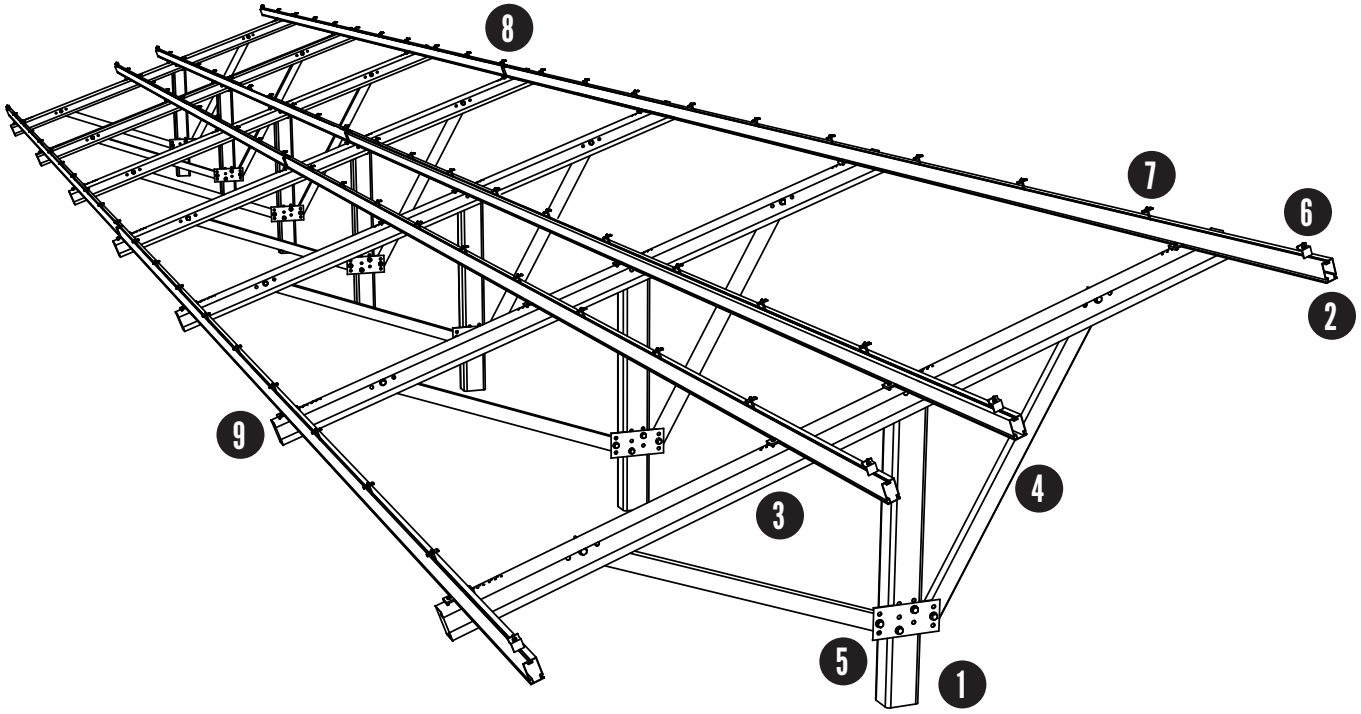
GFT GROUND FIXED TILT

INSTALLATION GUIDE

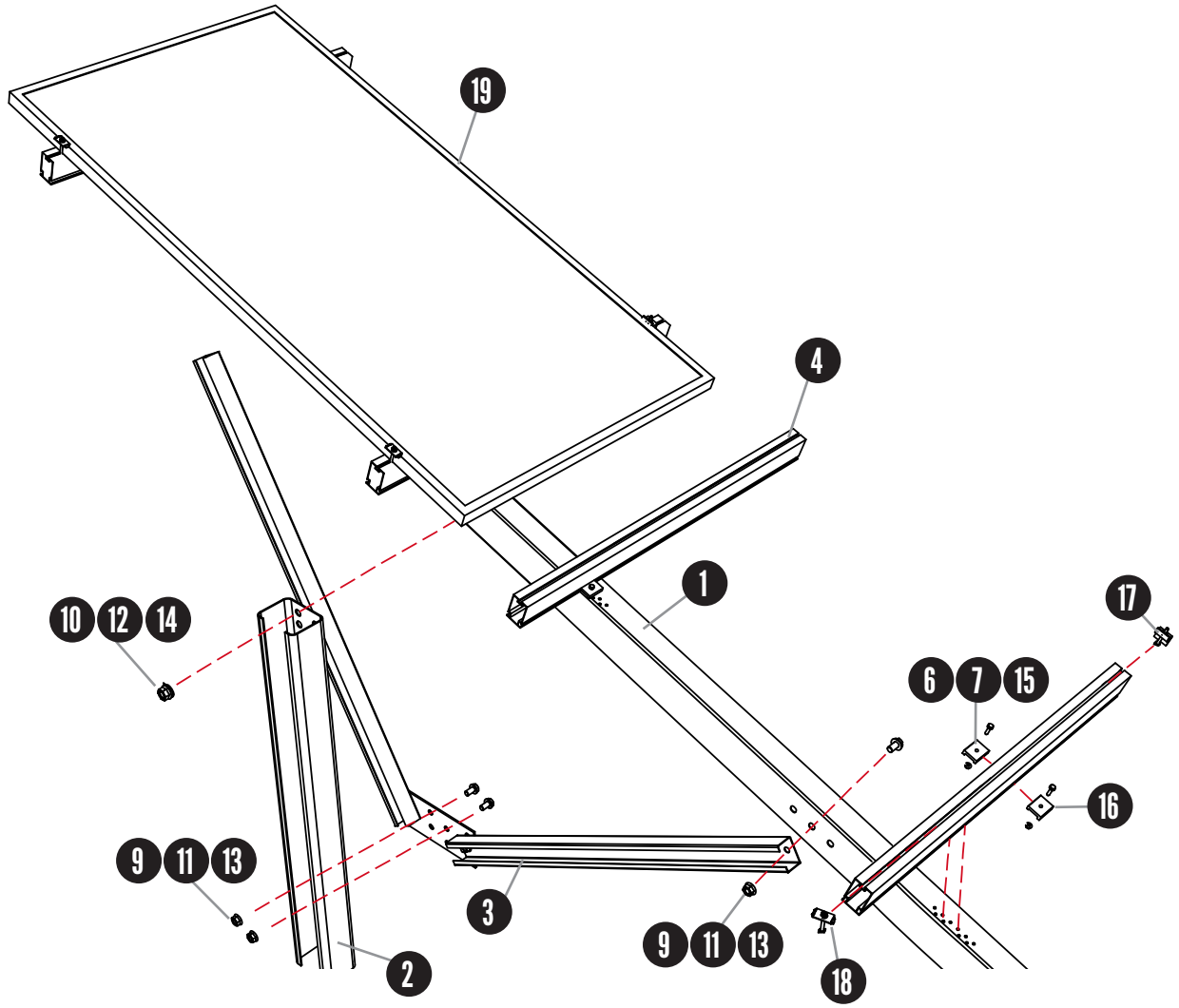
NOTE:
Refer to construction drawings for project specific details. Construction drawings have precedence over these installation guidelines.

PUB15JUN10



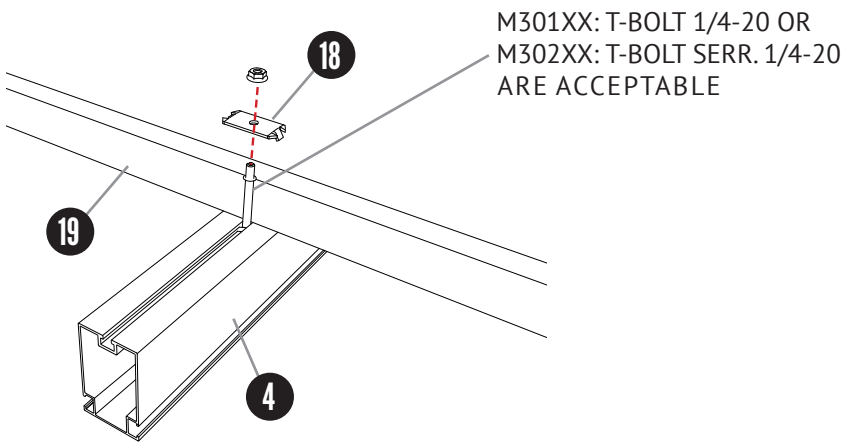
ITEM	COMPONENT	MATERIAL
1	Roll- Formed Steel Pile	4" or 4.5 " x 6" C Shape (Length Varies by Project)
2	Aluminum East-West Beam	Aluminum Beam with Continuous Slots for Adjustability
3	Roll-Formed Steel Top Chord	C Shape with Custom Hole Pattern for Adjustability
4	Roll-Formed Steel Diagonal Brace	C Shape
5	Steel Diagonal Brace Plate	Steel Plate with Custom Hole Pattern for Adjustability
6	End Clamp	End Clamp Assembly with T-Bolt
7	Mid Clamp	Mid Clamp Assembly with T-Bolt
8	Nested Splice Member	Internal Aluminum Splice Retained with Self-Tapping Screws
9	East-West Beam Clamp	Aluminum Extruded Clamp with Stainless Steel Hardware

OVERALL VIEW OF COMPONENTS

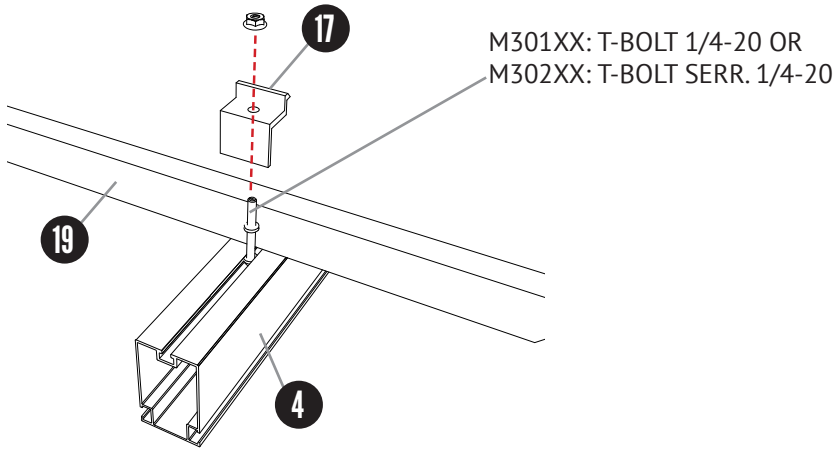


ITEM	COMPONENT
1	5" Top Chord Channel
2	6" x 4" or 4.5" C-Shape Pile
3	Diagonal Brace Assembly
4	3.25" x 2" East-West Aluminum Beam
5	(NOT USED)
6	Flat Washer 1/4"
7	Hex Flange Nut 1/4-20 Serrated
8	(NOT USED)
9	Flat Washer 5/8"
10	Flat Washer 3/4"
11	Hex Bolt 5/8-11" x 1-1/2"
12	Hex Bolt 3/4-10" x 1-1/2"
13	Hex Flange Nut 5/8-11 Serrated
14	Hex Flange Nut 3/4-10 Serrated
15	Hex Bolt 1/4-20 x 1"
16	East-West Rail Clip
17	End Clamp Assembly
18	Mid Clamp Assembly
19	PV Module (By Others)

Mid Clamp Assembly with T-Bolt



End Clamp Assembly with T-Bolt



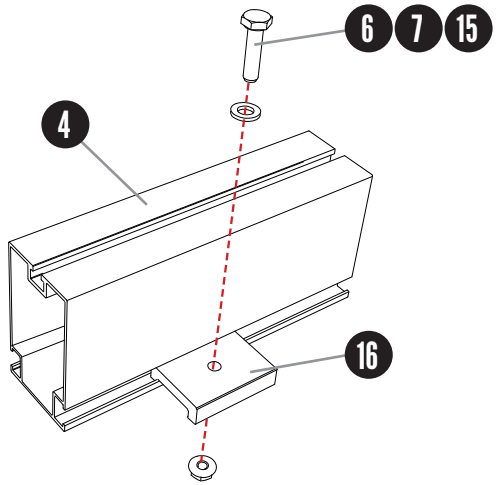
Mid Clamp Assembly With T-Bolt

ITEM	COMPONENT	MATERIAL
4	3.25" x 2" East-West Aluminum Beam	Aluminum Alloy 6005A-T61, 6351-T5 or 6061-T6, Fy = 35 ksi, Ftu = 38 ksi
18	Mid Clamp	Stainless Steel, 301,302, or 304, 1/4 Hard, Mill Finish
19	PV Module (By Others)	As per Manufacturer
SEE DWG	1/4-20 T-Bolt (Serrated or Non-Serrated)	300 Stainless Steel (301 Preferred) with Min Ftu = 70 ksi
SEE DWG	1/4-20 Serrated Flange Nut	Stainless Steel ASTM F594 with Min Ftu = 70 ksi

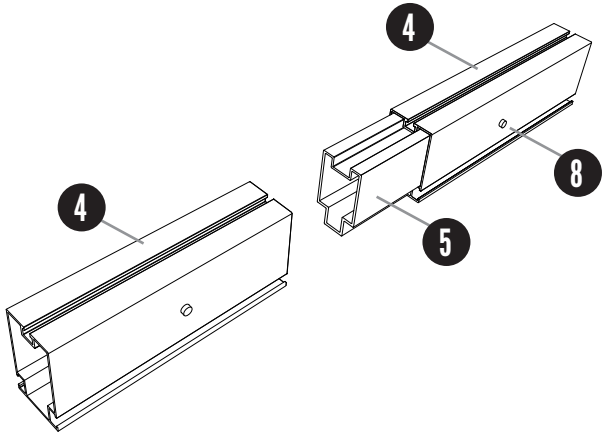
End Clamp Assembly With T-Bolt

ITEM	COMPONENT	MATERIAL
4	3.25" x 2" East-West Aluminum Beam	Aluminum Alloy 6005A-T61, 6351-T5 or 6061-T6, Fy = 35 ksi, Ftu = 38 ksi
17	End Clamp	Stainless Steel, 301,302, or 304, 1/4 Hard, Mill Finish
19	PV Module (By Others)	As per Manufacturer
SEE DWG	1/4-20 T-Bolt (Serrated or Non-Serrated)	300 Stainless Steel (301 Preferred) with Min Ftu = 70 ksi
SEE DWG	1/4-20 Serrated Flange Nut	Stainless Steel ASTM F594 with Min Ftu = 70 ksi

East-West Rail Clip



East-West Beam Splice



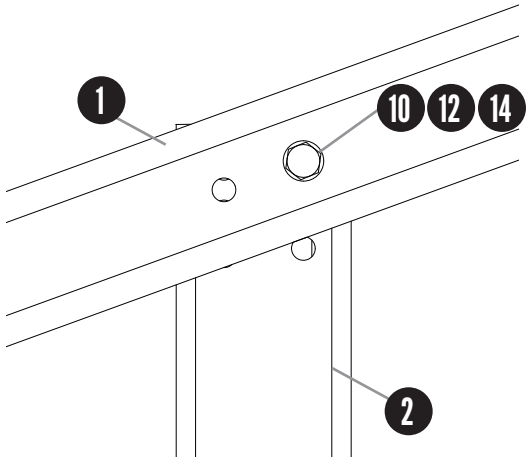
East-West Rail Clip

ITEM	COMPONENT	MATERIAL
4	3.25" x 2" East-West Aluminum Beam	Aluminum Alloy 6005A-T61, 6351-T5 or 6061-T6, Fy = 35 ksi, Ftu = 38 ksi
6	Flat Washer 1/4"	Stainless Steel ASTM F594 with Min Ftu = 70 ksi
7	Hex Flange Nut 1/4-20 Serrated	302HQ 18/8 Stainless Steel Austenitic 300 Series, Min Ftu = 85 ksi
15	Hex Bolt 1/4-20 x 1"	302HQ 18/8 Stainless Steel Austenitic 300 Series, Min Ftu = 85 ksi
16	East-West Rail Clip	Aluminum Alloy 6005A-T61, 6351-T5 or 6061-T6, Fy = 35 ksi, Ftu = 38 ksi

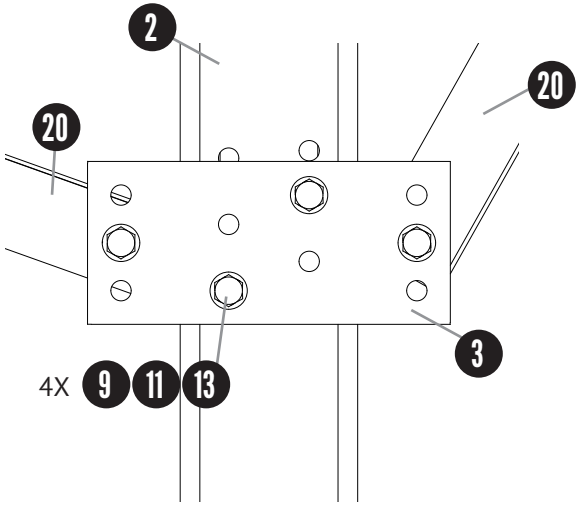
East-West Beam Splice

ITEM	COMPONENT	MATERIAL
4	3.25" x 2" East-West Aluminum Beam	Aluminum Alloy 6005A-T61, 6351-T5 or 6061-T6, Fy = 35 ksi, Ftu = 38 ksi
5	East-West Beam Splice Insert	Aluminum Alloy 6005A-T61, 6351-T5 or 6061-T6, Fy = 35 ksi, Ftu = 38 ksi
8	1/4" x 20 Self Drilling Screw (Buildex)	Grade 5, ASTM A449/ SAE J429 (Similar Properties Confirmed by testing)

Top Chord to Pile Connection



Diagonal Brace Plate to Pile Connection

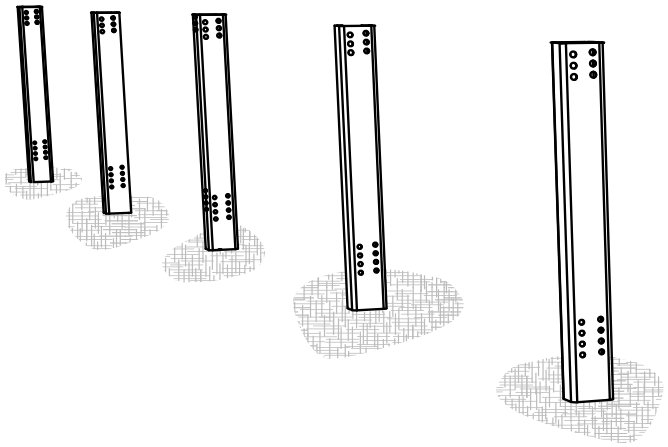


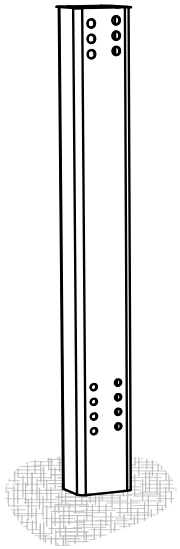
Top Chord to Pile Connection

ITEM	COMPONENT	MATERIAL
1	5" Top Chord Channel	Cold Rolled ASTM A653 HSLAS Grade 50 or 55
2	6" x 4 or 4.5" C-Shape Pile	Cold Rolled ASTM A653 HSLAS Grade 50 or 55
10	Flat Washer 3/4"	SAE Type A Narrow
12	Hex Bolt 3/4-10 x 1-1/2"	SAE J429-Grade Varies per Project
14	Hex Flange Nut 3/4-10 Serrated	SAE J429-Grade Varies per Project

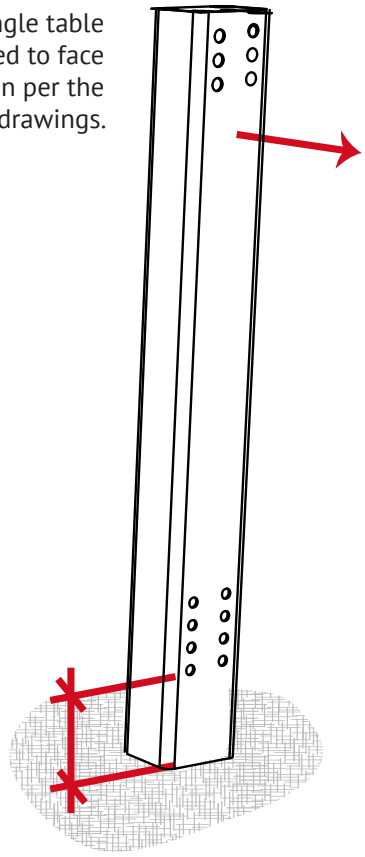
Diagonal Brace Plate to Pile Connection

ITEM	COMPONENT	MATERIAL
2	6" x 4 or 4.5" C Shape Pile	Cold Rolled ASTM A653 HSLAS Grade 50 or 55
3	Diagonal Brace Plate	ASTM A36 or ASTM A653 GR 50 Steel
9	Flat Washer 5/8"	SAE Type A Narrow
11	Hex Bolt 5/8-11 x1-1/2"	SAE J429-Grade Varies per Project
13	Hex Flange Nut 5/8-11 Serrated	SAE J429-Grade Varies per Project
20	Diagonal Brace	Cold Rolled ASTM A653 HSLAS Grade 50 or 55

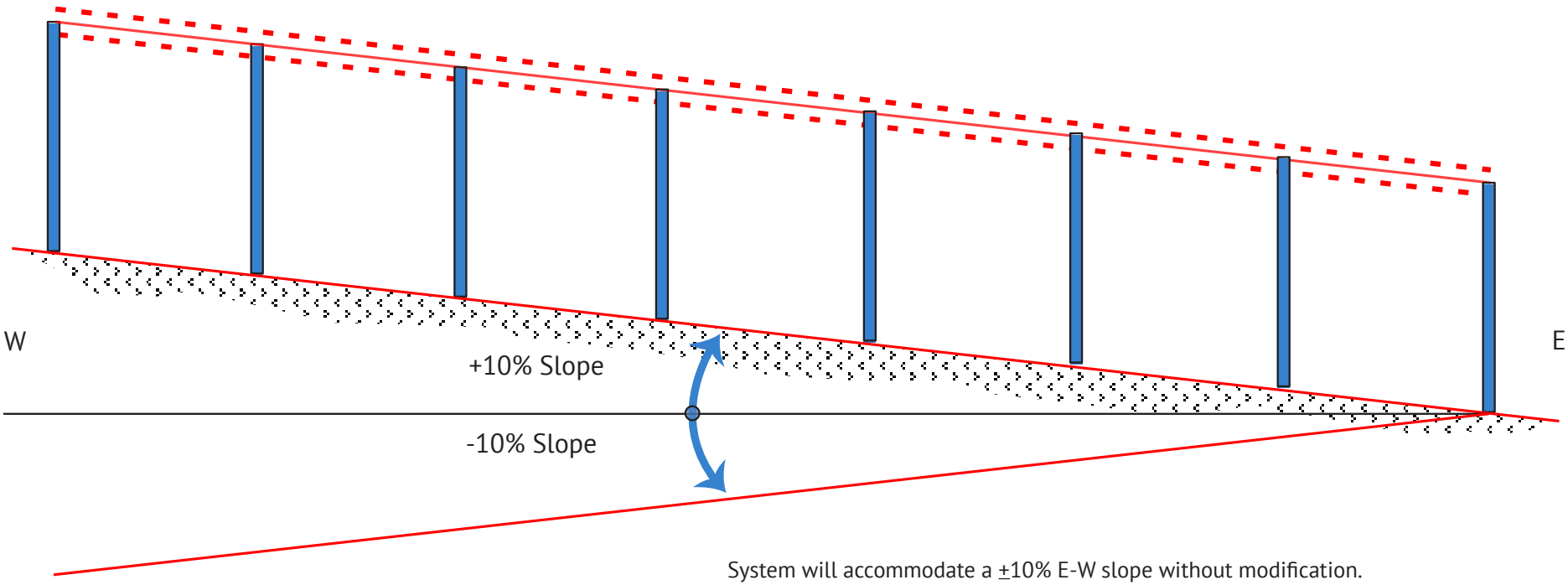




All piles within single table must be oriented to face the same direction per the construction drawings.

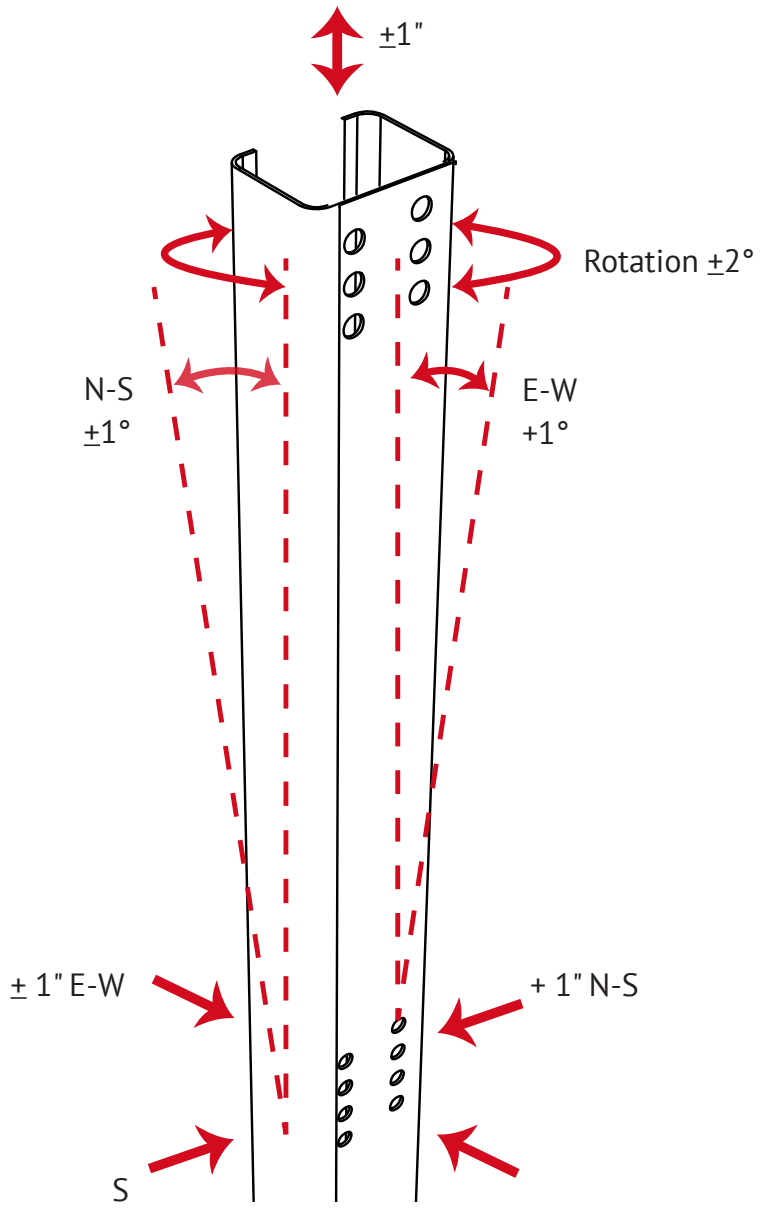


Hole height above grade per construction drawings.



System will accommodate a ±10% E-W slope without modification.

- Plumb tolerances apply regardless of slope.
- Pile position tolerances apply relative to nominal finish grade line.

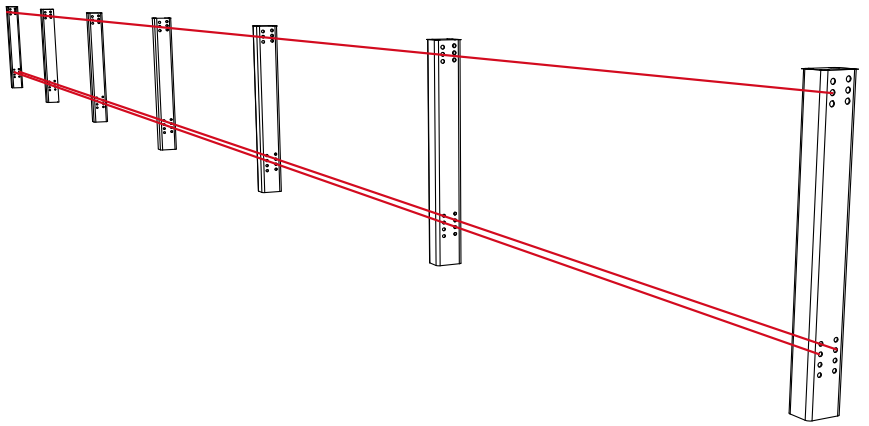

±1"
Rotation ±2°
N-S
±1°
E-W
+1°
± 1" E-W
+ 1" N-S
S

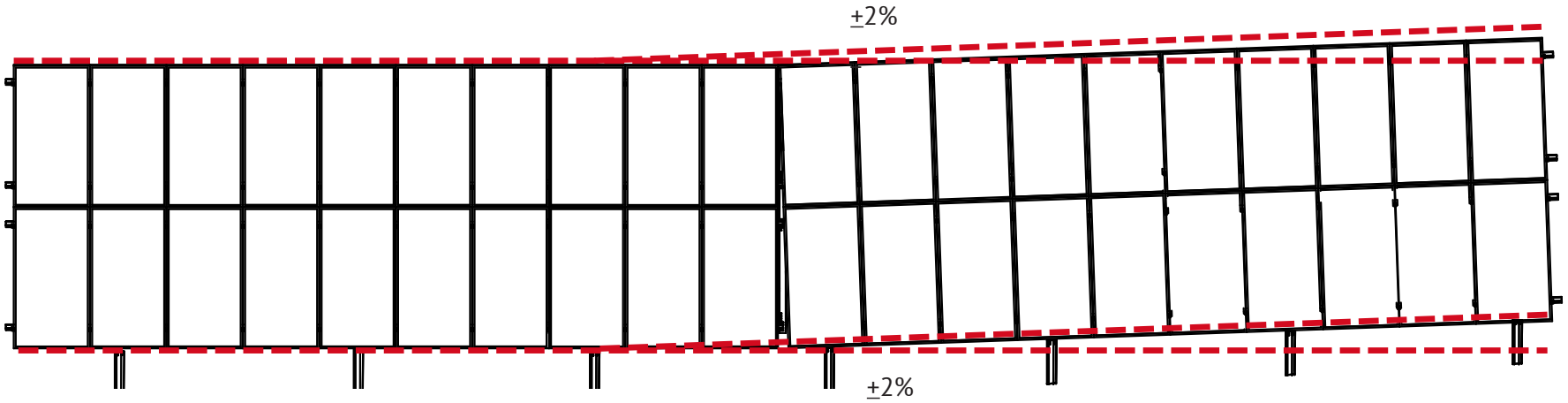
ALIGN ATTACHMENT HOLES ON PILES

1. Align target hole locations in all piles (within tables and table to table) using laser or string line.

2. Determine if adjustments are needed up or down (hole patterns allow for + 1-1/2" adjustments in 3/4" increments per instruction on following pages).

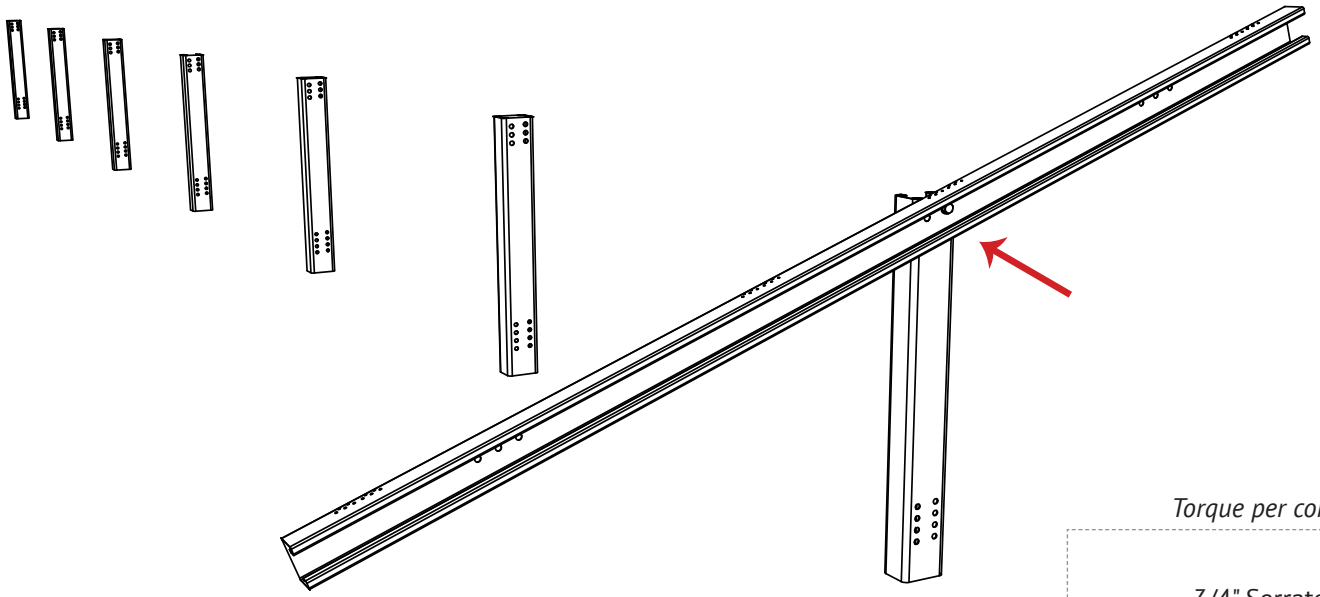
3. Mark holes to be used for top chord and diagonal brace plate attachments prior to installing.



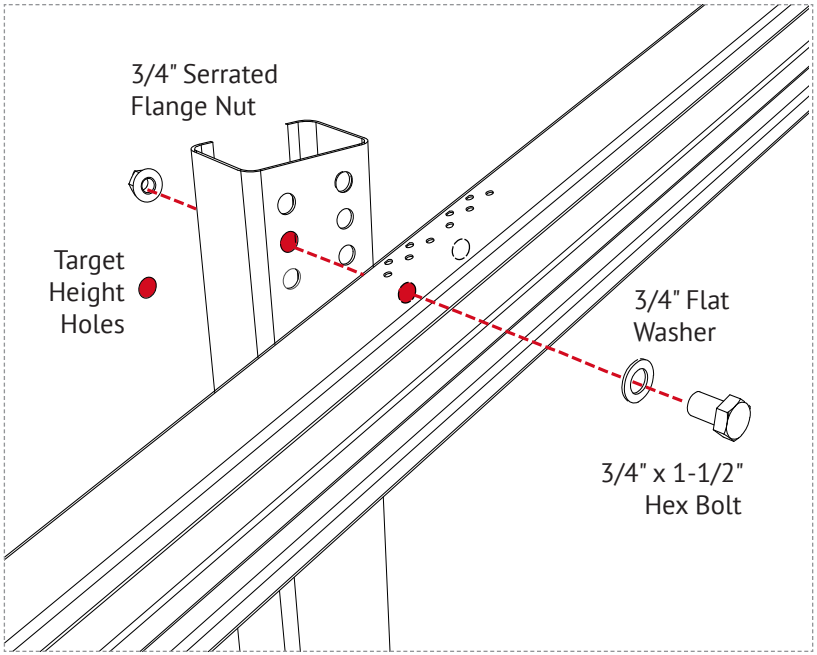


The system is capable of being aligned to the target string or laser line using the adjustment holes when piles are placed within allowable tolerances. Each table will however accommodate a 2% deviation from the target line as shown without impact to structural integrity.

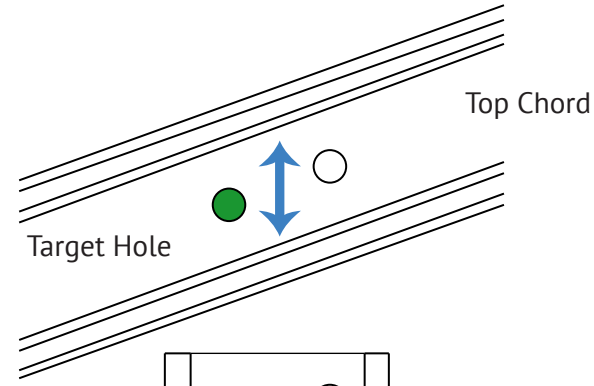
ATTACH TOP CHORD TO PILE

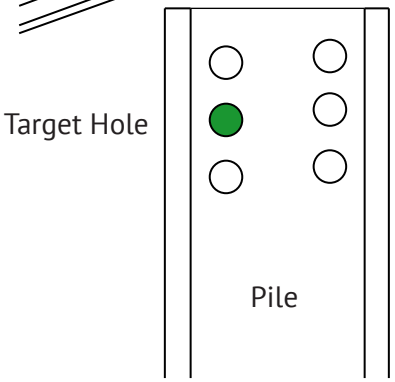


Install hardware snug tight.
Torque per construction drawings after final adjustments.



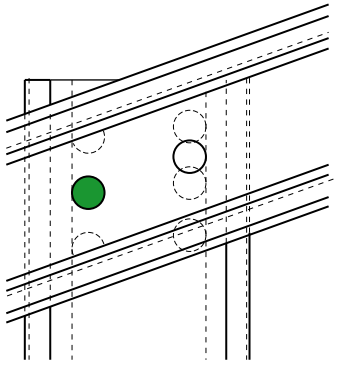
Target Height





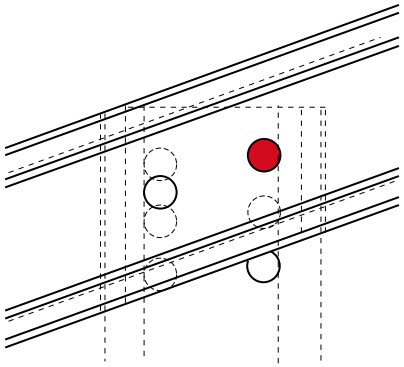
Move top chord up or down (not horizontally) as needed to adjust height in 3/4" increments.

Use single 3/4" bolt (nut and washer) at one of the locations shown.

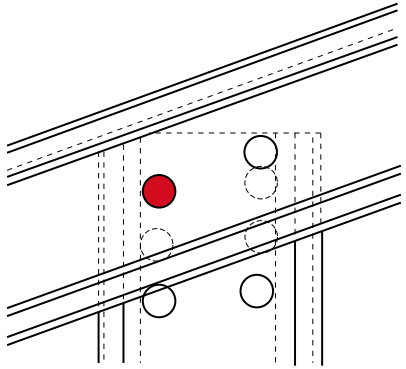


Target Height

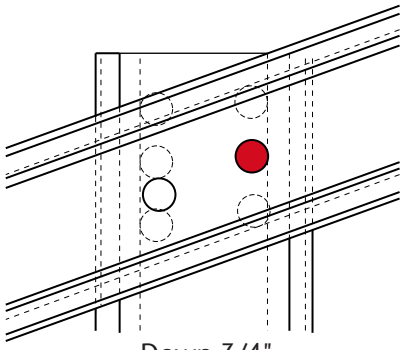
Adjustment Locations (Single 3/4" Bolt)



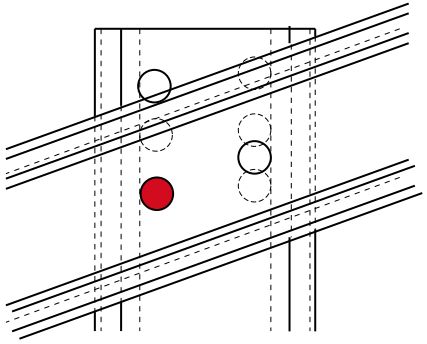
Up 3/4"



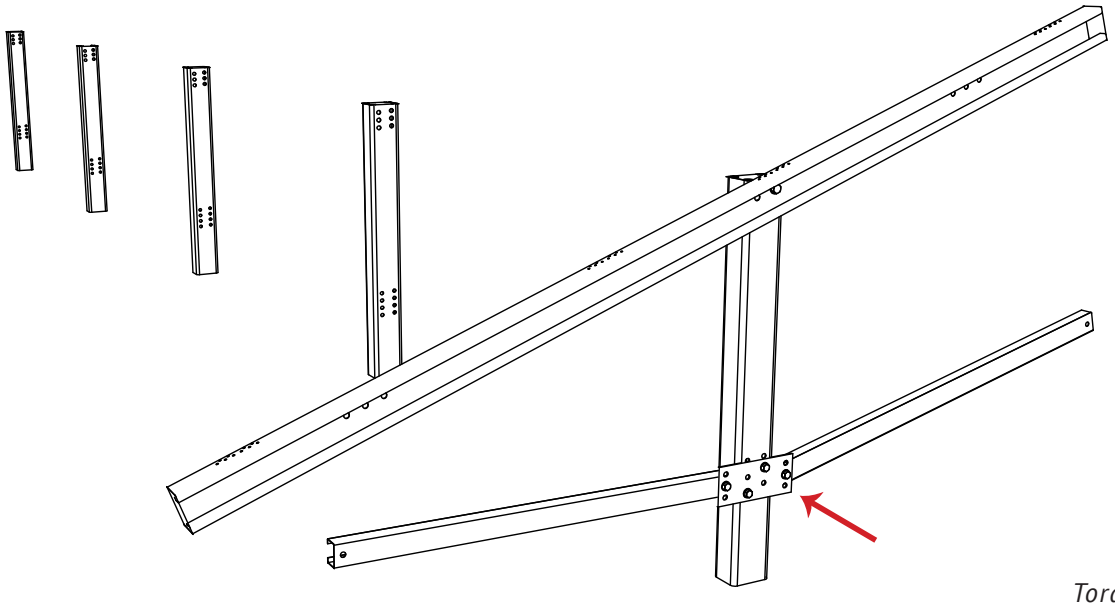
Up 1-1/2"



Down 3/4"



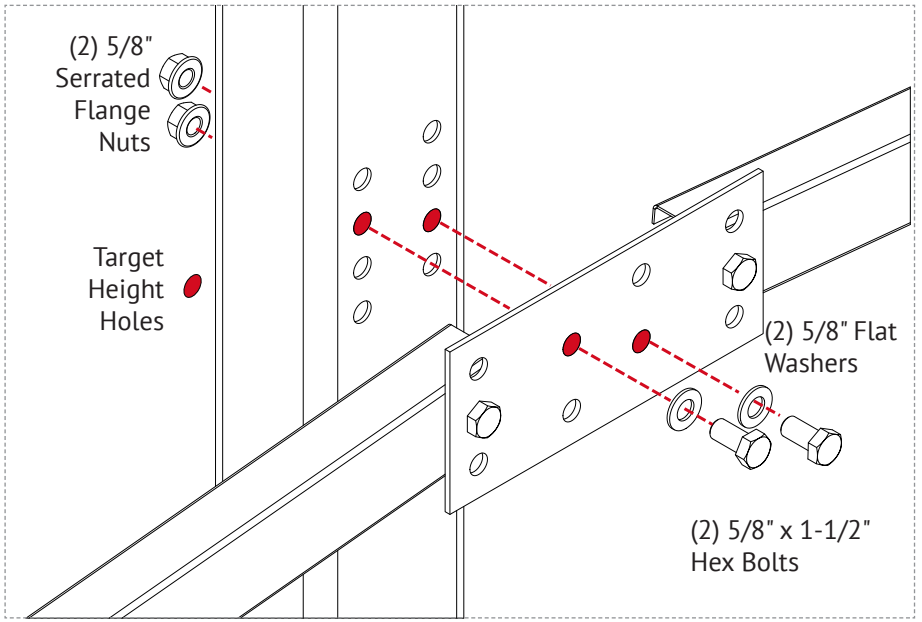
Down 1-1/2"



Diagonal Brace Assembly

Install hardware snug tight.

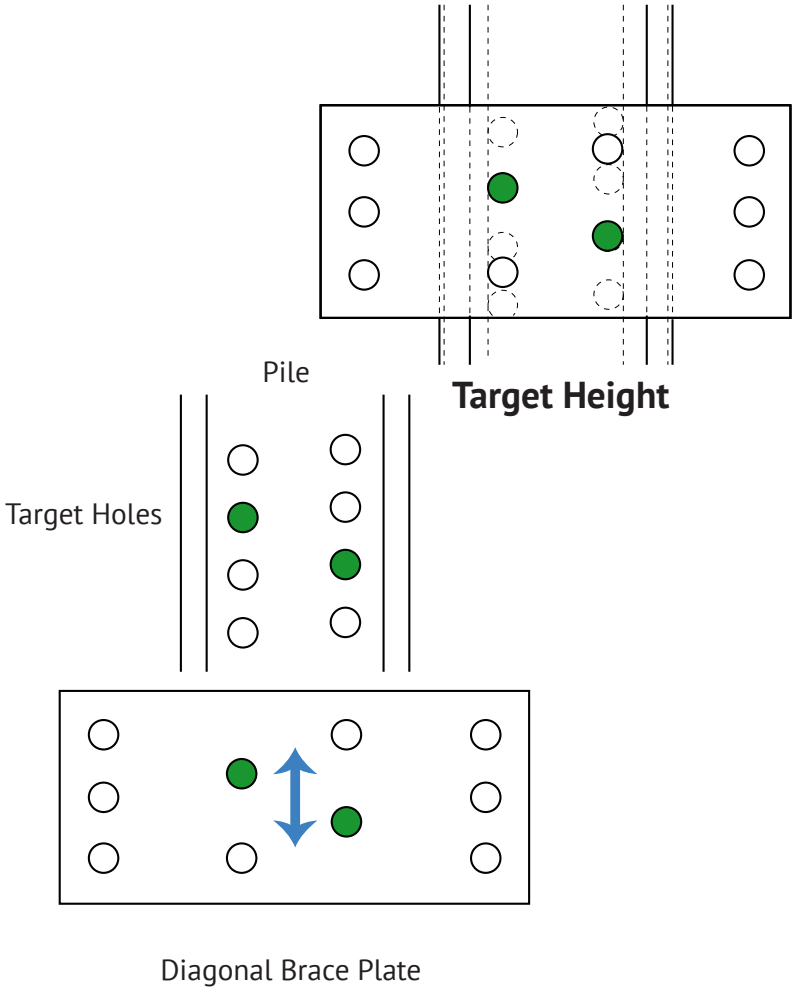
Torque per construction drawings after final adjustments.



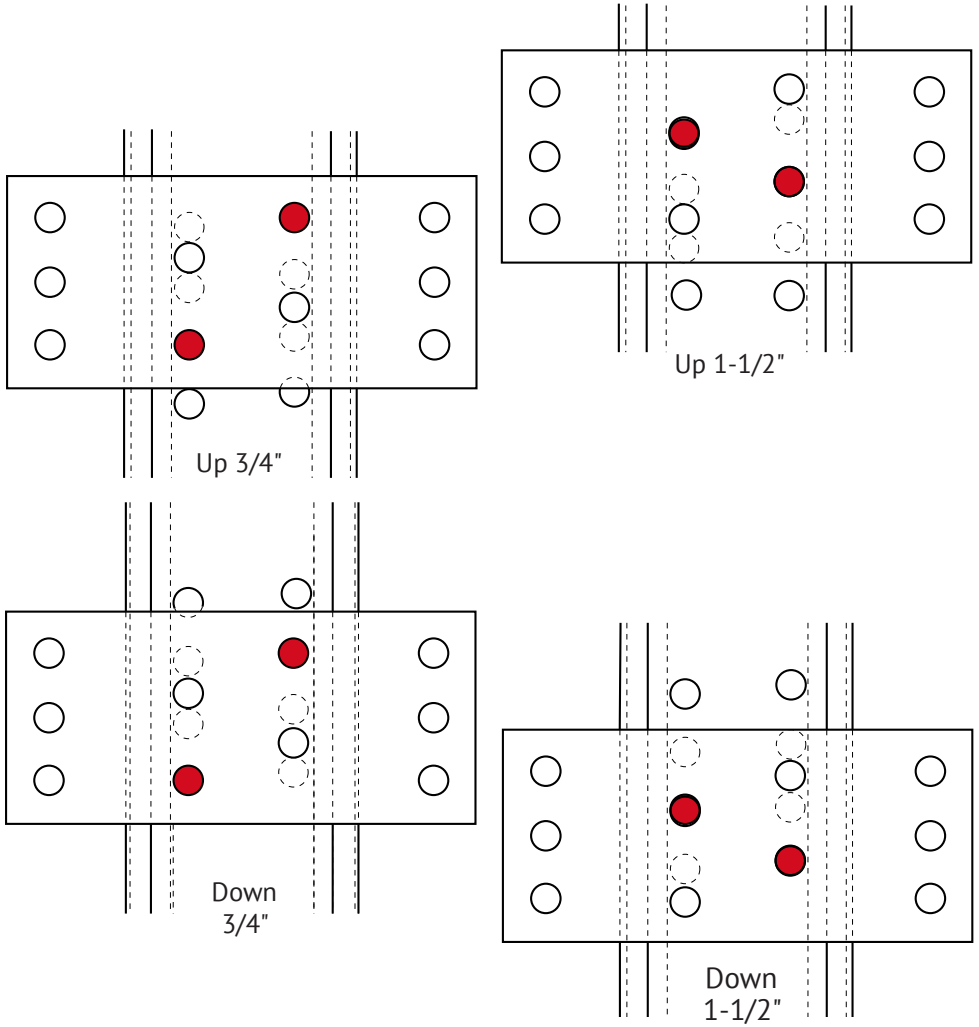
Target Height

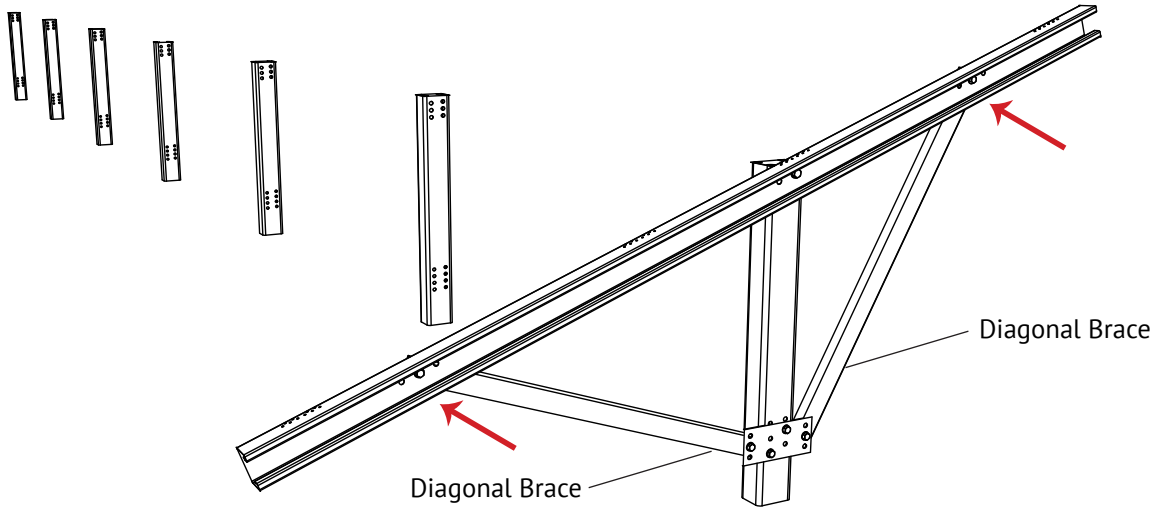
Move diagonal brace plate up or down (not horizontally) as needed to adjust height in 3/4" increments.

Use pair of 5/8" bolts (nuts and washers) at location shown.

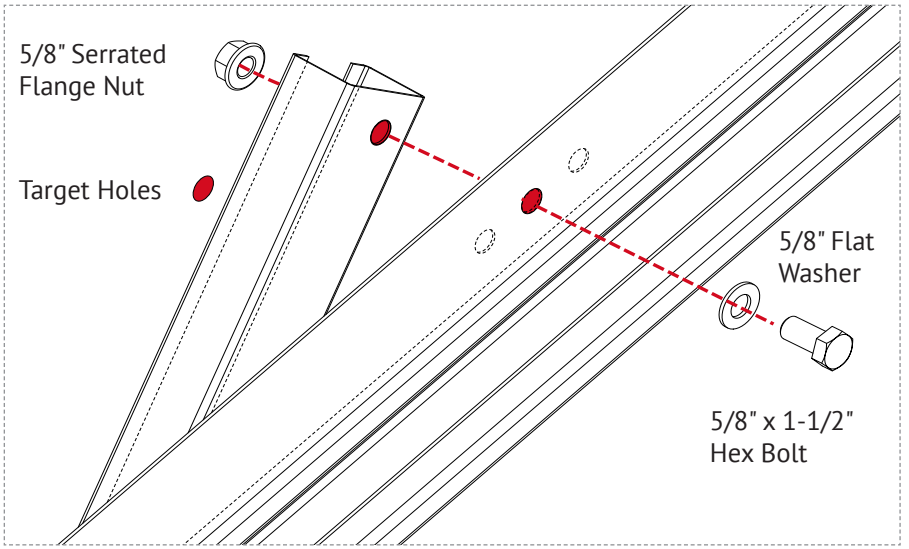


Adjustment Locations (Pair of 5/8" Bolts)

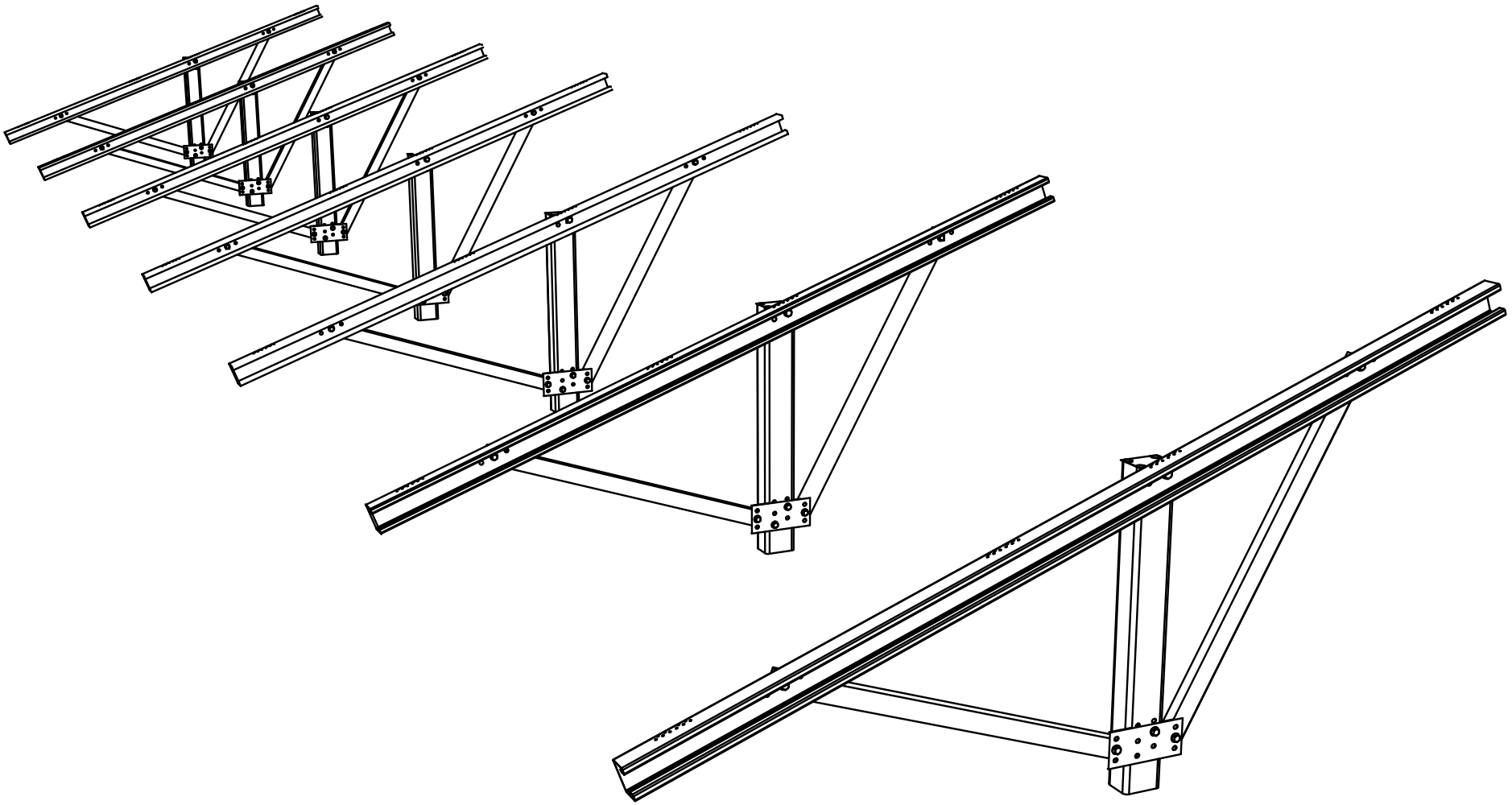


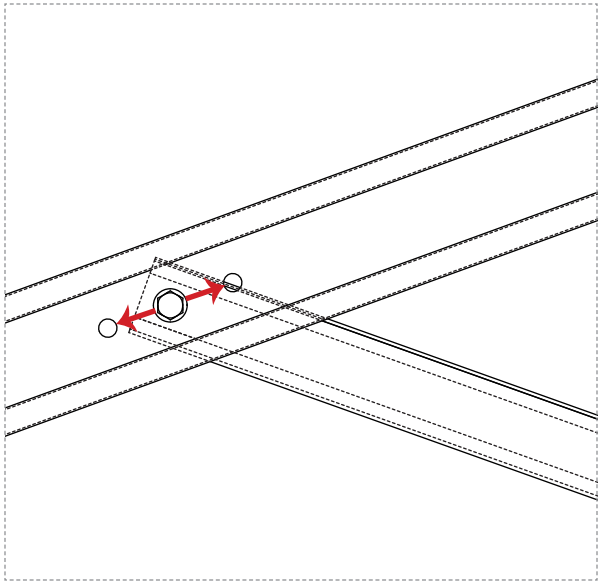


Install hardware snug tight.
Torque per construction drawings after final adjustments.

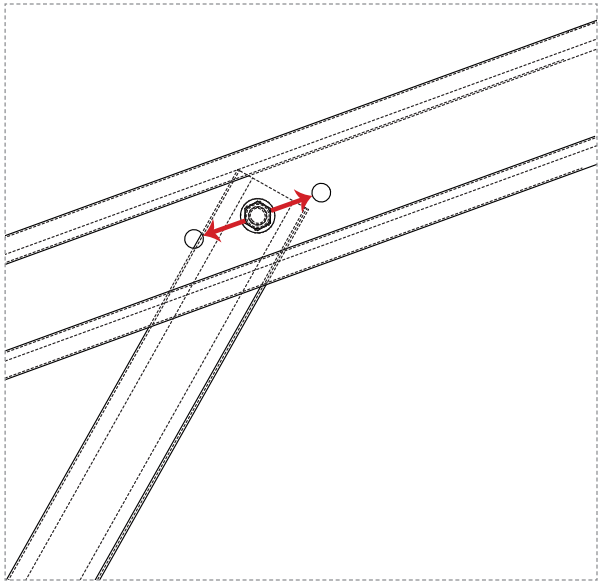


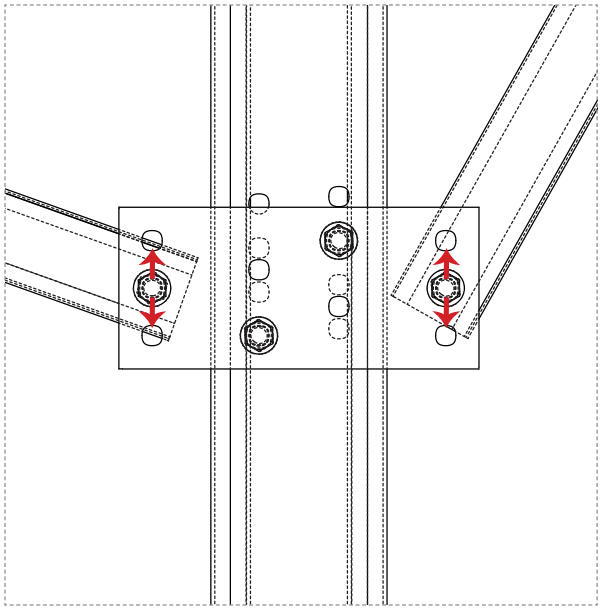
Torque all bolts after final adjustments.
Refer to construction drawings for torque values.

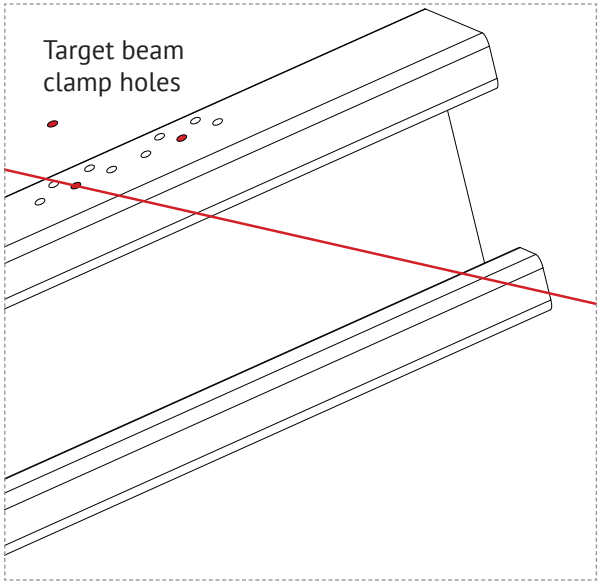




If required, additional minor adjustment of top chord angle may be achieved by a combined repositioning of diagonal braces to adjacent holes in top chord and diagonal brace plate.



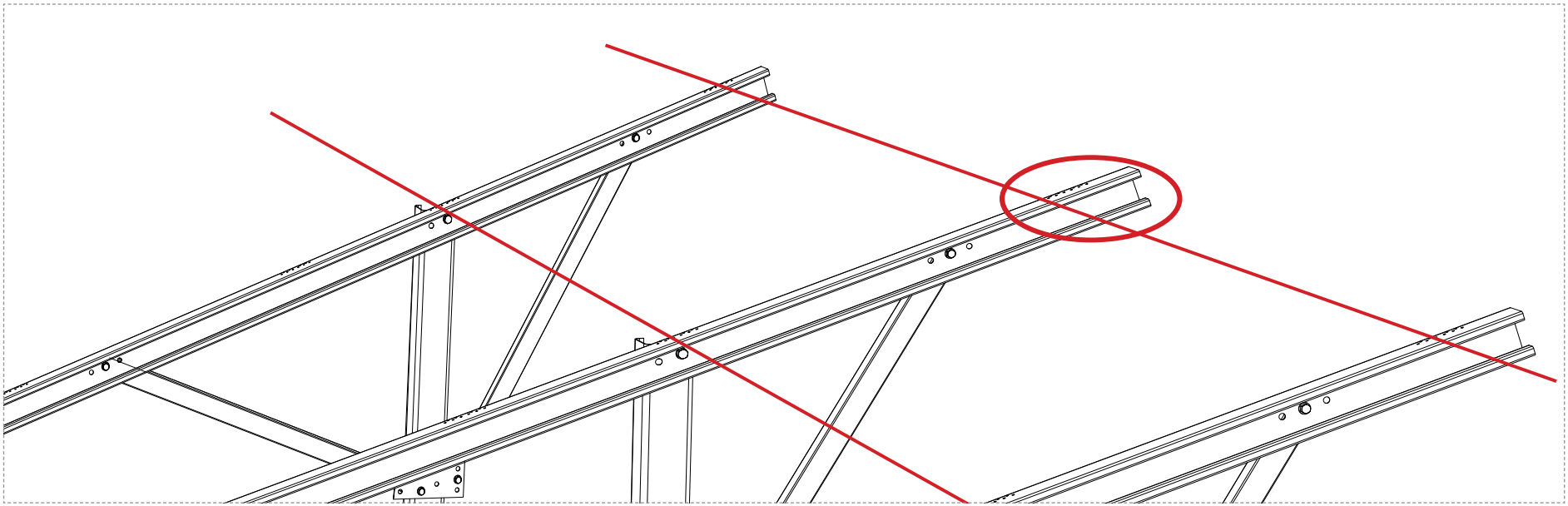




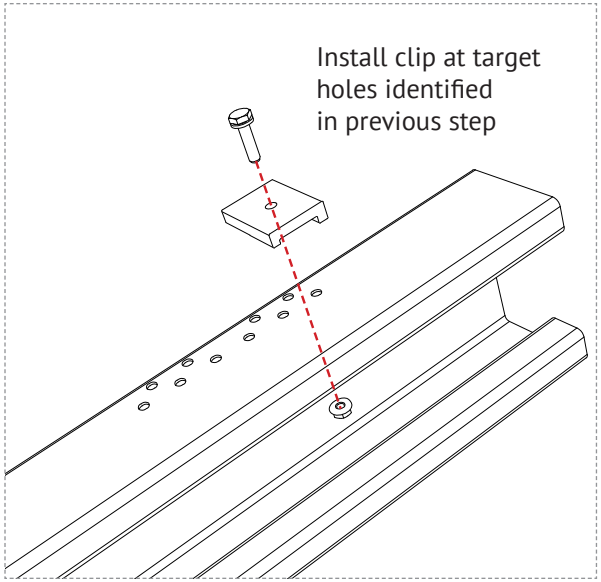
1. Align target hole locations using laser or string line.

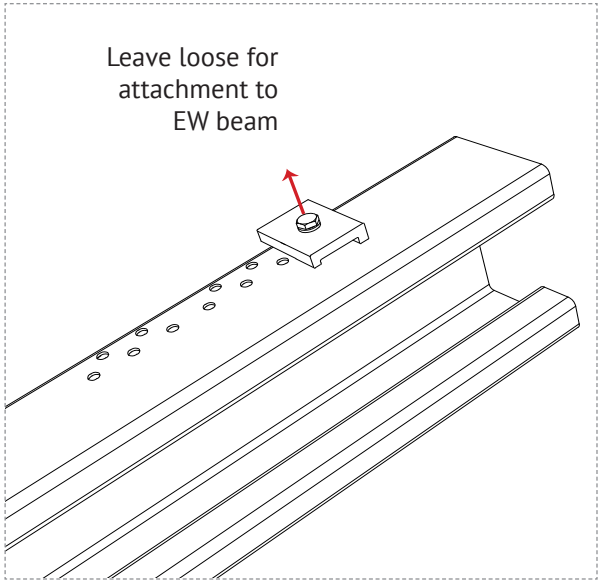
2. Determine if adjustments are needed up or down. (hole patterns allow for +1" adjustment in 1/2" increments per instruction on following pages).

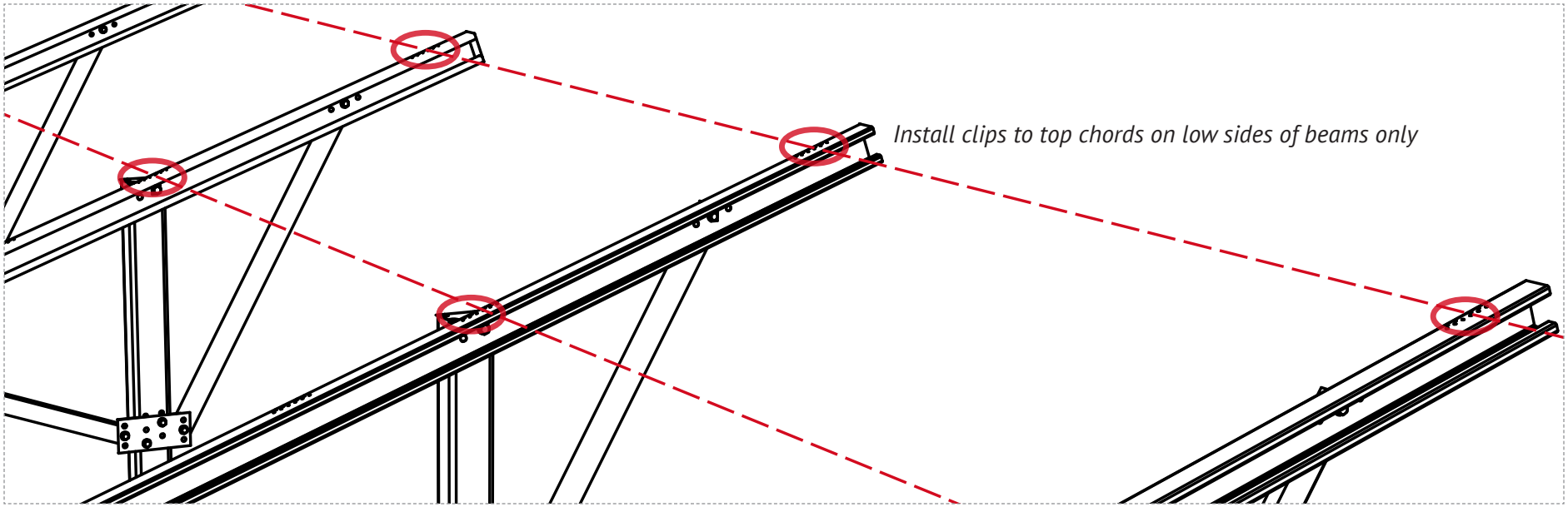
3. Mark holes to be used for attaching E-W beams prior to installing.

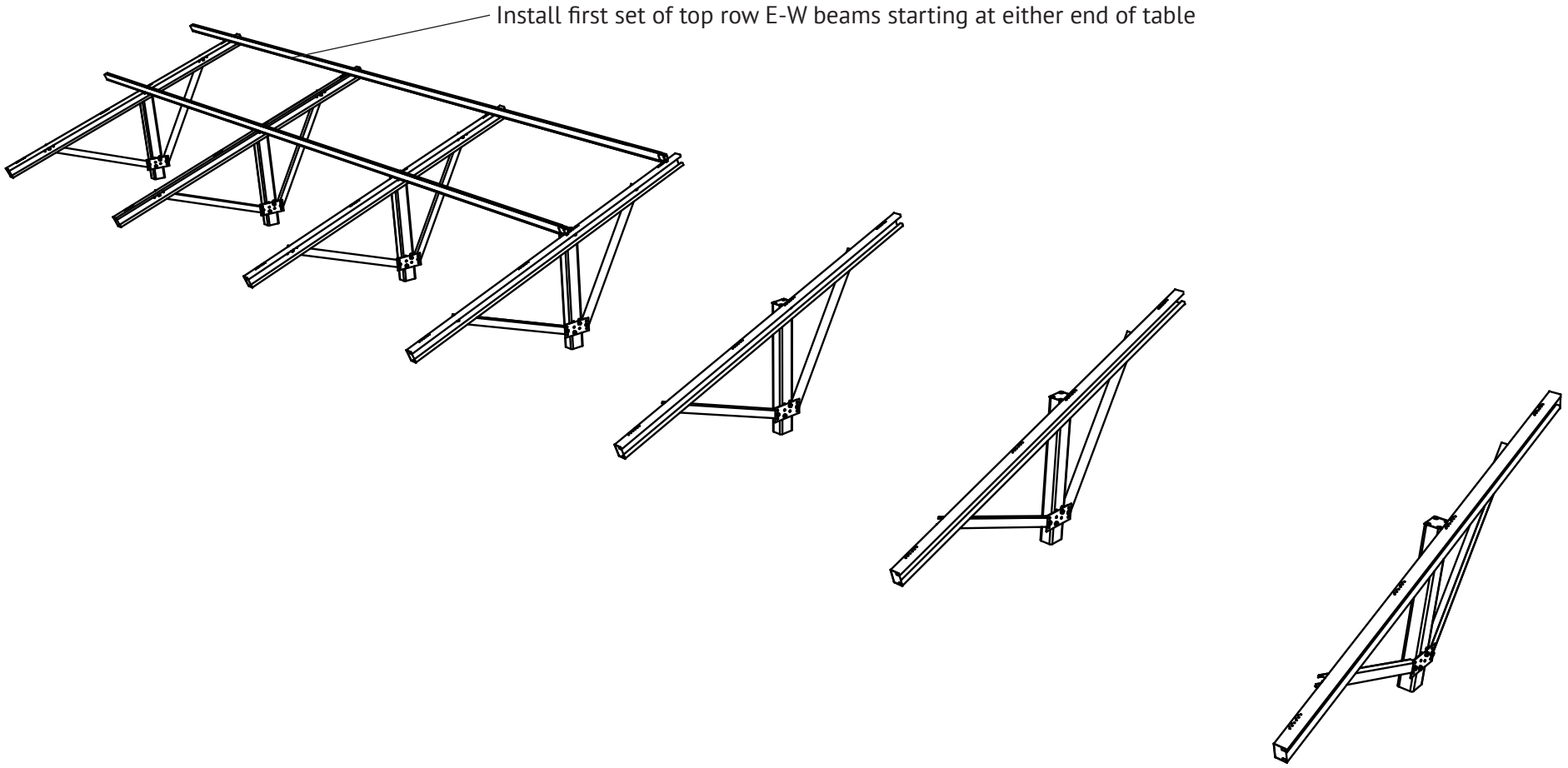


INSTALLATION OF E-W BEAM CLIPS TOP CHORDS

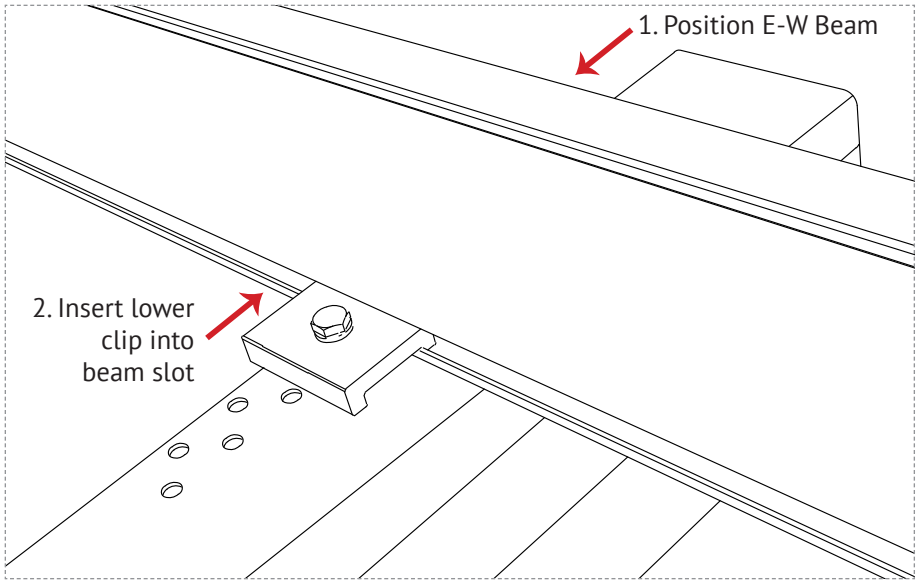


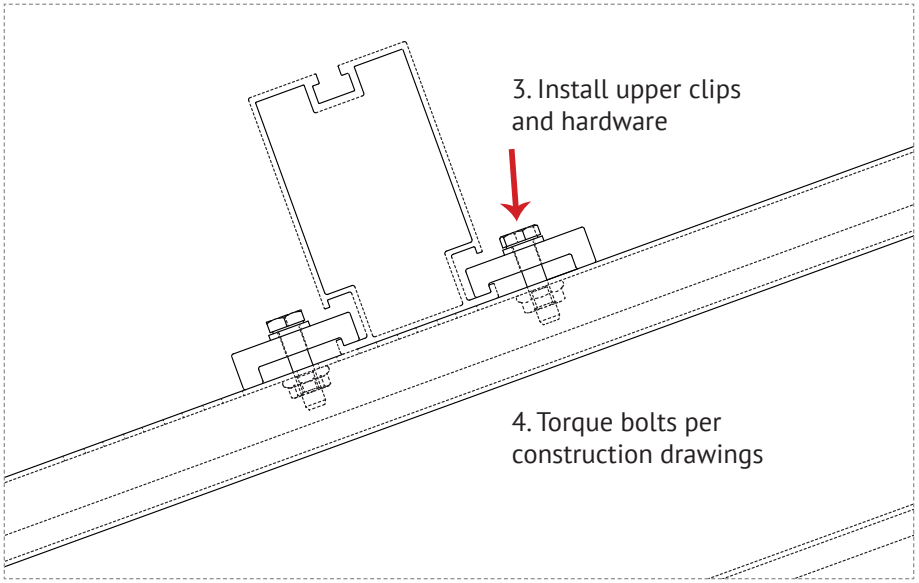


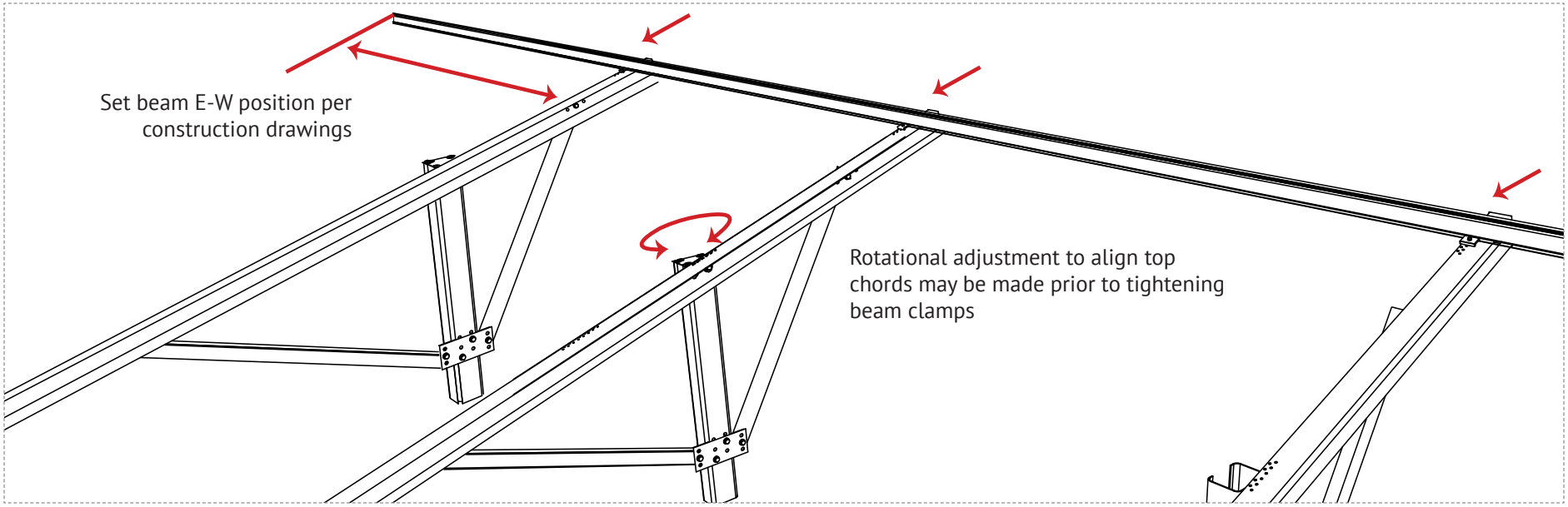


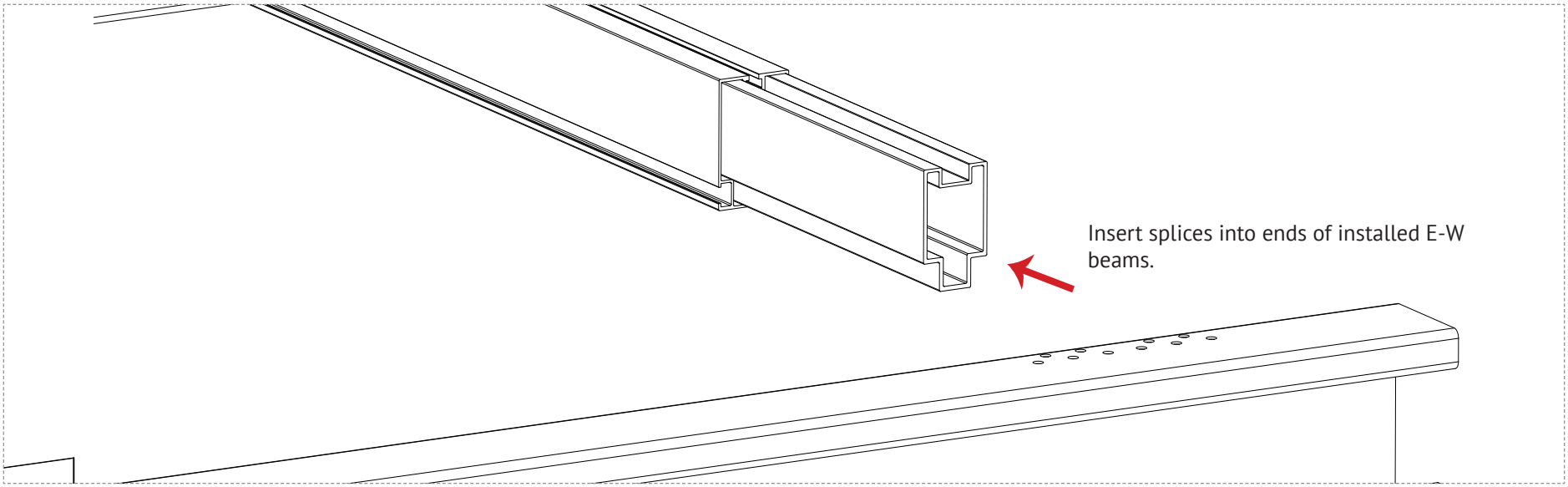

Install first set of top row E-W beams starting at either end of table

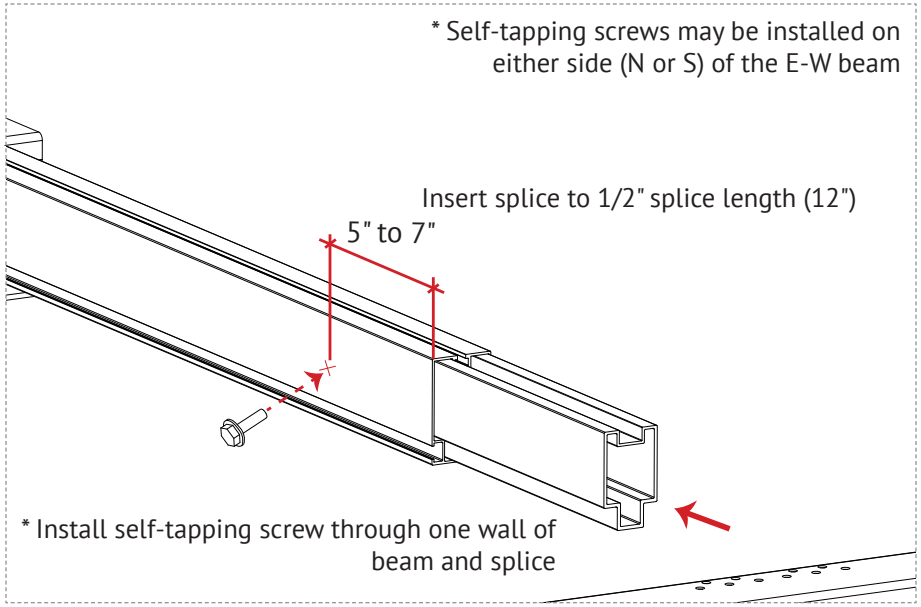
ATTACH E-W BEAMS TO TOP CHORDS

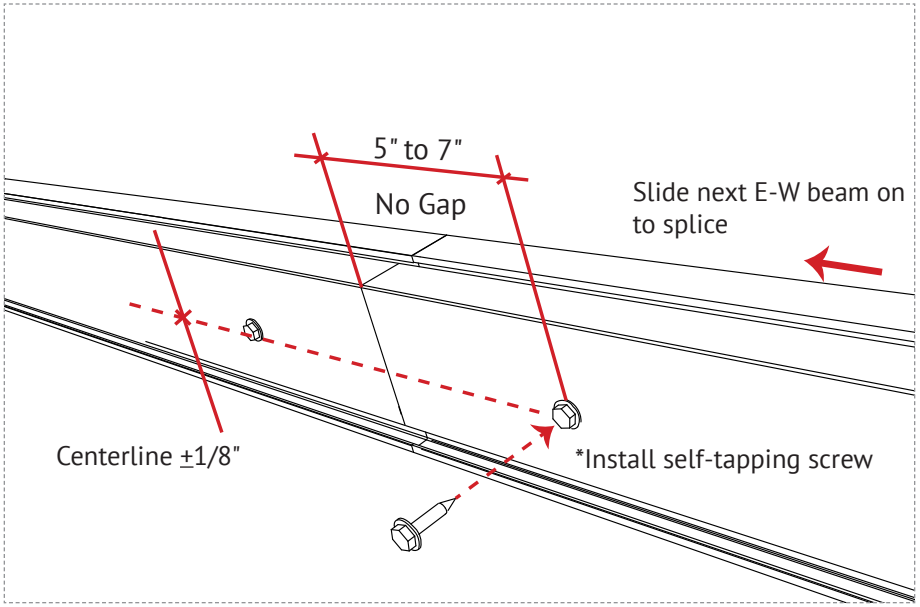


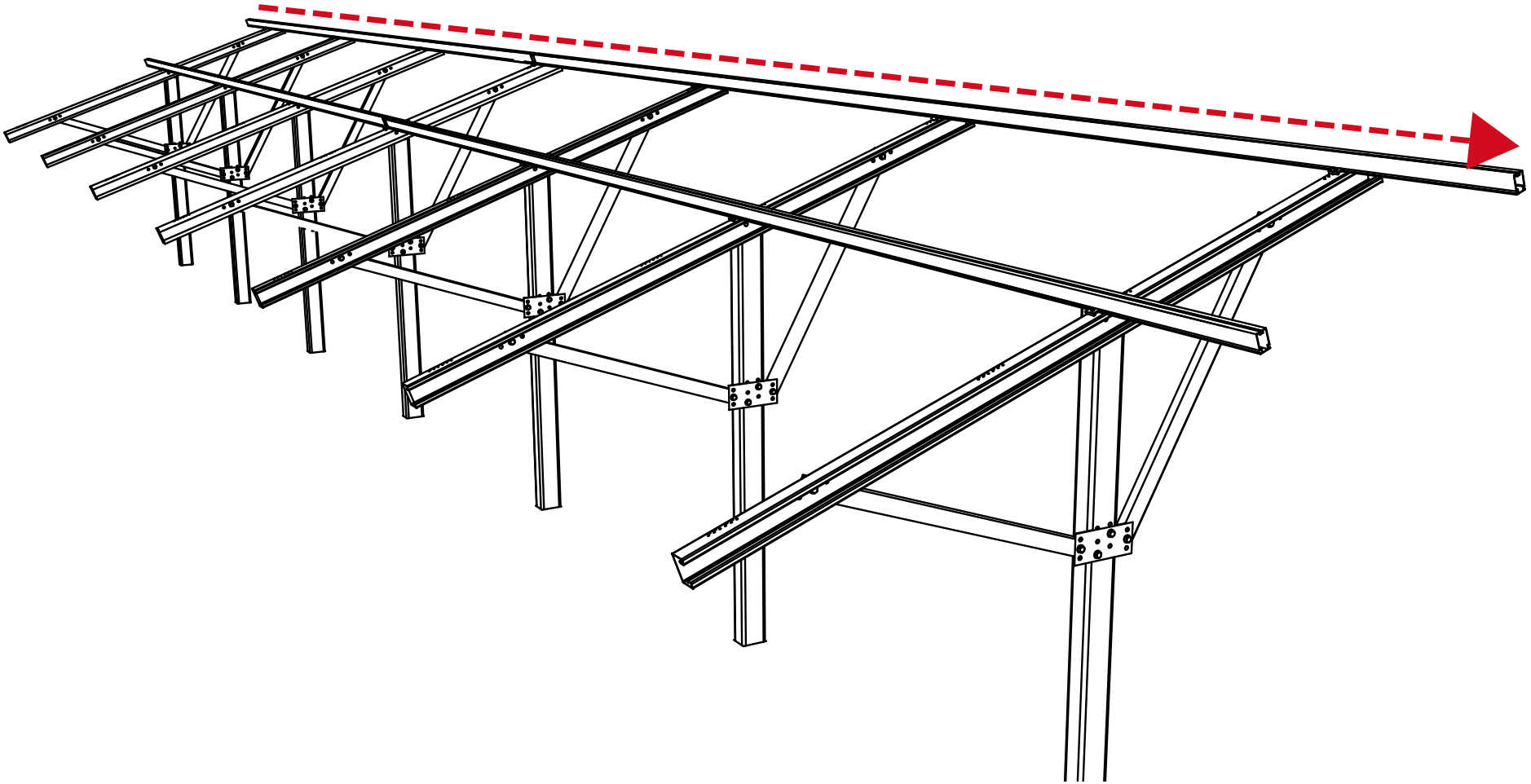




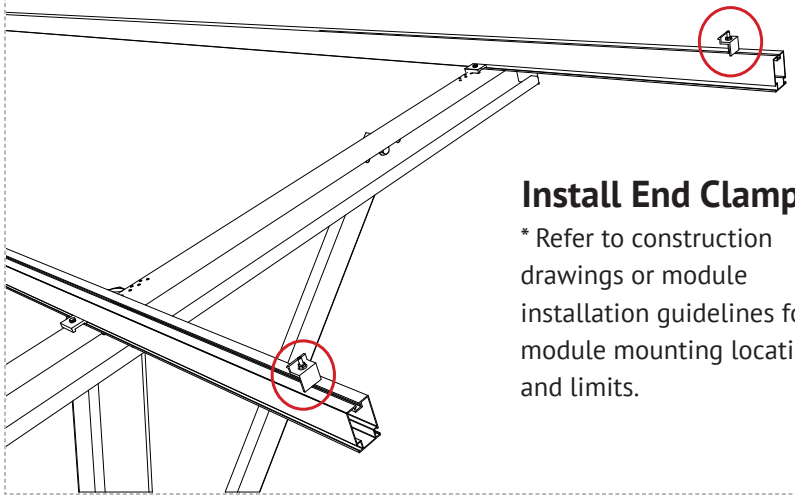

Insert splices into ends of installed E-W beams.


* Self-tapping screws may be installed on either side (N or S) of the E-W beam
Insert splice to 1/2" splice length (12")
5" to 7"
* Install self-tapping screw through one wall of beam and splice


5" to 7"
No Gap
Slide next E-W beam on to splice
Centerline ±1/8"
*Install self-tapping screw

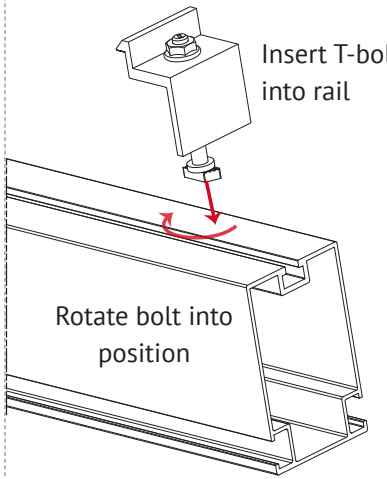


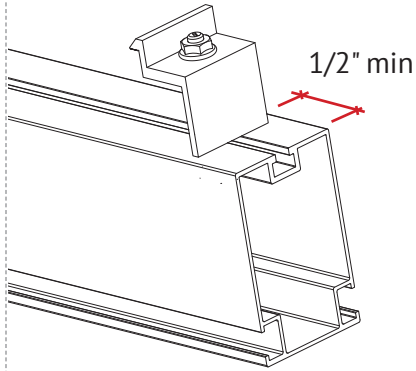
INSTALL MODULE W/END CLAMPS

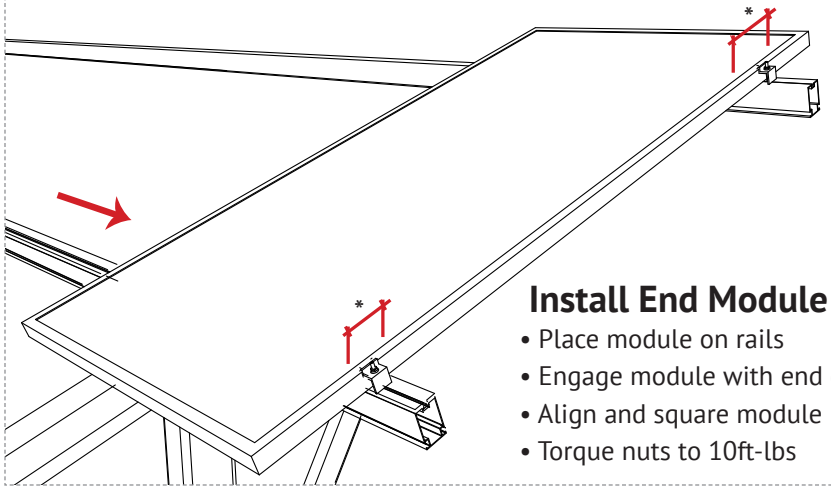


Install End Clamps

* Refer to construction drawings or module installation guidelines for module mounting locations and limits.



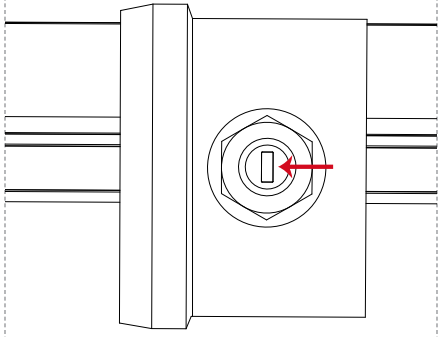




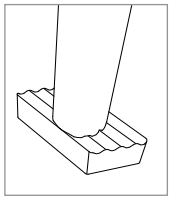
Install End Module

- Place module on rails
- Engage module with end clamps
- Align and square module
- Torque nuts to 10ft-lbs

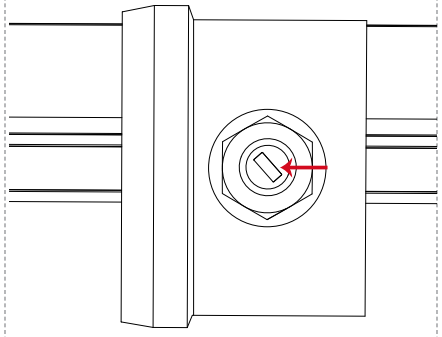
Serrated T- Bolts



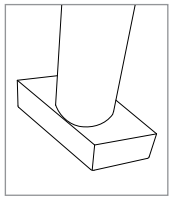
Verify that bolt position indicator is perpendicular to E-W beam



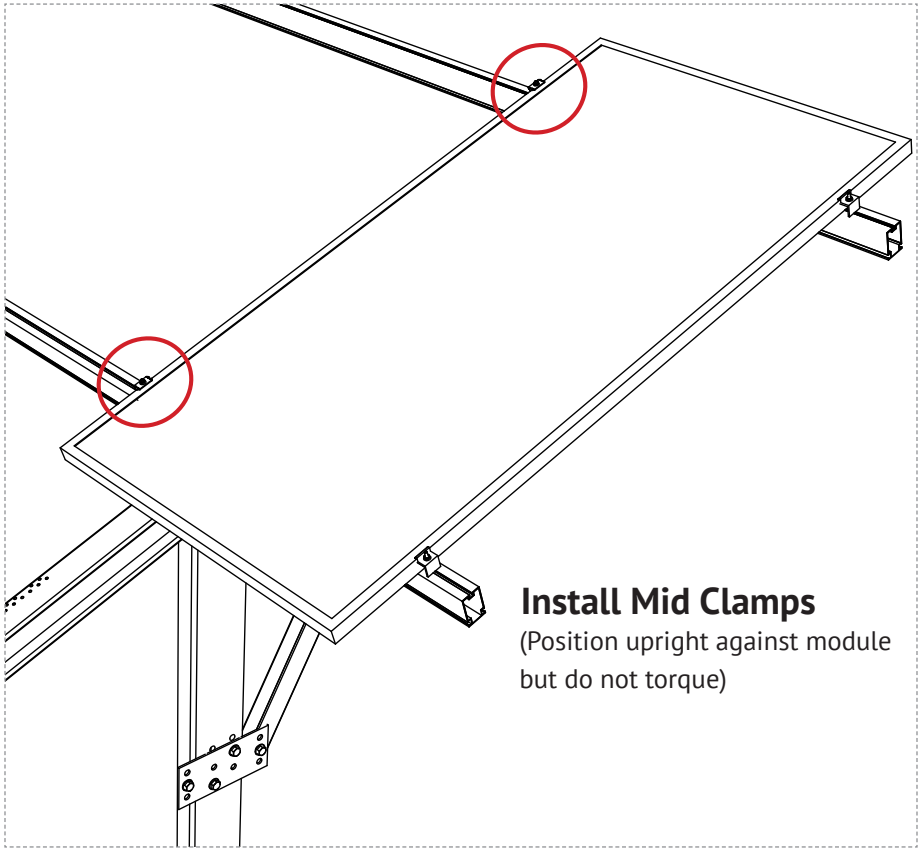
Non-Serrated T- Bolts



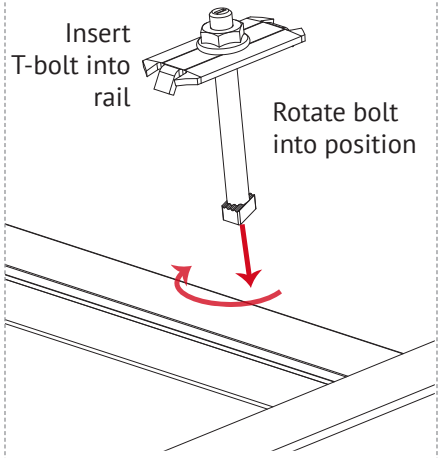
Verify that bolt position indicator is as shown



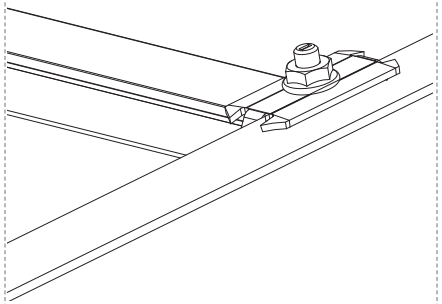
INSTALL MID CLAMPS ON 1ST MODULE



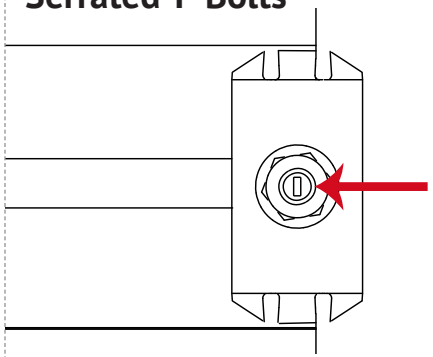
Install Mid Clamps
(Position upright against module but do not torque)



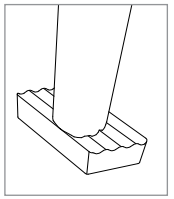
Position clamp on module.
Do not tighten nut until next module is in place.



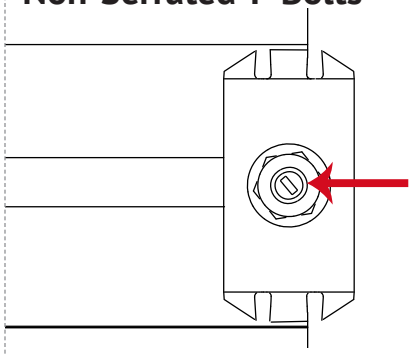
Serrated T- Bolts



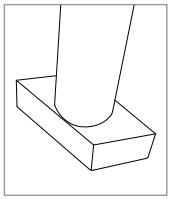
Verify that bolt position indicator is perpendicular to E-W beam

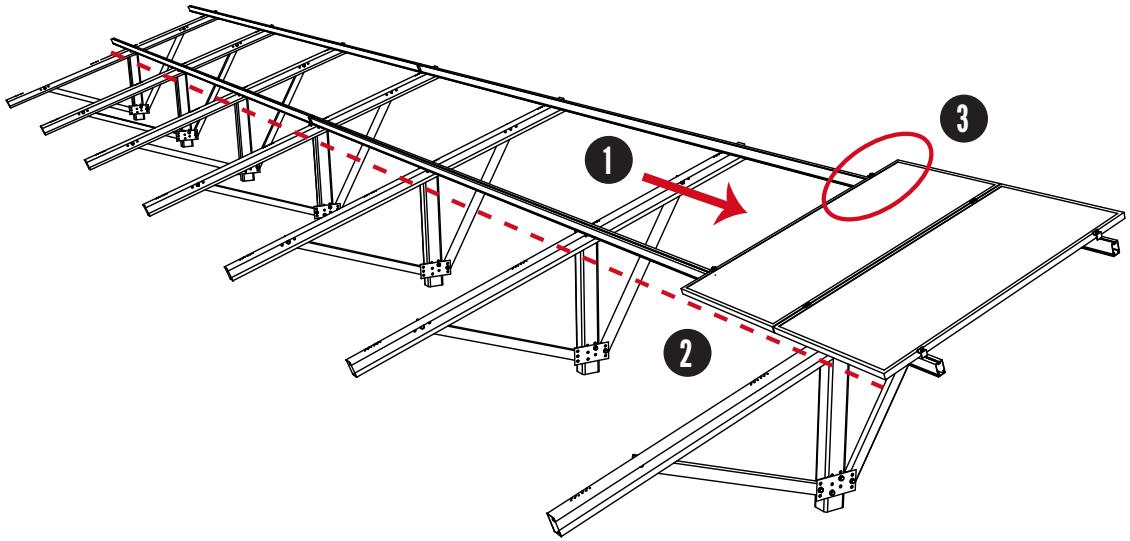


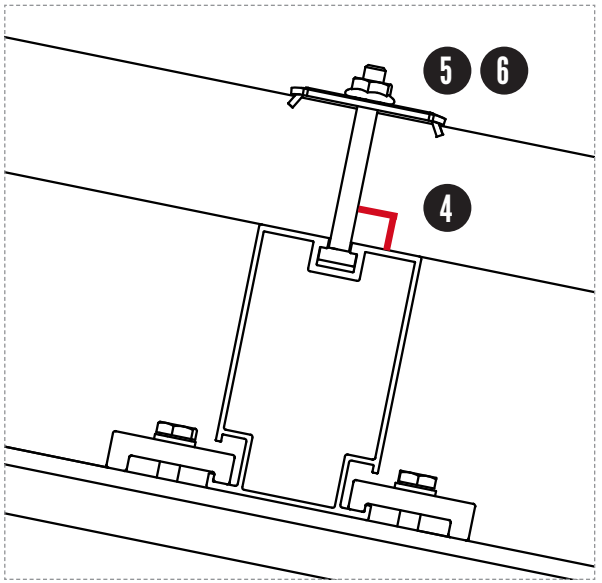
Non-Serrated T- Bolts

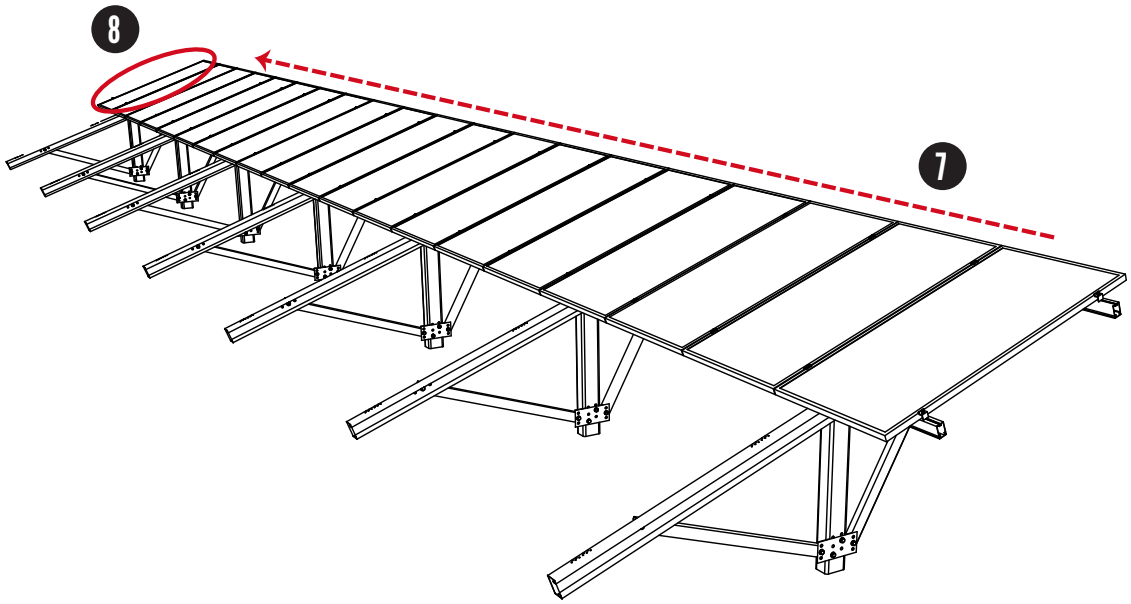


Verify that bolt position indicator is as shown

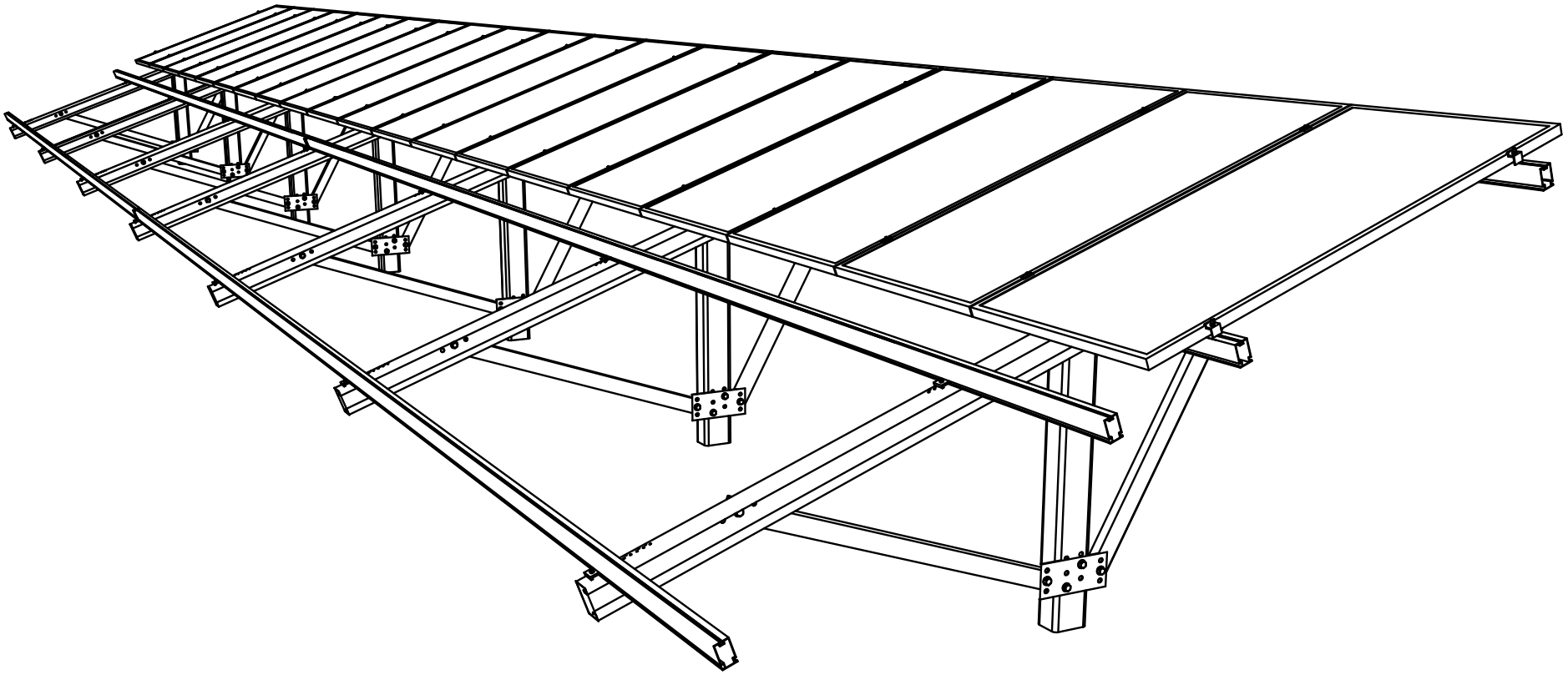


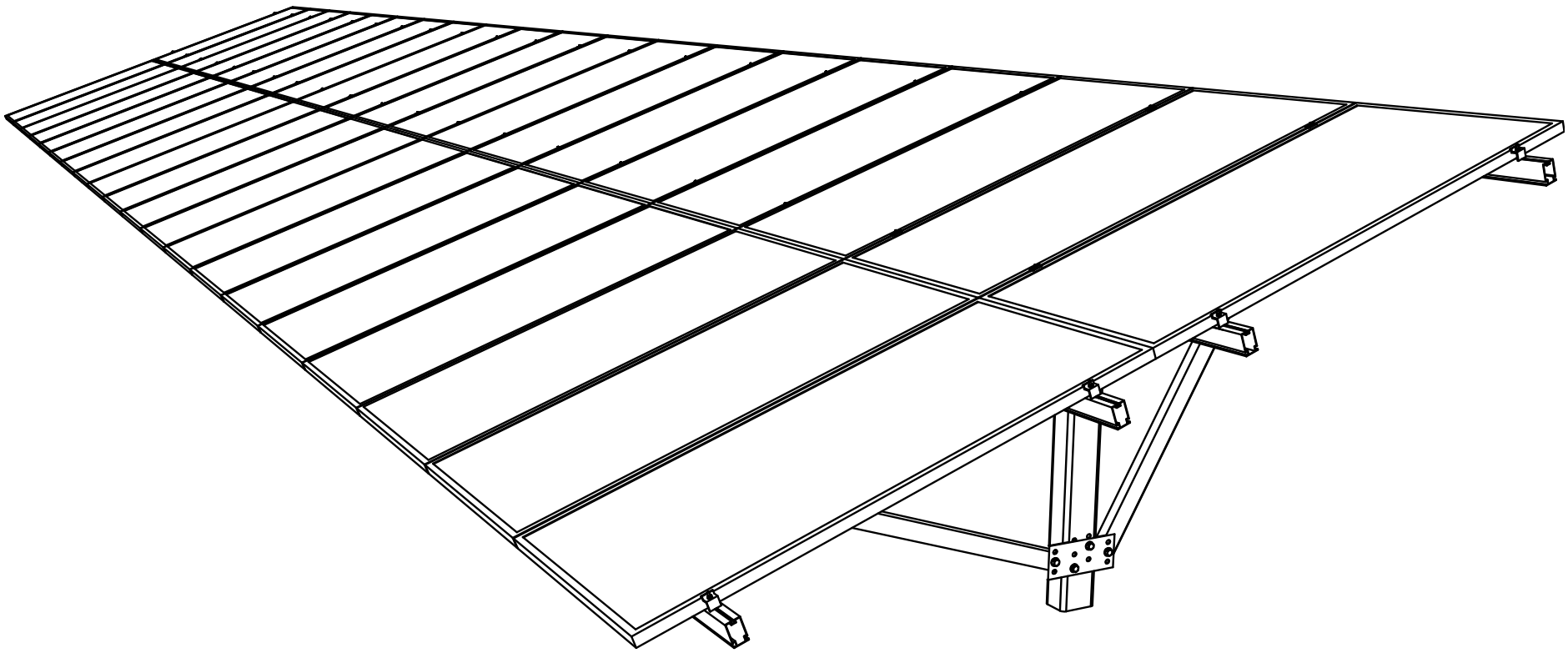


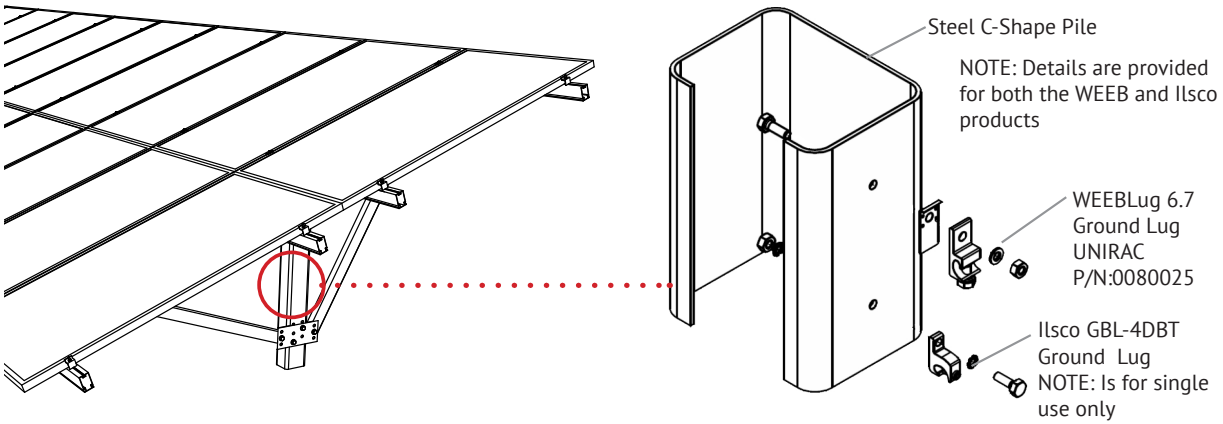




1. Place module on rails and engage with Mid Clamps
2. Align and square modules
3. Verify module gap (1/4")
4. Verify Mid Clamp bolt shafts are perpendicular to rail
5. Verify position of indicator mark on bolt
6. Torque nuts to 10 ft-lbs
7. Repeat installation of clamps and modules to complete top row
8. Install End Clamps on last module







The following grounding & bonding components have been certified to be compatible with Unirac GFT:

- Wiley WEEBLug (P/N 0080025) Torque 1/4" mounting hardware to 10ft-lbs. See product data sheet for conductor size and conductor fastener torque.
- Ilsco Lay-in Lug (P/N GBL-4DBT) Torque 10-32 mounting hardware to 5ft-lbs. See product data sheet for conductor size and conductor fastener torque.

Ground Lug	Bolt size	Drill size
WEEBLug	1/4"-20	17/64"
Ilsco	#10-32	7/31"

The entire Unirac GFT table has been classified for grounding & bonding to UL2703. The bonding path has been evaluated from the PV module frame all the way through to the pile. The following are suggestions to aid in grounding of the table for the project electrical engineer of record, and by the local authority having jurisdiction.

GROUND LUG MOUNTING DETAILS

Details are provided for both the WEEB and Ilsco products. The WEEBLug has a grounding symbol located on the lug assembly. The Ilsco lug has a green colored set screw for grounding indication purposes. One lug is recommended per GFT table. Installation must be in accordance with NFPA NEC70, however the electrical designer of record should refer to the latest revision of National Electrical Code (NEC) for actual grounding conductor cable size. Unirac GFT is intended to be used with PV modules that have a system voltage less than or equal to 1,000VDC. A minimum 10AWG, 105°C copper grounding conductor should be used to ground the system according to the (NEC) and the authority having jurisdiction. It is the installers responsibility to check local codes, which may vary.

TEMPORARY BONDING CONNECTION DURING ARRAY MAINTENANCE

When removing modules for replacement or system maintenance, any module left in place that is secured with a bonding mid-clamp will be properly grounded. If a module adjacent to the end of a row is removed, or if any other maintenance condition leaves a module without a bonding mid clamp, a temporary bonding connection must be installed as follows:

• Attach Ilsco GBL-4DBT or WeebLug 6.7 to both modules on either side of the module that has been removed. Note: The lug should be attached to the manufacturers designated grounding point on the frame.

• Install a solid #6 Awg copper wire to both grounding lugs.

MANUFACTURER	MODEL
Canadian Solar	CS6X-P
Canadian Solar	CS6P-M
Canadian Solar	CS6P-P
Canadian Solar	ELPS CS6P-MM
Canadian Solar	ELPS CS6A-MM
Jinko Solar	Standard-60
Jinko Solar	Standard-72
Jinko Solar	Standard-96
LG Solar	Mono X Neon
LG Solar	Mono X
REC	PE72
SolarWorld	Sunmodule Plus
SolarWorld	Sunmodule Pro XL
SolarWorld	Sunmodule Protect
SunPower	X21 Series
SunPower	E20/200 Series-72 Cell
SunPower	E20 Series-96 Cell
Trina	PA05 60-cell Universal Module
Yingli	YGE 60 Cell Series
Yingli	YGE-U 72 Cell Series
Yingli	Panda 60 Cell Series