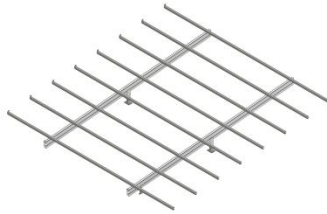


FSS Installation Manual



Safety Notifications

Below are the installation instructions for the FSS-20-2 Long Span Beam Mounting System. Please read these safety notifications prior to beginning installation.

Personnel

Observe all safety precautions relating to solar installations on a rooftop. Only appropriately skilled workers familiar with rooftop construction should be used for the installation. The installer should have sufficient electrical knowledge to prevent accidental shock or electrical injury from inappropriate contact with the photovoltaic devices that are to be installed.

Roof Load Capacity

The FSS Long Span Beam must be mounted to the building's main roof beams in order to withstand the maximum wind loads. Prior to installation the load capacity of the roof beams should be verified to make sure that the applied loads are within the allowable level for these beams.

Roof Anchors

All roof anchors that are to be used for mounting the FSS System must be verified to meet the calculated loads expected on the roof structure. Recommended capacities for these anchors are included in Section 1. Verification testing of anchors, if required, must be in accordance to local building construction codes and ordinances.

Roof Seals

Any sealing of FSS mounting posts must be made in accordance with good roof construction practices and should be performed by or with the approval of the roofing contractor responsible for the roof warranty.

Installation Tools

The following tools are required for installation:

- Torque wrench - 50 ft-lb capacity
- 3/8" Cordless drill motor with torque adjustment
- Drive sockets, 9/16", 3/4", and 15/16"
- Hex drives, 3/16" and 7/32"
- Open end Wrench - 9/16"

Parts

The following is a list of parts for the installation of a standard CSS-20 assembly. Both the Flanged Post and the Clamped Post are included shown but only one type is used depending on the type of roof. Flanged and Clamped Post commercial fasteners are not included here but are discussed below for each roof application.



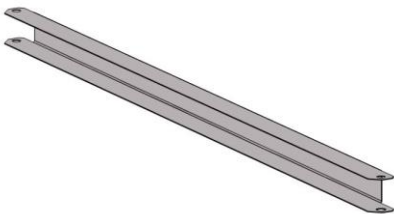
4x3 Strut



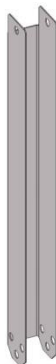
9x3 Strut



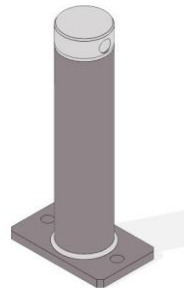
3x2 Strut



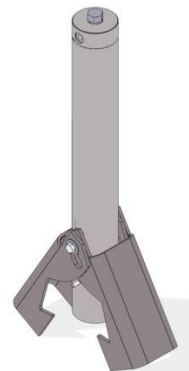
Stabilizer



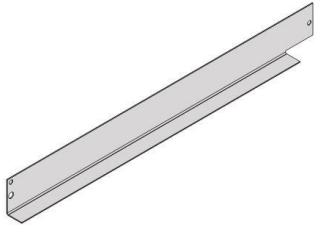
Center Support



Flanged Post



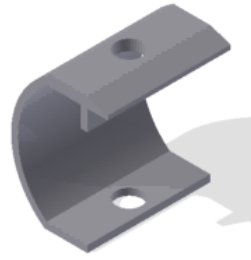
SureGrip Post



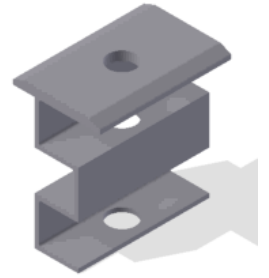
End Support Bar



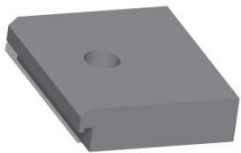
Strut Retainer



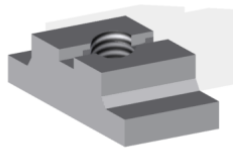
C-Clip



Waffle Clip



Collector Clamp



Angle Nut



Bushing



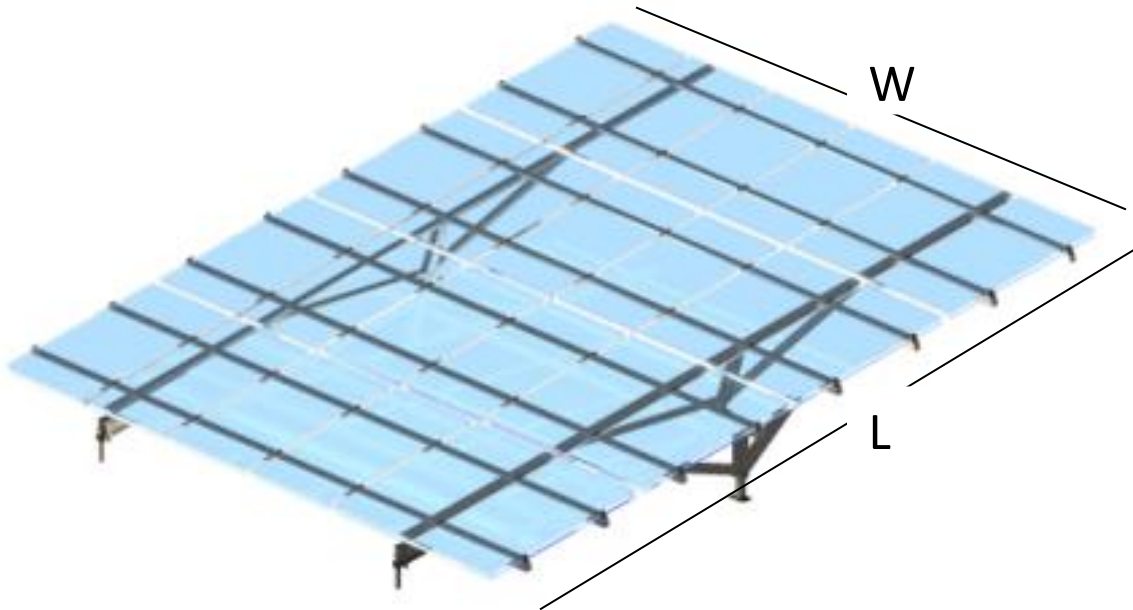
End Post

Commercial Components

- Hex Head Cap Screw, 3/8-16 x 4.5 Long, Locking, Stainless Steel
- Hex Nut, 3/8-16, Aluminum
- Flatwasher, 3/8, Stainless Steel
- Flathead Socket Cap Screw, 3/8-16 x 1.0 Long, Stainless Steel
- Flathead Six Lobe Screw, Locking, 5/16-18 x 0.75 Long, Stainless Steel
- Hex Head Cap Screw, 5/16-18 x 1.25 to 2.5 Long, Locking, Stainless Steel
- Flatwasher, 5/16, Stainless Steel

Installation Procedure

Choose the size and shape of the array and determine the array length and width. Some possible array lengths and widths are shown below.

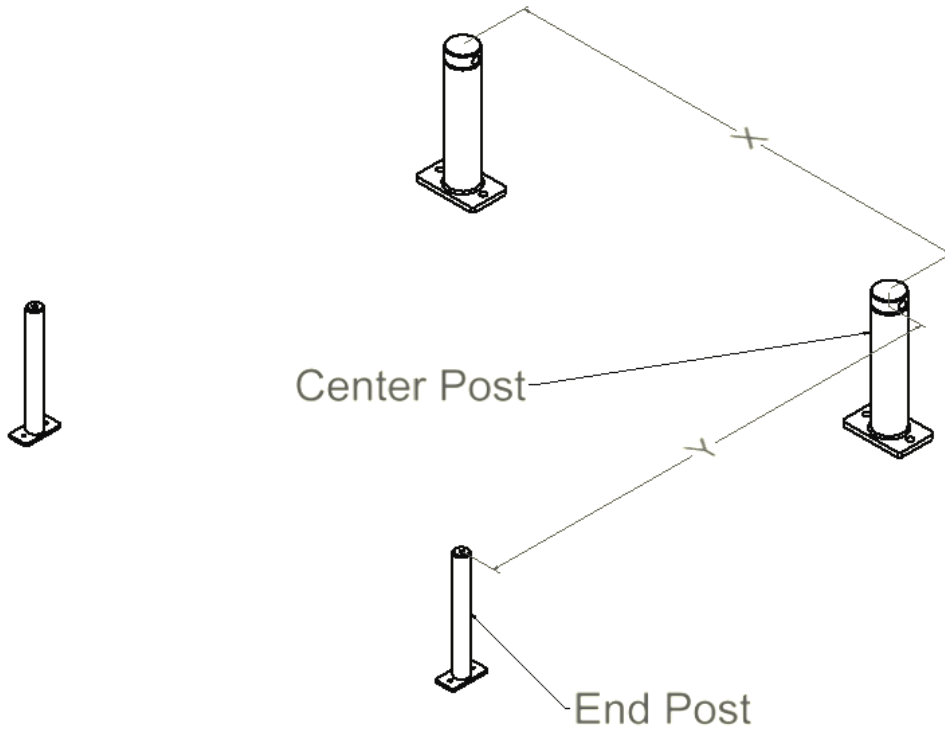


Post Positions

Each array has four posts – 2 center posts and 2 end posts. The post positions are dependent on the size of the array. Below are typical array dimensions and the suggested post spacings.

Post Spacing Table

<u>Array Length, L</u> (Feet)	<u>Array Width, W</u> (Feet)	<u>X, Feet</u>	<u>Y, Feet</u>
16	16	9	8
20	20	11	10
22	24	12	12



Types of Center Posts

There are two types of center support posts - Flanged Post and SureGrip Clamped Post. The type of Post required is dependent on the roof structure:

<u>Roof Structure</u>	<u>Center Support Post Type</u>
Concrete	Flanged
Glulam	Flanged
Steel Building - Main Beams Flush with Joists	Flanged
Steel Building - Main Beam below Joists	Clamped

Types of Post Attachments

The type of post attachment that is used is dependent on the application noted above.

Warning

All attachments described below must be reviewed and approved by a licensed civil or structural engineer to insure a safe operating system.

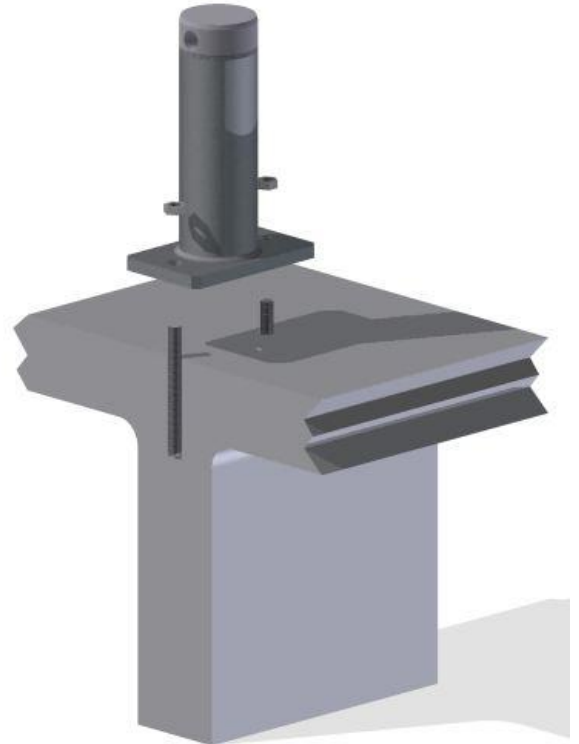
Attachment to Concrete

Center Post Attachment

1. Remove roofing and insulation down to structural concrete roof structure.
2. Use 1/2" diameter, 3-1/2" embedment, Hilti HIT-TZ 1/2"x3-1/2" Threaded Rod anchor or equal.
3. Drill 9/16" diameter x 3-1/2" deep hole for anchors.
4. Bond anchors using HIT-HY 150 MAX-SD Fast Cure Hybrid Adhesive.
5. Fasten post to anchors with 1/2"-13 Hex Nuts, Grade 5, Torque Nuts to 40 Ft-Lbs.

If installed on a waffle or joist slab, anchors must be inserted in deep ribbed section.

Tightening Torque: 40 Foot-Pounds



End Post Attachment

Anchor with 1/4" drop-in anchors 1" long.

Tightening Torque: 15 Foot-Pounds



Attachment to Wood Beams

Center Post Attachment

Attach with 1/2" x 8" lag bolts. Tightening Torque: 40 Foot-Pounds

End Post Attachment

Attach to wood purlins with furnished 1/4" x 2" lag screws.

Tightening Torque: 15 Foot-Pounds

Attachment to Steel Beams - Flush with Joists

Center Post Attachment

Match drill holes in Upper Steel Beam Flange and mount with 1/2-13 hex head bolts and nuts. The Steel Beam may also be tapped if sufficiently thick.

Tightening Torque: 40 Foot-Pounds

End Post Attachment

The end post is typically mounted to the closest purlin. Attach with the two furnished self-tapping high strength sheet metal screws as shown.

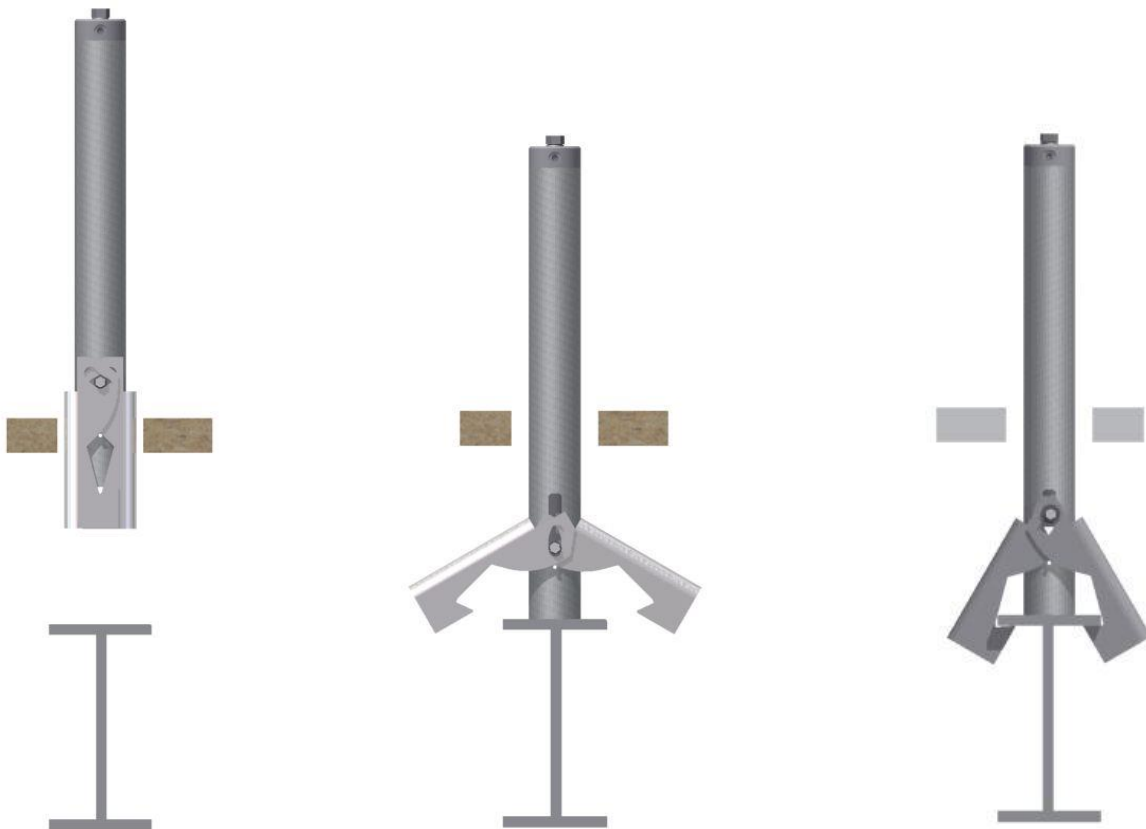
Tightening Torque: 15 Foot-Pounds



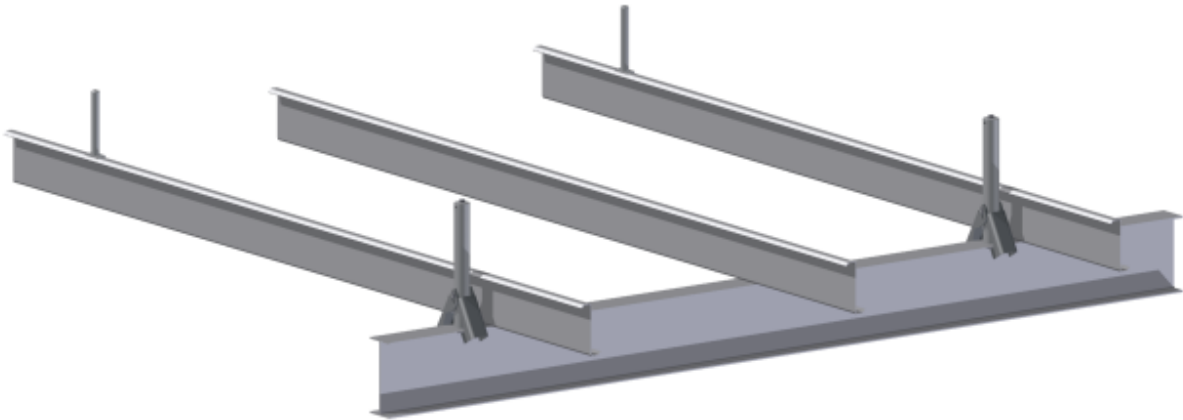
Attachment to Steel Beams - Located Below Joists

The SureGrip Beam Clamp is used for the application where the WF roof support beams are under the joists. Cut a 5" hole in the roof and insert SureGrip Clamp. Once inserted the jaws of the SureGrip are expanded open by turning the top bolt counterclockwise. Then turn the bolt clockwise to tighten.

Clamping Torque: 40 Foot-Pounds



Typically the SureGrip Clamps are positioned side by side on the same WF beam as shown below. They should be located adjacent to purlins so that the End Posts that tie to them are in line with the Main Beams. Beam sizes that are acceptable for use with this attachment method are typically 12WF14 or larger.



End Post Attachment

Attach to End Post to the closest available purlin with 1/4" x 2" self-tapping screws

Tightening Torque: 10 Foot-Pounds.

Roof Sealing

Utilize NRCA approved methods of sealing around penetrations. Typical methods of sealing include flashing from roof to post, for built-up and membrane roofs, or pitch pans.

1. Second Post – Repeat Steps 1-4.

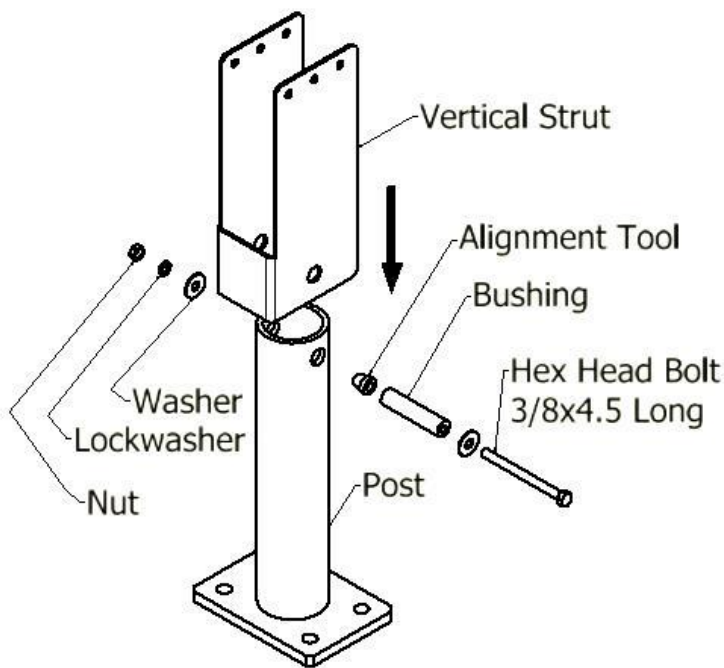
FSS Beam Assembly

The Main Strut

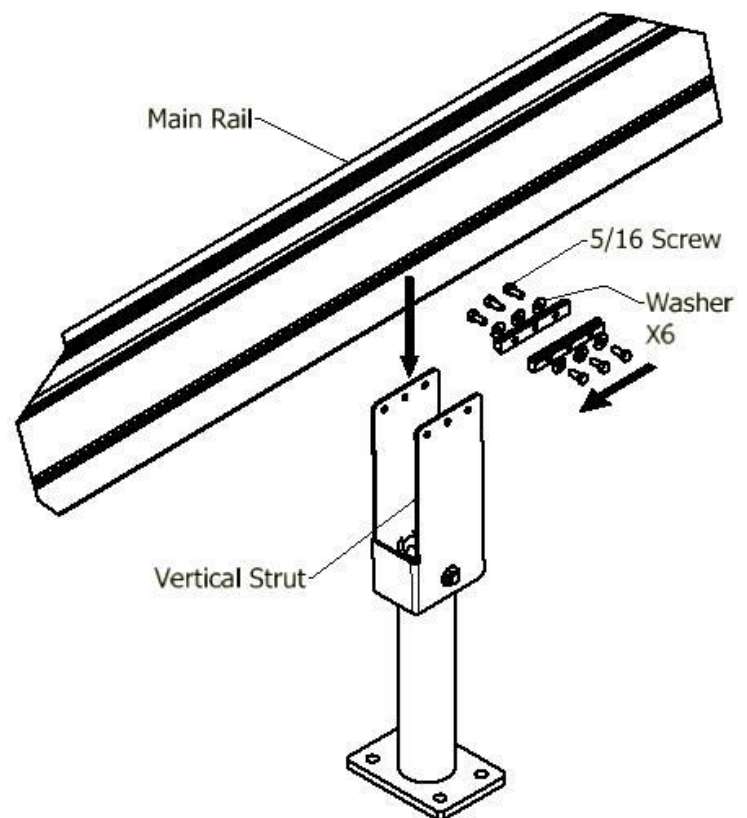
Assemble as follows:

1. Bolt Vertical Strut to Center Post
2. After insertion of Hex bolt, bushing & washer, remove alignment tool & install flat washer, lock washer & nut – Torque to 25 Ft-Lbs.
3. Bolt Main Strut to Vertical Strut – Torque to 20 Ft-Lbs. x 6
4. Assemble Second Strut Beam Assembly to Second Post – Repeat Steps 1-4.

Steps 1& 2



Step 3



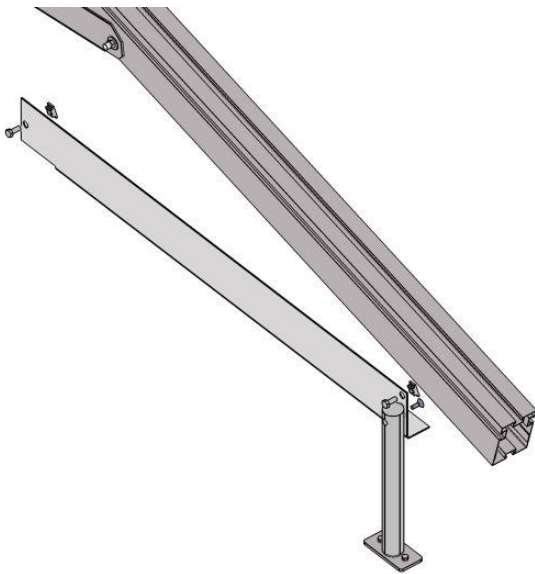
Connection of FSS to End Post – If Applicable to Installation

1. Attach the End Support Bar to the End Post with HFCS3120000 flathead screw, HN
2. Rest the end of the FSS Beam Assy. onto the End Support Bar and bolt together with the 3/8-16 x 3/4 hex bolt and Anchor Nut

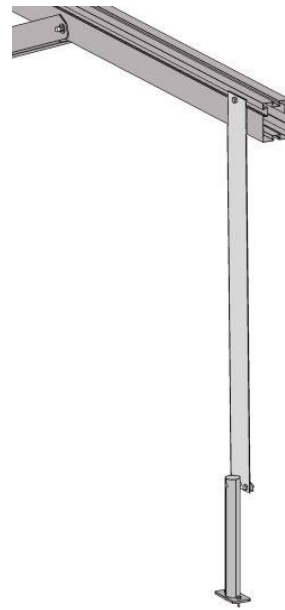
4. Repeat this process for the second FSS.

Torque all bolts to 15 Ft-Lbs.

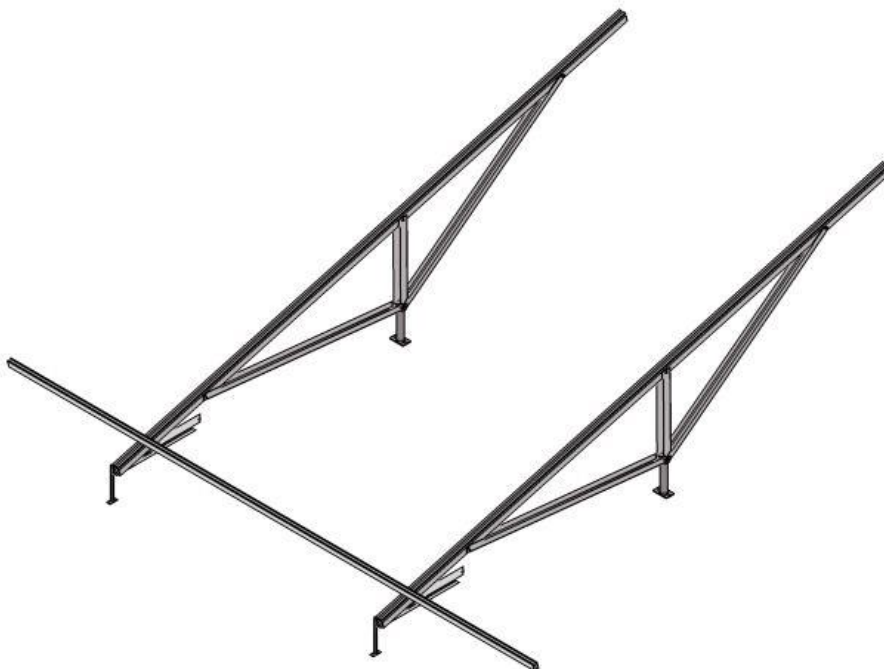
The FSS Units are now ready for mounting the PV support hardware. If it is desired to mount the PV supports and modules in the horizontal service position, the End Support Bar is disengaged at the End Post location and reattached at the other end as shown below.



Operating Position



Service Position

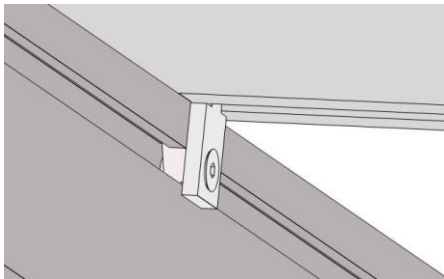


PV Support Strut
Assembly

Position first PV
Support Strut on
ends of Main Struts
closest to the End

Union City CA 94587

Post. Exact position is determined based on module size and orientation desired.

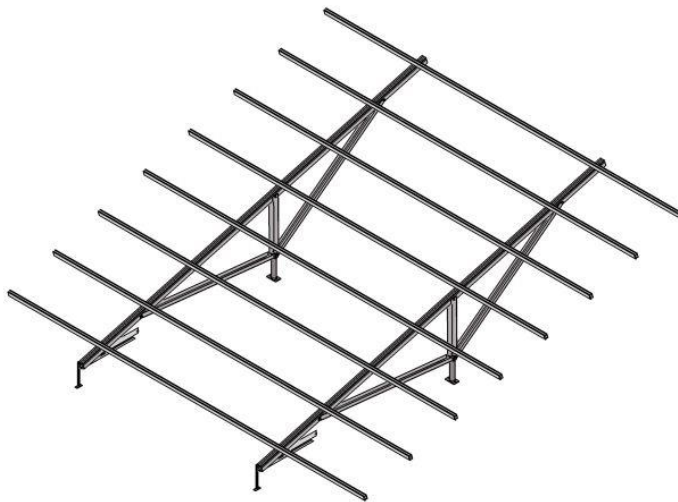
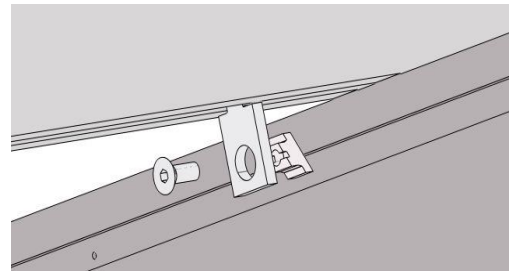


Anchor bottom of PV Support Strut to the Main Struts with Strut Retainers, Angle Nuts, and 5/16 x 3/4 flat head screws-

One Retainer on each

side of each Main Strut, 4 connections total – Torque to 20

Ft-Lbs. The cordless drill with 3/16" socket driver works well in this application.



Install remaining PV Mounting Struts to the Main Struts at desired spacing to match module size.

Tilt Procedure

To tilt the Array up for reroofing or for servicing:

1. Loosen and withdraw the bolt and angle nut connecting the End Support Bar from each of the two Main Strut slots.
2. Lift up the lower end of the Array to the horizontal position.

Caution: The Array should be lifted by two workers and held in this position.

3. Insert the bolt and angle nut located on the opposite end of each End Support Bar

into each Main Strut Slot and tighten to 20 Ft.-Lbs.

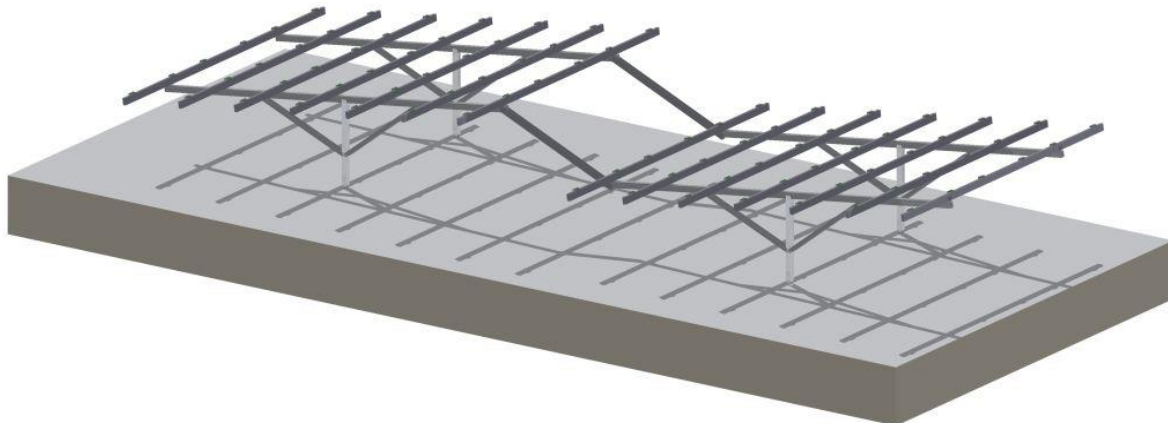
This completes the tilting of the Array.



Tandem Mount Alternative

For instances where it is desired to eliminate the end mount, the Tandem Mount Alternative is a satisfactory mounting alternative.

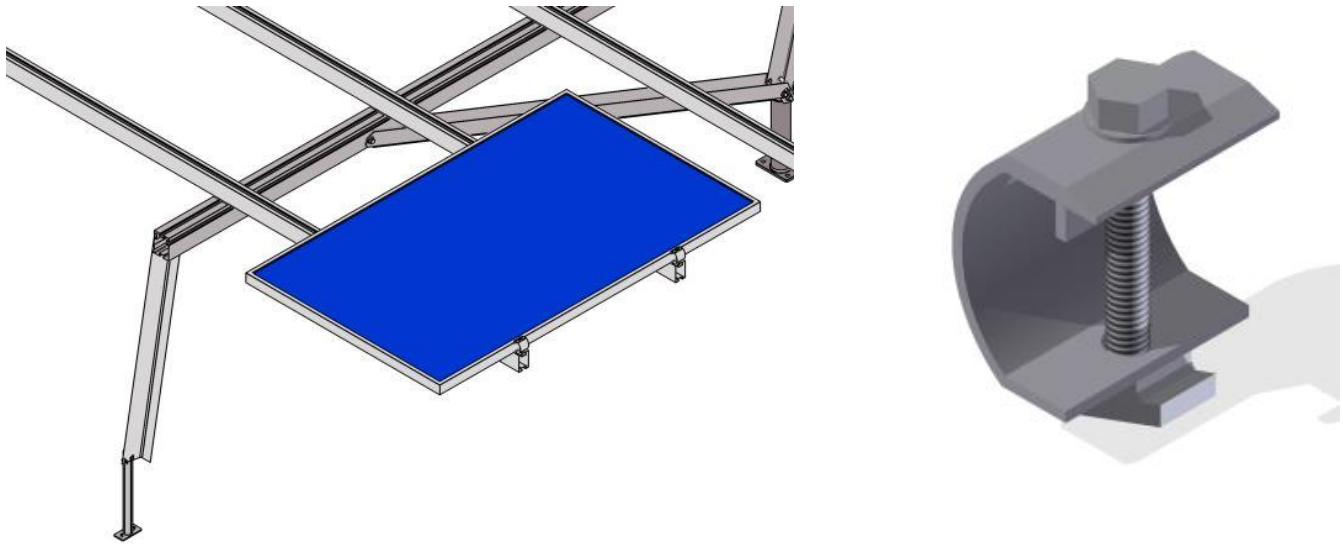
With this method, the two arrays are connected together, front to back with tilt bars.



Module Installation

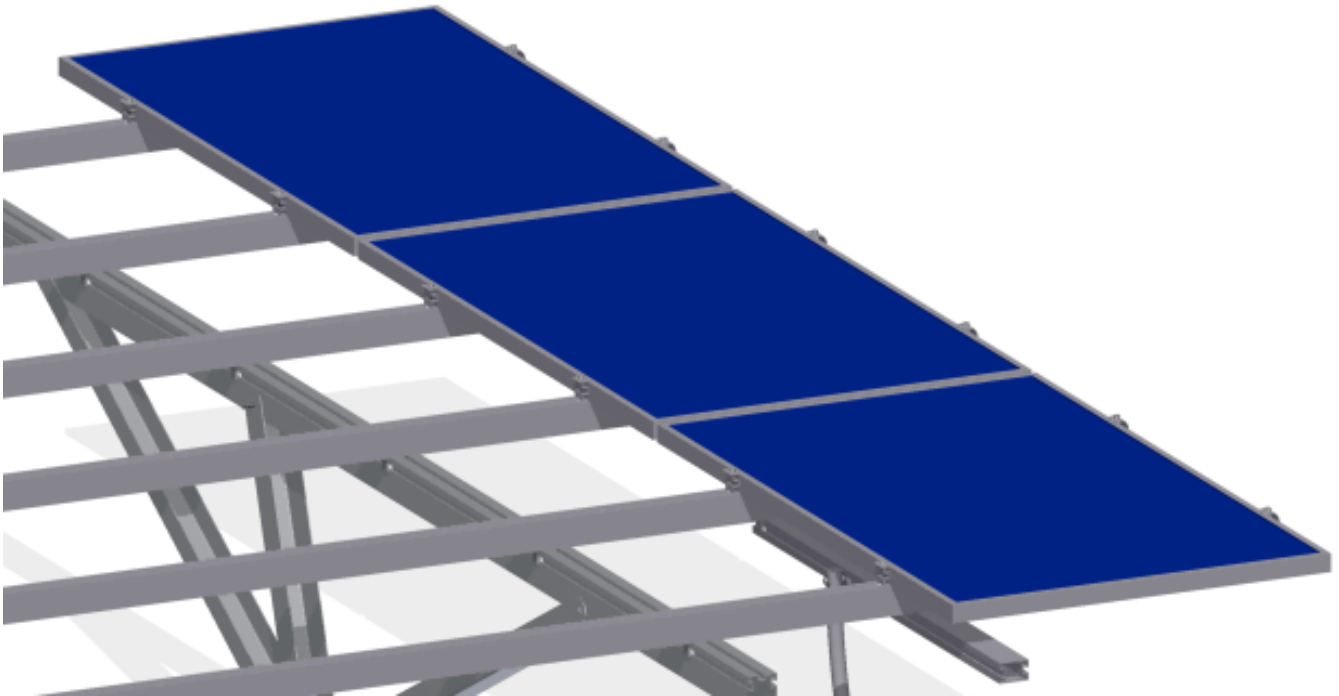
Note: It is recommended to follow the module manufacturer's instructions and insure that these modules are clamped at the appropriate positions. The ISA racking system clamping components typically clamp the modules on the long sides at the $\frac{1}{4}$ positions. For example if the module is 64 inches long we recommend clamping 16 inches from each end on both sides of the module.

Begin from one side and assemble the first module into position with two C-Clips, and the 5/16 bolts, angle nuts and washers. These can be preassembled so they are ready for installation as shown.



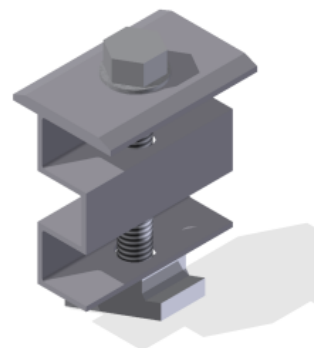
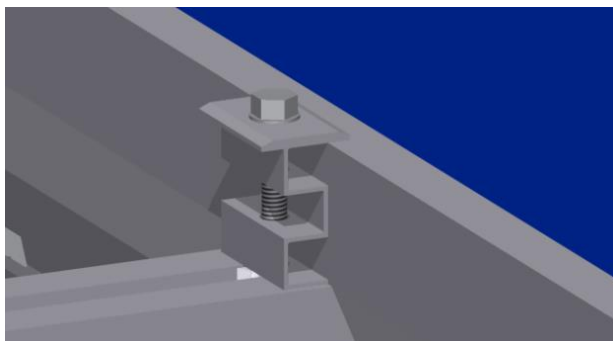
Torque to 15-20 Ft-Lbs.

Install the remaining modules with C-lips to complete the first column as shown below.

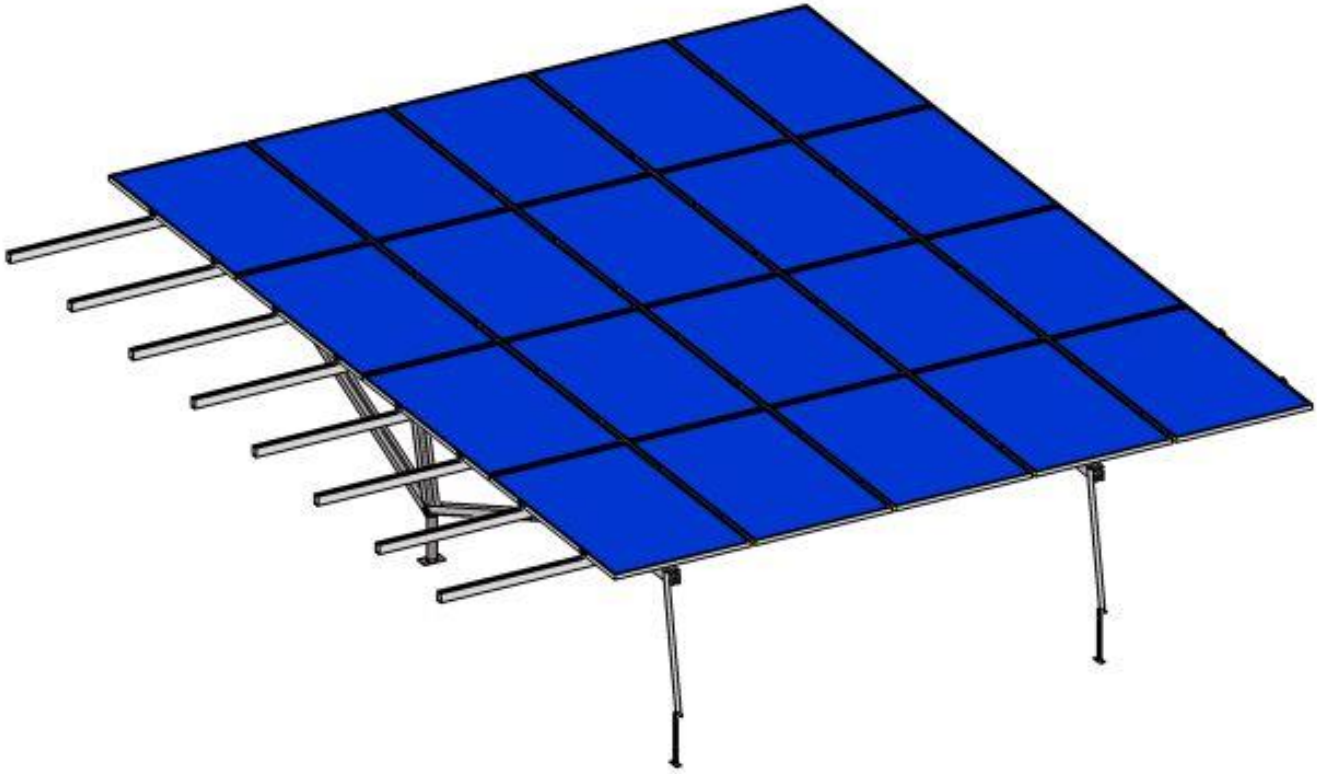


Position the Waffle Clip so that long side of the clip is against the module edge. Then initially tighten to hold this first column of modules in position. A second row of modules can then be slid under the short lip which is not fully compressed. Then the Waffle Clips can be tightened all the way – 15-20 Ft-Lbs.

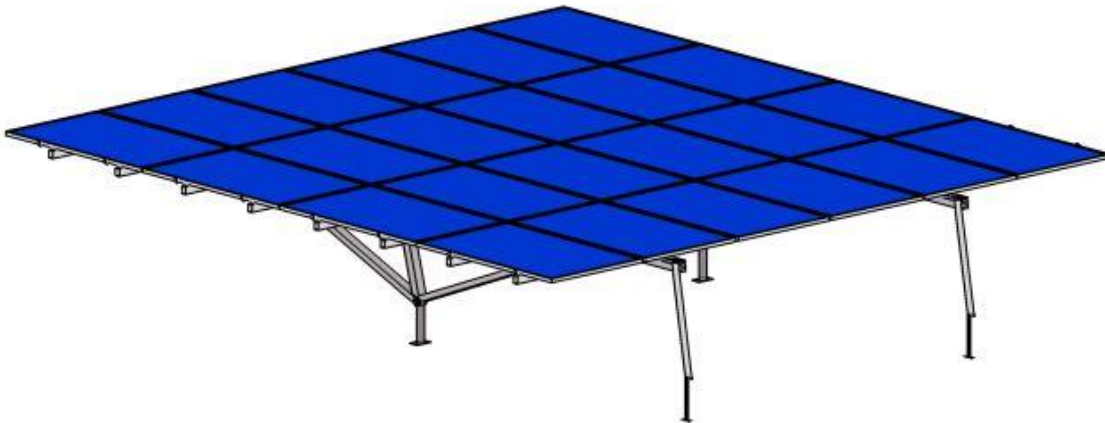
Below is a more detailed view along with a preassembly illustration.



Continue to install the modules column by column as shown below.



Install the final column of modules and secure in place with the C-Clips as was done in the initial column and as shown below.



This completes the mechanical assembly. At this point the electrical components and connections can be made before lowering it into position and connecting to the Tilt Bases as was described earlier. It is recommended that if there are any wire connections between adjacent CSS-20 arrays, that these interconnections be routed along the center to minimize the relief wiring lengths needed when the arrays are tilted at a later date.