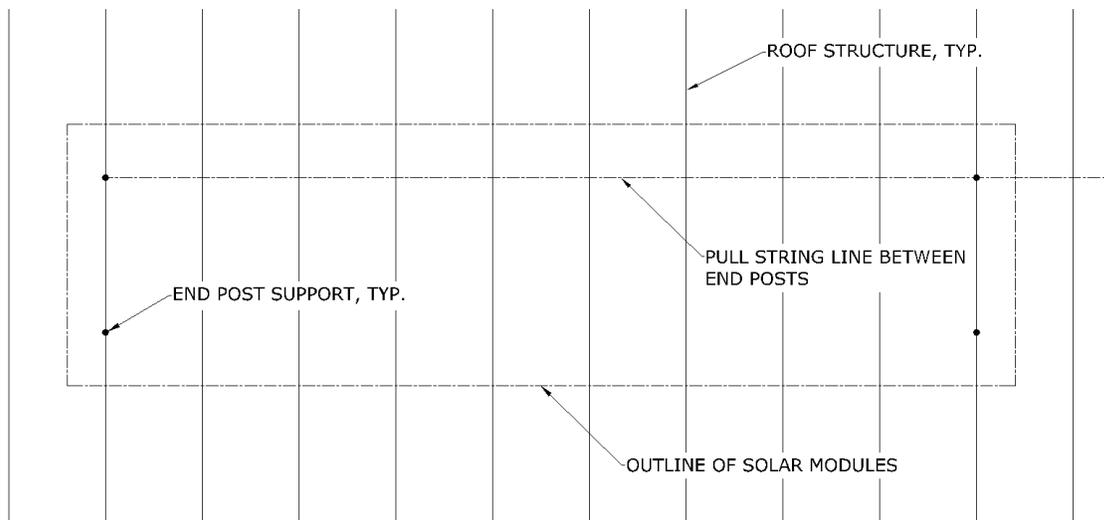


FIGURE 4

### STEP 2: INSTALL REMAINING POST SUPPORTS

Install the remaining Post Supports per the layout in the shop drawings. Post Supports should be installed true and straight using the string line between end posts as explained in the previous step. Post Supports must also be installed at the same height from one end of the array to the other.

Post Supports may be fixed height or two-piece adjustable height configurations depending on roof slope and how the project is designed.

**Fixed Height Post:** If your project is designed with fixed height posts, the roof deck must be completely flat, or all the posts must be on a single slope plane. To install fixed height posts, first mount the Round Post Support to the roof structure, lining up the top of each post with the string line installed in the previous step. After roof flashings are installed (see next step) each Post Support will receive a Slip-on Round Post Cap.

The Slip-on caps are secured to the tube with self-sealing Tek Screws (see Figure 5). Do not install the Post Caps at this time as they will interfere with flashing installation in the next step.

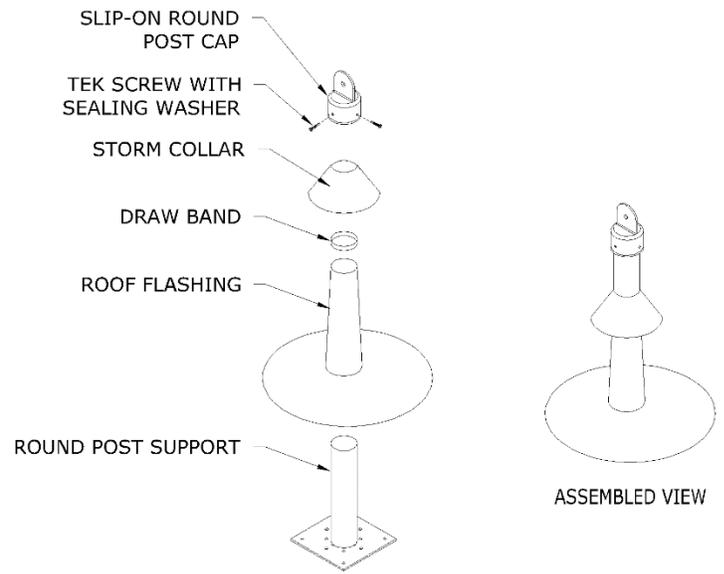


FIGURE 5

**Adjustable Height Post:** If your project has variable and/or multiple roof slopes, adjustable height posts are used. Adjustable post configurations include a Sleeve Tube that telescopes on the Round Post Support to allow height adjustment (see Figure 6).

To install adjustable posts, first mount the Round Post Support to the roof structure. Next, slip the Sleeve Tube over the post and adjust the height to follow the string line as illustrated in Figure 7. Holding the Sleeve Tube at the proper height, fasten it to the post with Pan Head Tek Screws. The quantity of screws to use will be specified on the shop drawings. The Sleeve Tube will have a minimum required distance it must overlap the Post Support, which is also specified on the shop drawings.

After roof flashings are installed (see next step) each Post Support will receive a Slip-on Round Post Cap. The Slip-on caps are secured to the tube with self-sealing Tek Screws. Do not install the Post Caps at this time as they will interfere with flashing installation in the next step.

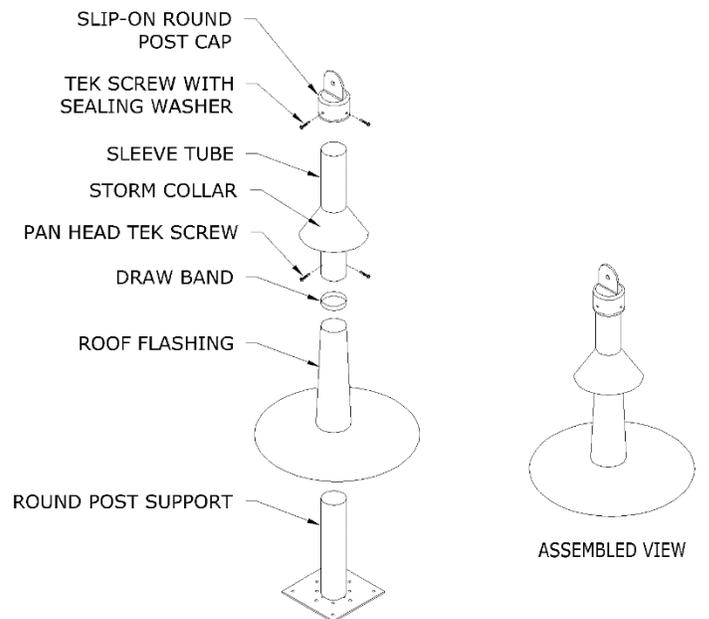


FIGURE 6

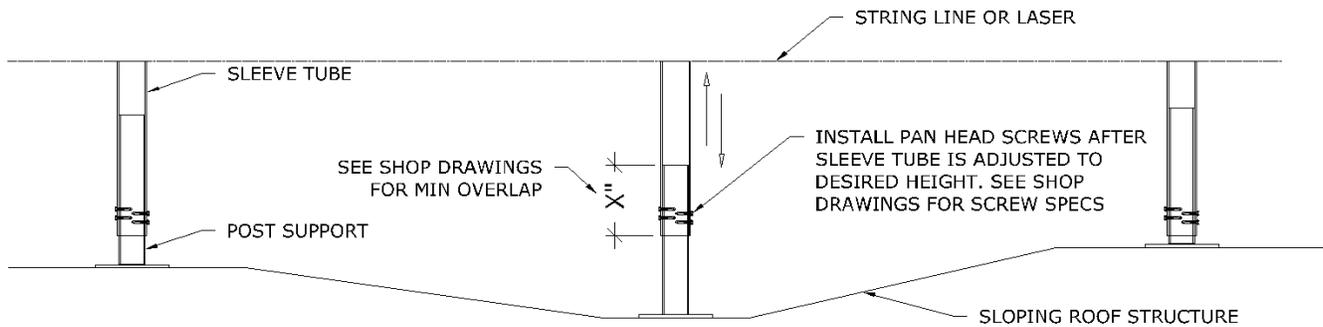


FIGURE 7

### STEP 3: INSTALL FLASHINGS

Flashing type varies depending on the project and type of roofing system. A qualified professional roofing contractor should install the flashings and roof them in with appropriate methods for the type of roofing system being used.

Slip the flashing over the Round Post Support (and Sleeve Tube, if applicable). If the adjustable height Post is being used, make sure the flashing is tall enough to cover the Pan Head Tek Screws that fastened the Sleeve Tube to the Round Post Support. Use the Draw Band to clamp the flashing to the tube, including sealant or tape as required by the manufacturer of the roofing system being used. Stretch the Storm Collar over the tube and slide it down to the top of the flashing. Install the Slip-on Post Cap, ensuring the fin is properly oriented for the horizontal tubing. Fasten the Post Cap with (4) Tek Screws with Sealing Washers per specifications in the shop drawings.

### STEP 4: PREPARE HORIZONTAL TUBES

Horizontal tubes may be shipped in lengths up to 24'. In some cases, these tubes will be pre-cut to various lengths and labeled per the layout on the shop drawings. Lay the tubes on the roof where they will be installed and make any necessary cuts to ensure the tubes are the proper length per the shop drawings.

Next, determine how many connectors will be required for each tube to attach to the Post Supports. Typical configurations will use A14 Assemblies as shown in Figure 8. However, other assembly types may also be used depending on the project so it is important to review the shop drawings.

Slip the connectors on the tube, placing one connector near each post location as shown in Figure 9. Do not fasten the connectors to the tubing at this time.

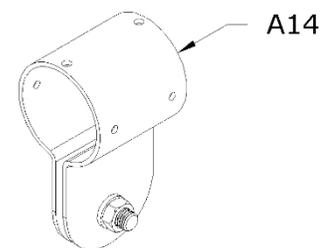


FIGURE 8

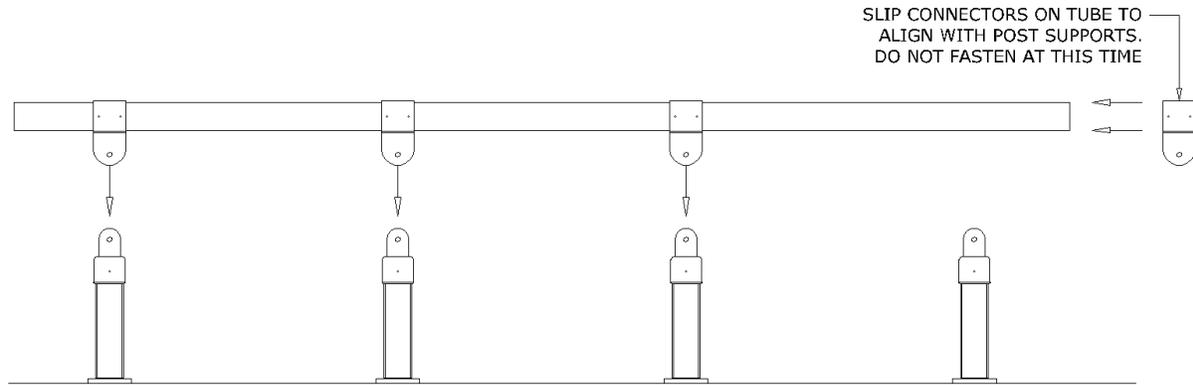


FIGURE 9

### STEP 5: INSTALL HORIZONTAL TUBES

Lift the tubing in place and bolt the connectors to the top of each post support to create a continuous horizontal tube the entire length of the array, or as detailed on the shop drawings. To connect horizontal tubes end-to-end, review the splice detail in the shop drawings. Typically, the splice will consist of a 3' piece of smaller diameter tubing that will slip into each end of the horizontal tubes as shown in Figure 10. The splice is secured with Tek screws as required by the drawings.

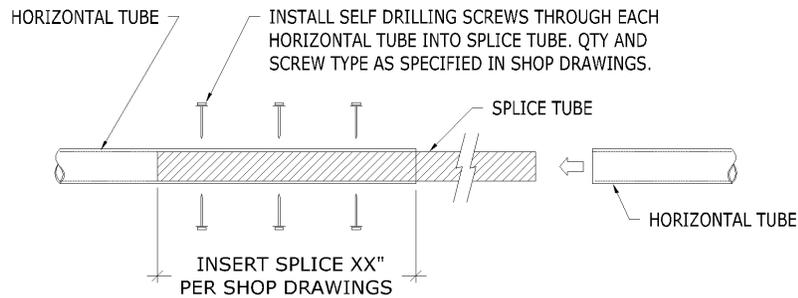


FIGURE 10

Once all the long tubes are installed and spliced end-to-end, tighten all connector bolts and fasten connectors to the tubing with S10 Self-Drilling Tek Screws. Each connector receives 4 Tek Screws. See Figure 11.

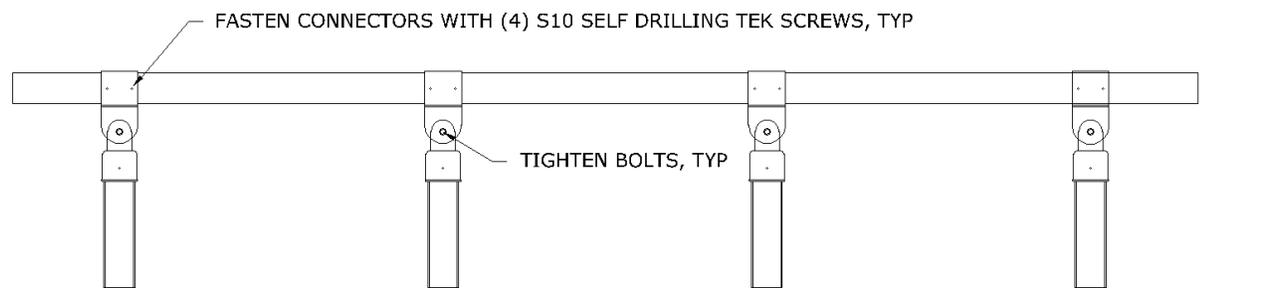


FIGURE 11

## STEP 6: INSTALL HAT SECTION

Hat section is the typical member used to span across the horizontal tubes providing an attachment rail for the solar modules. See Figure 12.

Depending on the project design, there may be two Hats per module, or the modules may share Hats. The number of Hats and their exact placement, as well as the amount of allowed cantilever past the horizontal tubes, is detailed on the shop drawings.

To install hats, place each piece on the tubes ensuring the cantilever and spacing is correct. Using S10 Tek Screws, fasten the Hat flanges onto the tubing. The number of screws per flange will be specified on the shop drawings. It may be helpful to use large Vise Grip clamps to hold the hats to the sloped tube while installing screws. Hats must be in a perfectly straight line to ensure the modules are straight when installed. To do this, install the first and last hat on each array and pull a string line between them to guide the remaining hats. If the array is too long for a string line, use a laser level in vertical mode.

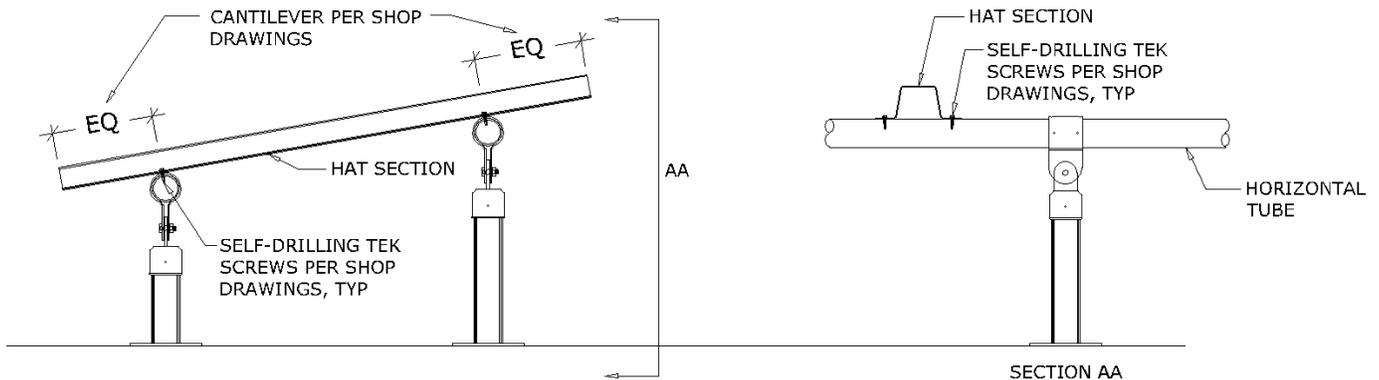
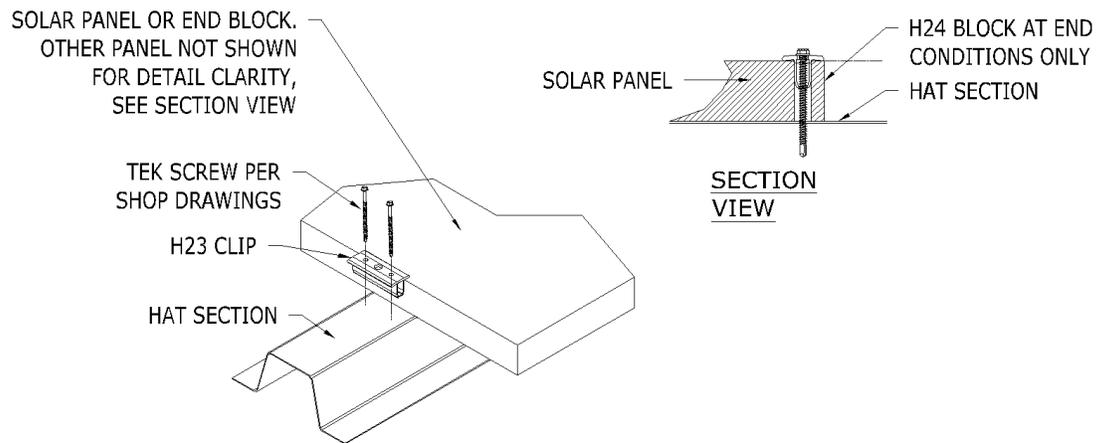


FIGURE 12

## STEP 7: INSTALL MODULE CLIPS

Position the first module on the Hat Sections as illustrated in Figure 13. Secure the outside edge of the module with a Clip (H23) and End Block (H24). Bring the next module into position, placing clips between modules and directly over the hat sections. Hold the module tightly against the clips and install two Self-Drilling Tek Screws through holes in the clip and into the hat sections below. Continue this process for the remaining modules.

If WEEB grounding hardware is being used, a bolt, nut and washer will be used in the center hole of the clip instead of the Tek Screws in the two outer holes. Please see the shop drawings and WEEB Silverback Installation Manual for more information.

**FIGURE 13**

**Important:** Improper grounding or inadequate grounding is not only dangerous, but it can lead to “stray current” corrosion and degradation of the racking components. This could result in a voided warranty as well as structural rack failure.

## STEP 8: FINAL QUALITY CHECK

Do a final quality control inspection. Check that all the Tek Screws have been installed in the frames. Make sure that all assembly bolts are tight. Vacuum or sweep all metal shavings left over from the installation of Tek Screws off the painted parts to prevent rust from forming. Pick up any screws and other miscellaneous items that may have been dropped to prevent damaging the roof membrane should someone step on them.

Ensure system is properly grounded. The Silverback Solar R-Series Racking is approved for use with WEEB grounding washers between the PV modules and Hat Sections. However, grounding is the responsibility of the installer. Proper grounding, meeting all requirements by the Building Code and Electrical Code, is required.