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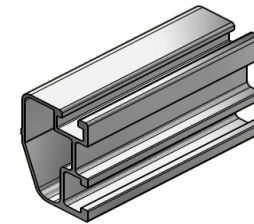
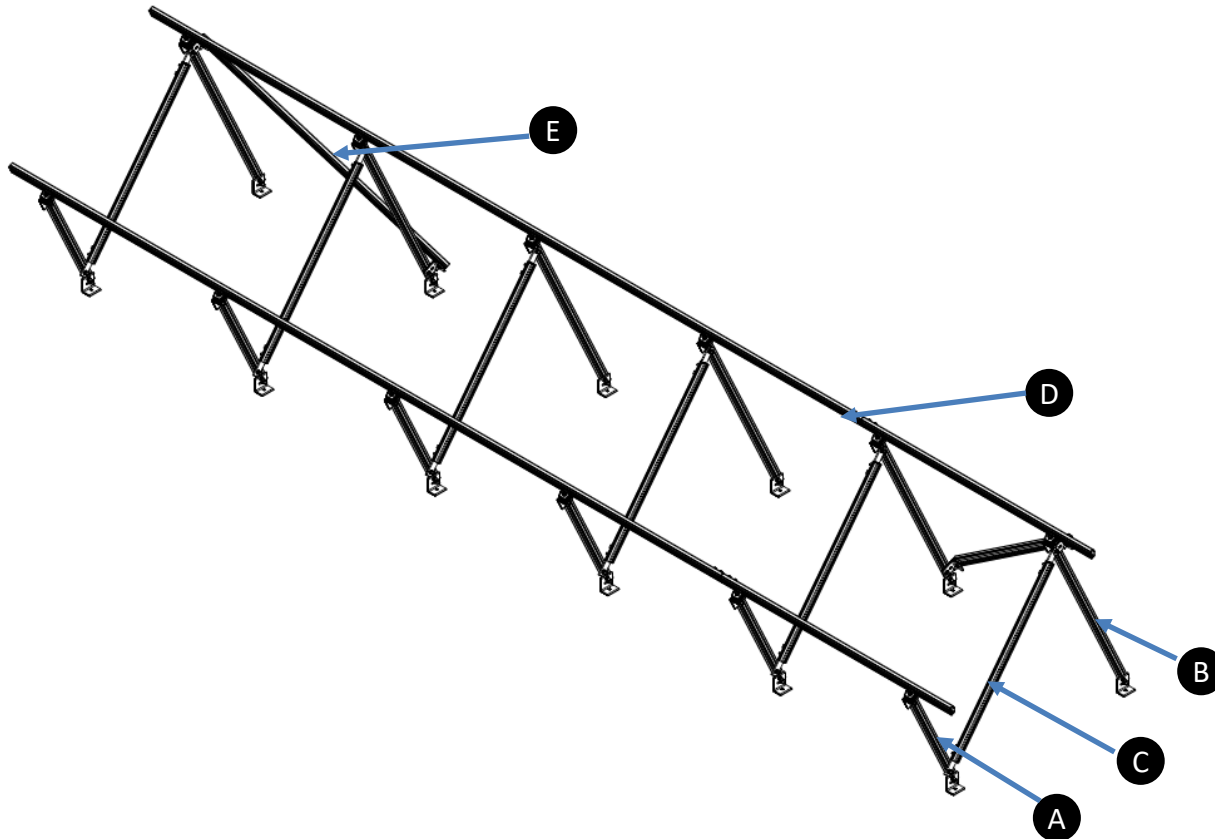
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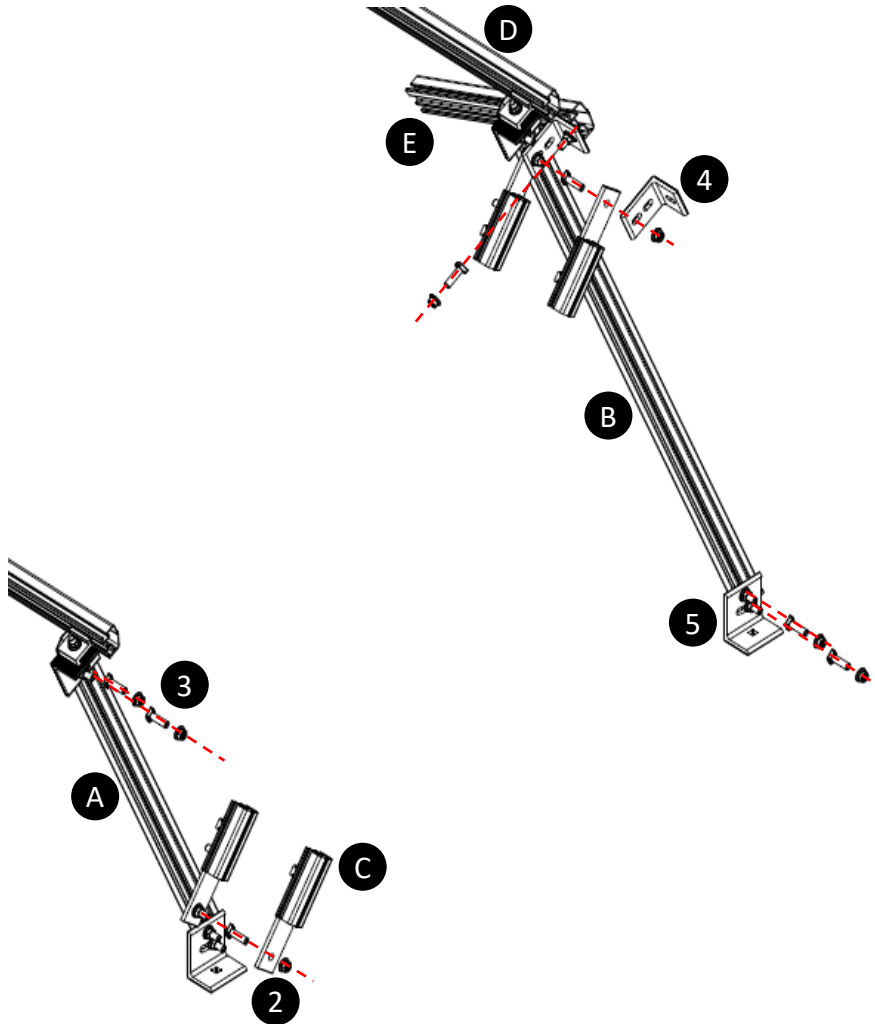




- 1 **ASCENDER RAIL** - Functions as **A** to **E**. Aluminum extrusion, available in mill finish.
- A** **FRONT TILT LEG** - Supports NS rail. Use one Front Tilt leg per frame/bay.
- B** **REAR TILT LEG** - Supports NS rail. Use one Rear Tilt leg per frame/bay.
- C** **NS Bracing** - NS Bracing is connected between the Front tilt Leg and Mid Tilt Leg.
- D** **EW BEAM** - Supports PV module. Use two rails per row of modules. EW Beam runs in East-West direction.
- E** **EW REAR Bracing** - Connects the Rear Tilt legs.

SAFETY:

All applicable OSHA safety guidelines should be observed when working on a PV installation job site. The installation and handling of PV solar modules, electrical installation and PV racking systems involves handling components with potentially sharp metal edges. Rules regarding the use of gloves and other personal protective equipment should be observed.

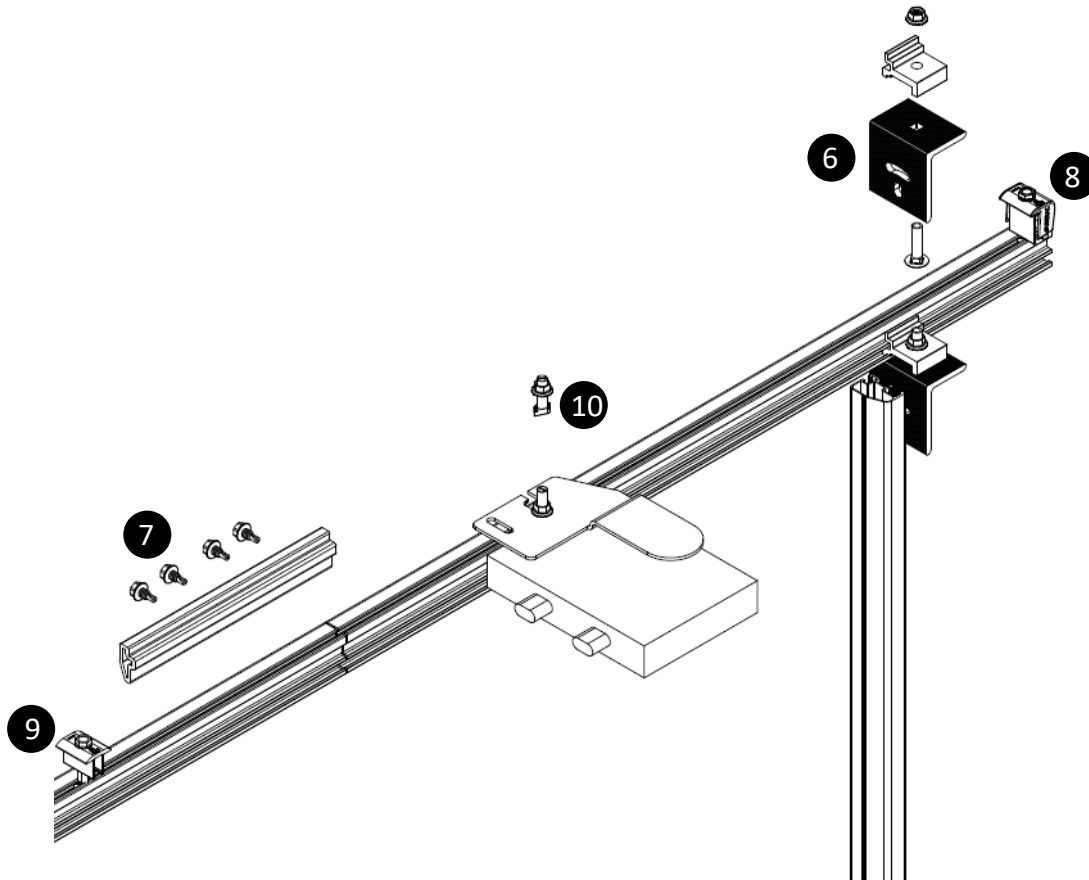


- 2 **ASCENDER TILT PLATE ASSY** – Connects Tilt legs with NS rail and NS bracing with Tilt legs.
- 3 **T-BOLT AND SERRATED FLANGE NUT (3/8" X 1.2" SS)** – Use on Tilt plate assembly, EW Bracing to L-foot and Tilt leg to L-foot connection. Provides electrical bonding from Tilt plate to rail and L-foot to rail.
- 4 **L-FOOT SERR W/ HARDWARE** – (1) T-bolt and (1) serrated flange nut will be shipped with L-foot. Use L-Foot to secure the EW Bracing to the tilt leg.
- 5 **SWIVEL L-PLATE W/ HARDWARE** - (1) T-bolt and (1) serrated flange nut will be shipped with swivel L-foot. Use Swivel L-Foot to secure the Tilt legs.

Note: Depending upon the load, two T-Bolts will be required in some cases. Please consult the SM Ascender calculator tool for the T-bolt requirements—the same Swivel L-Feet will be used regardless of the number of T-bolts required for the connection.

Wrenches and Torques		
Description	Wrench or Socket Size	Recommended Torque (ft-lbs)
5/16" Thread cutting Bolt (2)	1/2"	30
3/8" T-Bolt (3,4,5)		30

Note: Only unique connections are displayed in each detail. Same connections are not repeated.



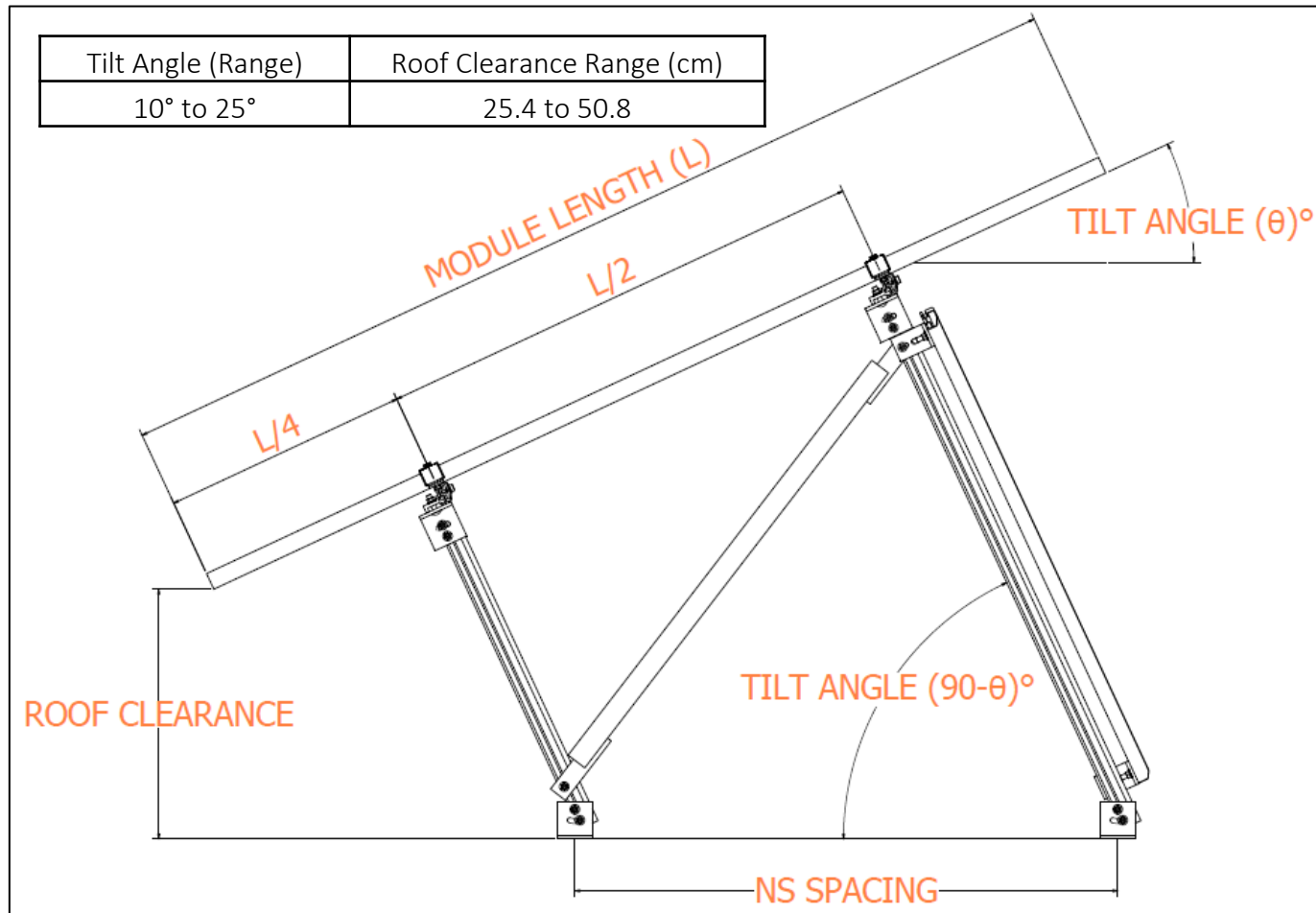
- 6 ALTERNATE ASCENDER BEAM CLIP ASS** - Connects the EW beam to the Tilt Legs.
- 7 ASCENDER SPLICE WITH HARDWARE** – 4 of 5/16"-18 X 0.75" SS Hex Head Drilling Screws will be shipped with splice. Connects EW rail to EW rail. Structural splice joins, aligns and electrically bonds rail sections into single length of rail. Forms a rigid splice joint, 10 inches long, assembled with bonding hardware. Use 4 screws per splice.
- 8 UNIVERSAL AF END CLAMP** - Pre-assembled universal clamp that secures module to rail at module flange by tightening ½" Hex Bolt.
- 9 UNIVERSAL AF MID CLAMP** - Pre-assembled universal clamp provides module to module and module to rail bond. Aluminum clamp with stainless steel bonding pins and T-Bolt.
- 10 MICROINVERTER MOUNTING BOLT** – Pre-assembled bolt, nut and captive star washer attaches and bonds microinverter to rail.

Wrenches and Torques

Description	Wrench or Socket Size	Recommended Torque (ft-lbs)
Beam Clip (6)	1/2"	15
Rail Splice Bolt (7)		20
End Clamp (8)		15
Mid Clamp (9)		15
Micro Inverter (10)		10

Required Tools

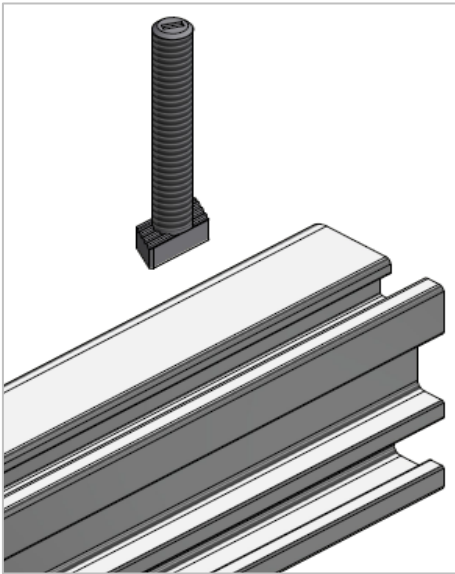
1. Torque Wrench
2. Impact Wrench
3. 1/2" Socket
4. Saw
5. Measuring Tools



- Note down the NS spacing from tool for STEP 4.
- Note down EW rails spacing for STEP 13.
- Note down the Module overhang distance to position the module.

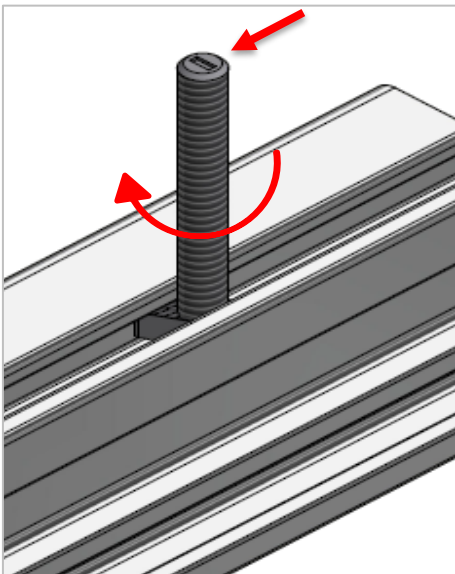
NOTE: ALL DIMENSIONS IN THE ABOVE FIGURE ARE IN CENTIMETERS. MODULE DIMENSIONS TO BE TAKEN IN CENTIMETERS FOR CALCULATING OTHER DIMENSIONS AS MENTIONED IN THE FIGURE.

COMMON STEPS FOR ALL T-BOLT INSTALLATIONS



STEP A. INSERT T-BOLT

Insert T-Bolt into the rail and position the T-Bolt.



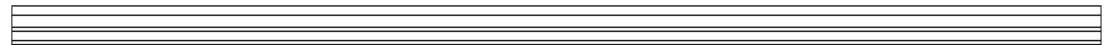
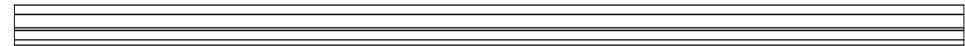
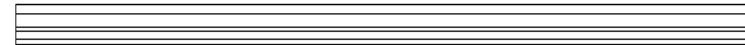
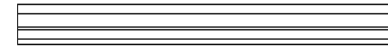
STEP B. ROTATE THE T-BOLT

Rotate T-Bolt into position. Verify that the position indicator and T-Bolt shaft are angled in the correct position.

STEP 1. CUT RAIL INTO SECTIONS

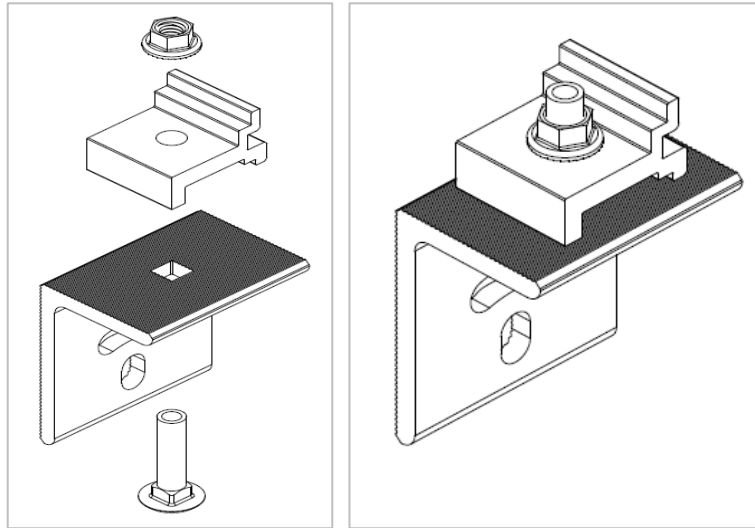
Cut rails into needed lengths and verify the count of each part. Refer to the tool to find the length and quantities of the following parts:

Length & Quantities	1 : Tilt Post - Front	XXX cm
		XX c/u
	2 : Tilt Post - Rear	XXX cm
		XX c/u
	3 : NS Bracing	XXX cm
		XX c/u
	4 : Overall EW Beam	XXX cm
		XX c/u
	5 : EW Bracing - Rear	XXX cm
		XX c/u



CUTTING GUIDE :

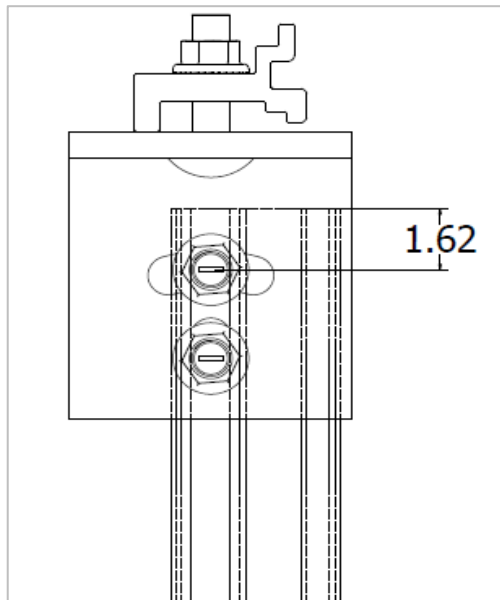
1. Cut the East-West Beam into the specified length. Measure before cutting to minimize waste.
2. Utilize excess rail after cutting the EW beam before using a new rail to make other members of the structure.
3. Minimize rail waste by considering the different length of the rail necessary for each member of the structure.
4. Cutting must be accurate to next millimeter. Any discrepancy in the lengths may result in difficulties while installation of the structure.
5. For installation on uneven sites, measure from the deepest undulation to calculate spans and build the first frame. The rest of the tilt legs must only be adjusted by shortening.



STEP 2. ASSEMBLE SWIVEL L-FOOT TO BEAM CLIP

Assemble the part using the carriage bolt and nut included in the kit.

Do not tighten nut in this step.



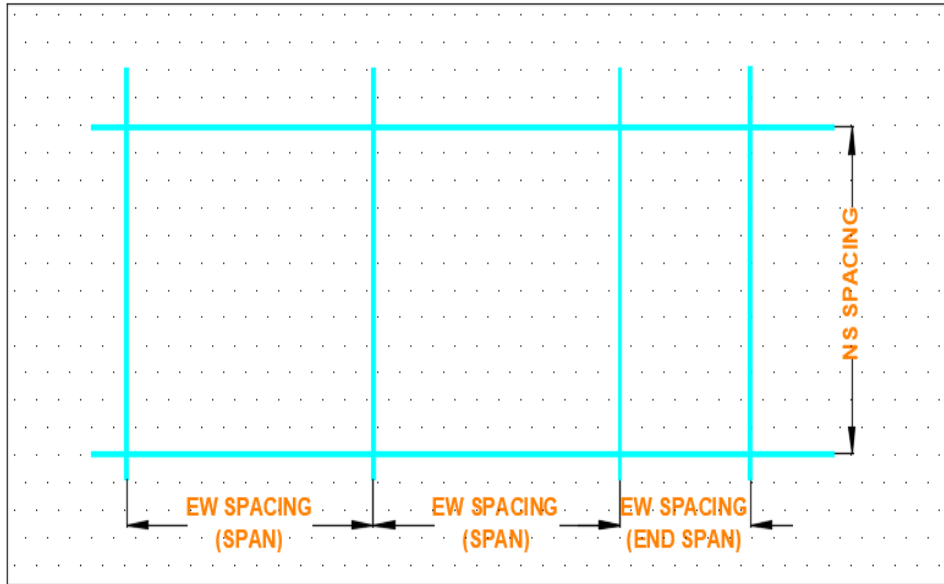
STEP 3. ATTACH BEAM CLIP ASSEMBLY TO TILT LEGS

Attach assembly to Tilt legs using two T-bolts. Install assembly parallel to the tilt legs.

Install T-Bolt at a distance of 1.62 cm from the face of the rail as shown in the figure.

Note: Above installation to be done while keeping the tilt legs on the ground.

TORQUE VALUE (See PG. E STEP A & B) 3/8" nut to 30 ft-lbs.



STEP 4. ARRAY LAYOUT

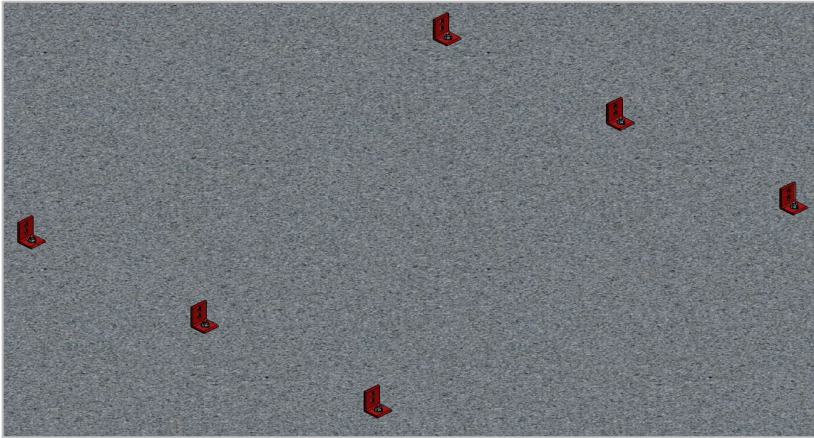
Refer to the calculator tool for details of EW span and NS Spacing. Mark the location for the L-feet.



STEP 5. DRILL HOLES AND INSTALL CONCRETE ANCHORS

Follow anchor/epoxy manufacturer guidelines for hole depth and diameter.

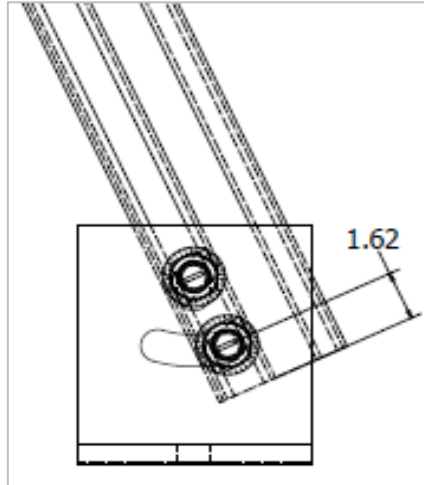
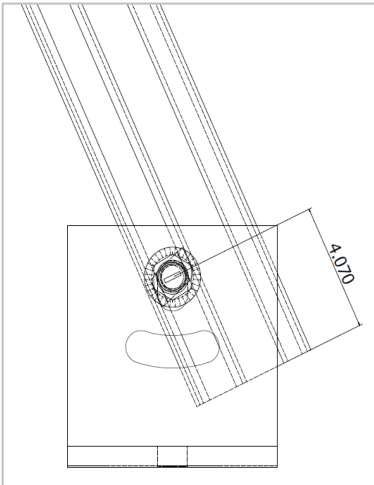
Ensure all dust and debris are removed from holes prior to anchor installation. Insert anchors into holes and set per manufacturer's recommendations.



STEP 6. ATTACH L-FEET TO ANCHORS

Use 3/8" bolt or all-thread with nut, install L-Feet and secure to concrete anchors. Ensure all L-Feet are oriented in the same direction. Follow anchor manufacturer requirements for torque specification.

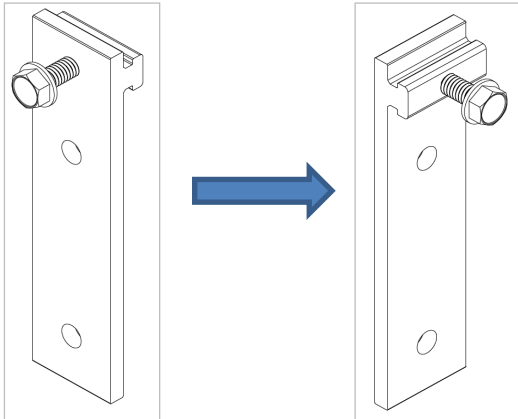
Warning: Weak connection may cause failure. Ensure that L-feet are securely fastened to the concrete.



STEP 7. SECURE TILT LEGS TO L-FOOT

Secure tilt legs with one or two T-bolts depending upon the suggestion from the calculator sheet.

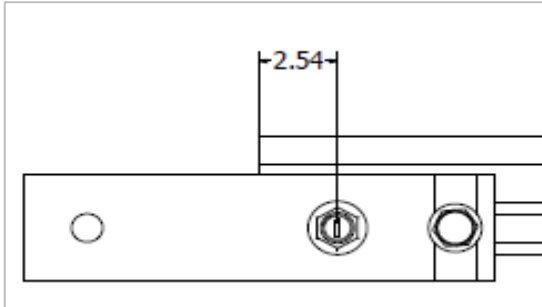
Install Tilt legs to the required inclination. For 1-T-Bolt connection, install T-Bolt at a distance of 4.04 cm and for 2 T-Bolt connections, install the first T-Bolt at a distance of 1.62 cm from the face of the rail.



STEP 8. MOVE 5/16 BOLT FROM ONE SIDE OF TILT PLATE TO THE OTHER

Move 5/16" bolt from the existing side of the tilt plate to the opposite end for installing the N/S Bracing.

Do not tighten the bolt now—tightening the bolt now would prevent tilt plate entry to the rail slot.



STEP 9. ATTACH TILT PLATE TO NORTH-SOUTH (N/S) BRACING

Install the T-Bolt connecting the Tilt plate and N/S Bracing at **2.54 cm** from the face of the rail.

Once the T-bolt is in the rail, drive the 5/16" thread cutting bolt as far as it goes. Similarly, install the Tilt plate to the N/S Bracing on the other end. **A gap will be formed between the tilt plate and the N/S Bracing as shown on figure A on the right.**

TORQUE VALUE (See PG. E STEP A & B) 3/8" nut to 30 ft-lbs and for 5/16" thread cutting minimum to 30 ft-lbs.

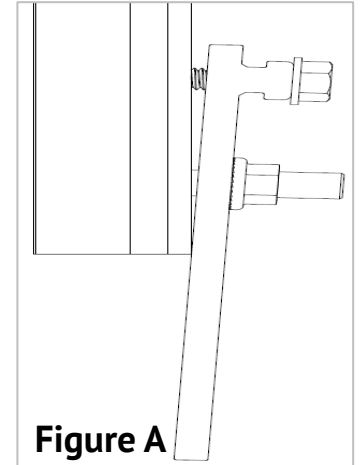
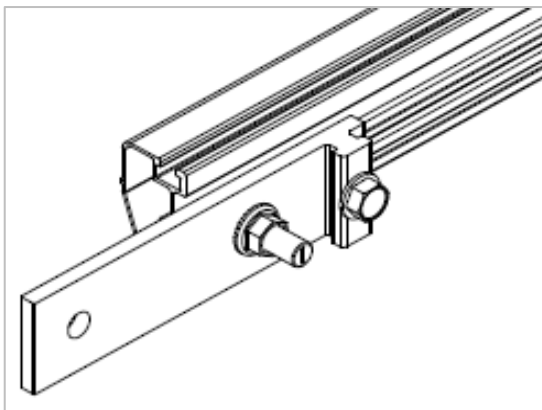
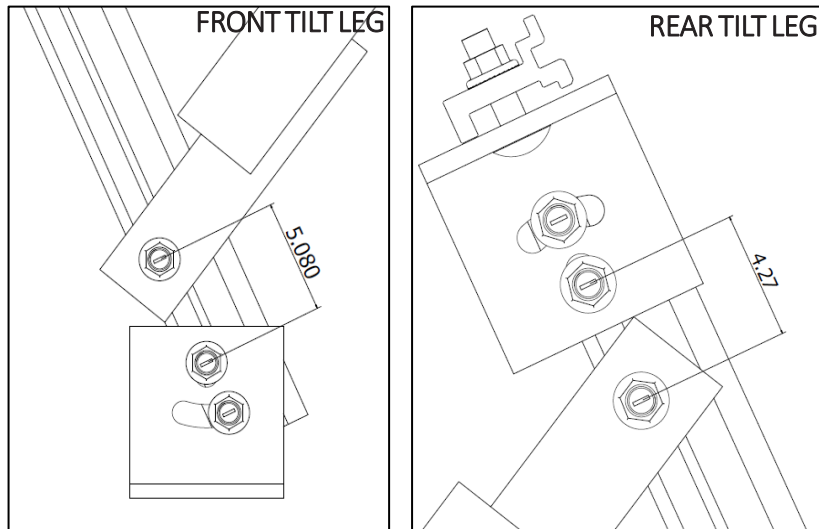


Figure A

**GAP FORMED BETWEEN
TILT PLATE AND THE
N/S BRACING**



STEP 10. SECURE ASSEMBLY OF NS BRACING AND TILT PLATE TO TILT LEGS

Attach assembly of Tilt Plate and NS rail to the Tilt leg using one T-Bolt at a distance of **5.08 cm and 4.27 cm** at Front and Rear Tilt leg respectively.

Note: The NS Brace should be facing towards the tilt plate as shown on Figure B.

TORQUE VALUE (See PG. E STEP A & B) 3/8" nut to 3 ft-lbs.

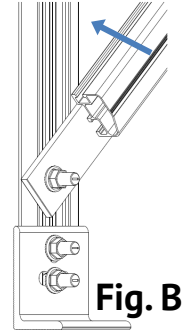
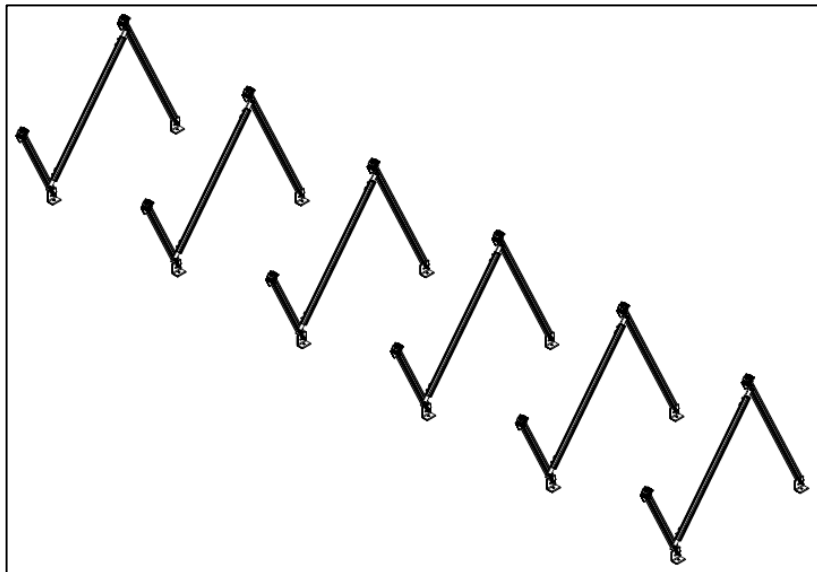
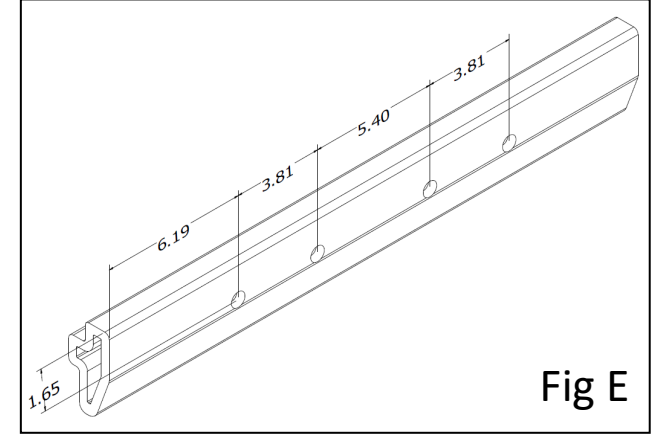
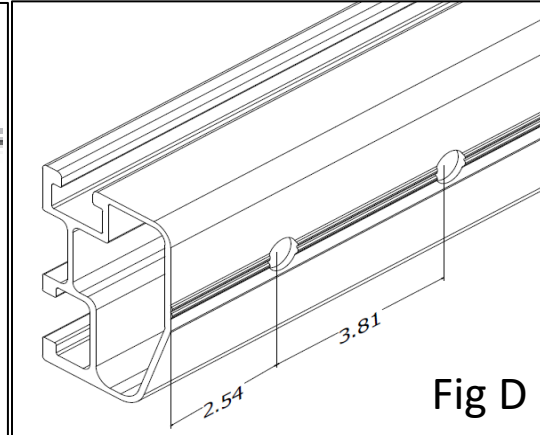
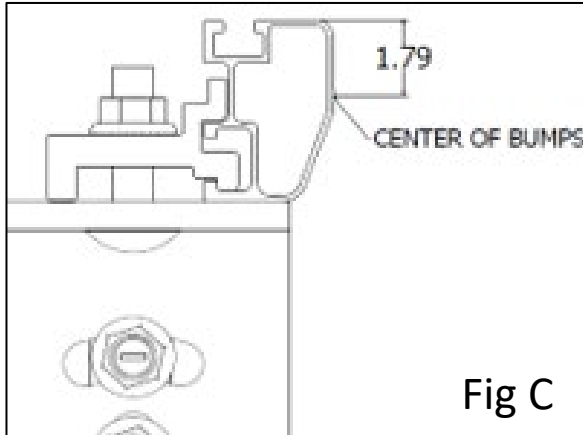


Fig. B



STEP 11. INSTALL ALL THE FRAMES

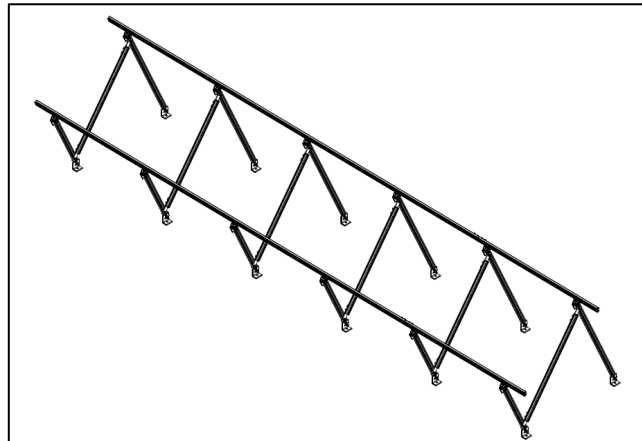
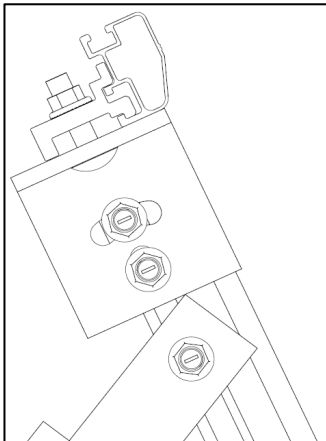
Install all the frames. Refer to the calculator tool for the spans.



STEP 12. DRILL HOLES ON EAST-WEST (EW) BEAMS & SPLICE MEMBERS

Measure the specified distances on the rail used EW beams as shown on Fig C & D. Drill pilot holes to allow 5/16" drilling screw.

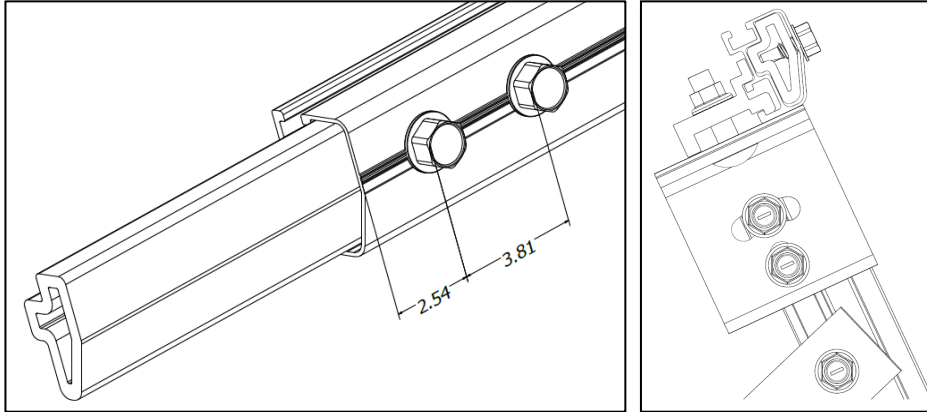
Measure the specified distances on the side of the splice as shown on Fig E. Drill pilot holes with the same size drill bits as used to make holes on EW beams.



STEP 13. INSTALL EW BEAMS

Assemble EW beams to the beam clips. Ensure that the desired tilt angle is met. Now torque the nut which was left loosened in step 2.

TORQUE VALUE - 3/8" nut to 15 ft-lbs.

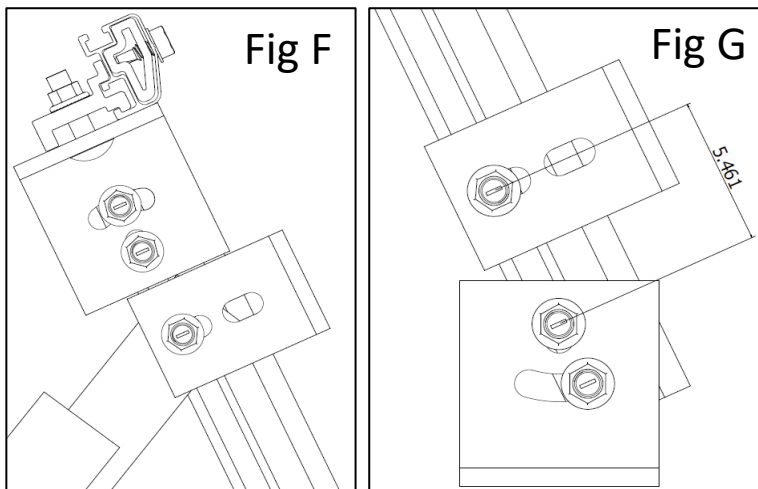


STEP 14. INSTALL SPLICE MEMBERS ON EAST-WEST (EW) RAILS

Insert the splice into the EW Beam equally on both sides. **Ensure that the splice holes and EW rail holes are drilled in the specified distances as mentioned in step 12 and the gap between the spliced EW beams does not exceed 0.32 cm. Failure to do so may result in lowered structural strength.**

Use 4 Self-drilling screws, 2 screws on each EW beam with the distance mentioned on the above figure. Drive the self drilling screws using impact drill as far as it goes.

TORQUE VALUE - 5/16" self drilling screw to minimum 20 ft-lbs.

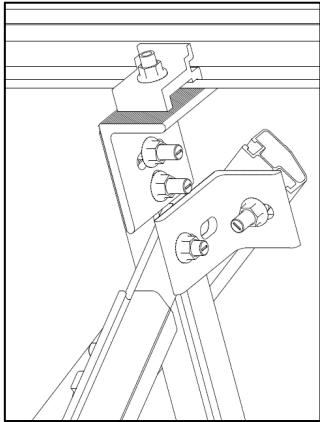


STEP 15. SECURE L-FOOT ON REAR TILT LEGS FOR EAST-WEST (EW) Bracing

Top L-Foot: Loosen the nut on Tilt plate and position the L-Foot as shown in Fig F. Tighten the nut to the recommended torque value.

Bottom L-Foot: **To connect the bottom L-Foot, place the T-Bolt at a distance of 5.46 cm from the bottom T-Bolt and place the L-Foot as shown on Fig G.** Tighten the nut to the recommended torque value.

TORQUE VALUE (See PG. E STEP A & B) 3/8" nut to 30 ft-lbs.

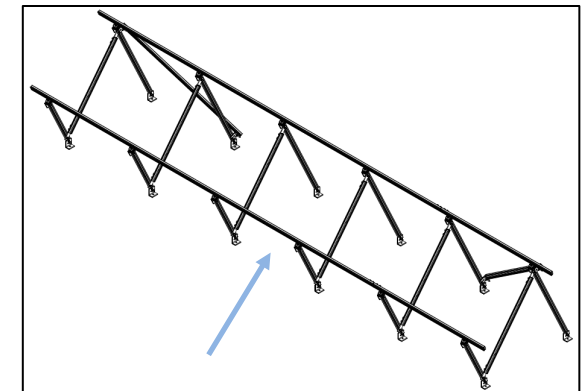
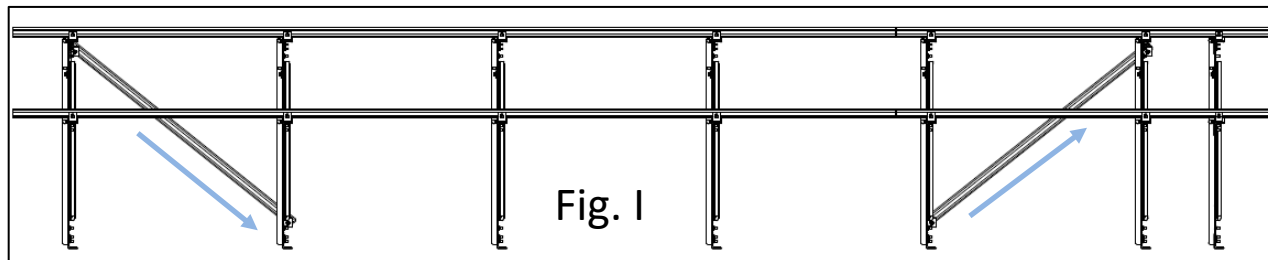
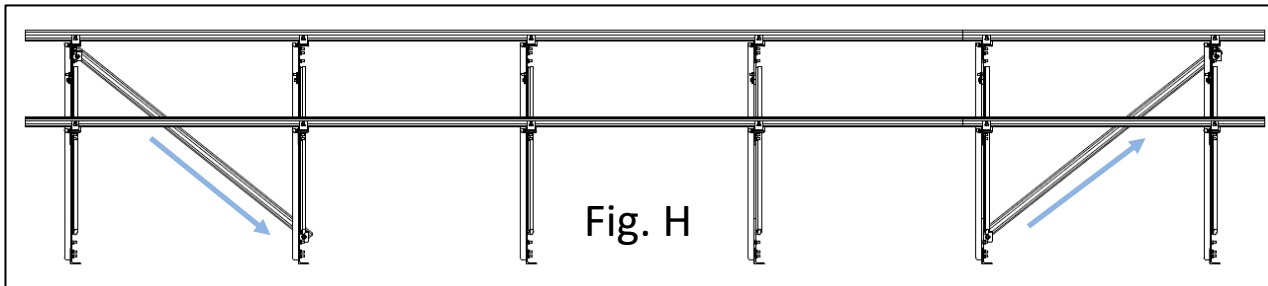


STEP 16. SECURE L-FOOT TO EW Bracing

Once the L-Feet are fixed, position the EW Bracing as shown. **Install T-bolt at a distance of 2.54 cm from the face of the rail.**

TORQUE VALUE (See PG. E STEP A & B) 3/8" nut to 30 ft-lbs.

Caution: System may lose structural strength if recommended bracing connection distance is not observed.

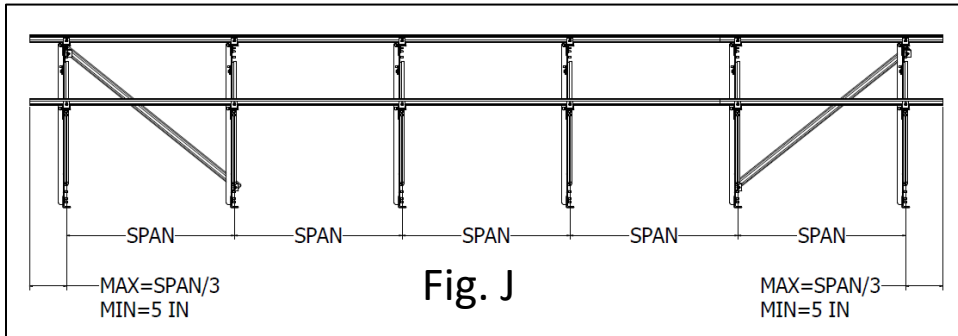


Note: The direction in the above figure shows the view direction of the observer for Fig E, Fig F and Fig G.

STEP 17. INSTALL EW BRACINGS WITH EQUAL OR UNEQUAL SPAN DISRIBUTION

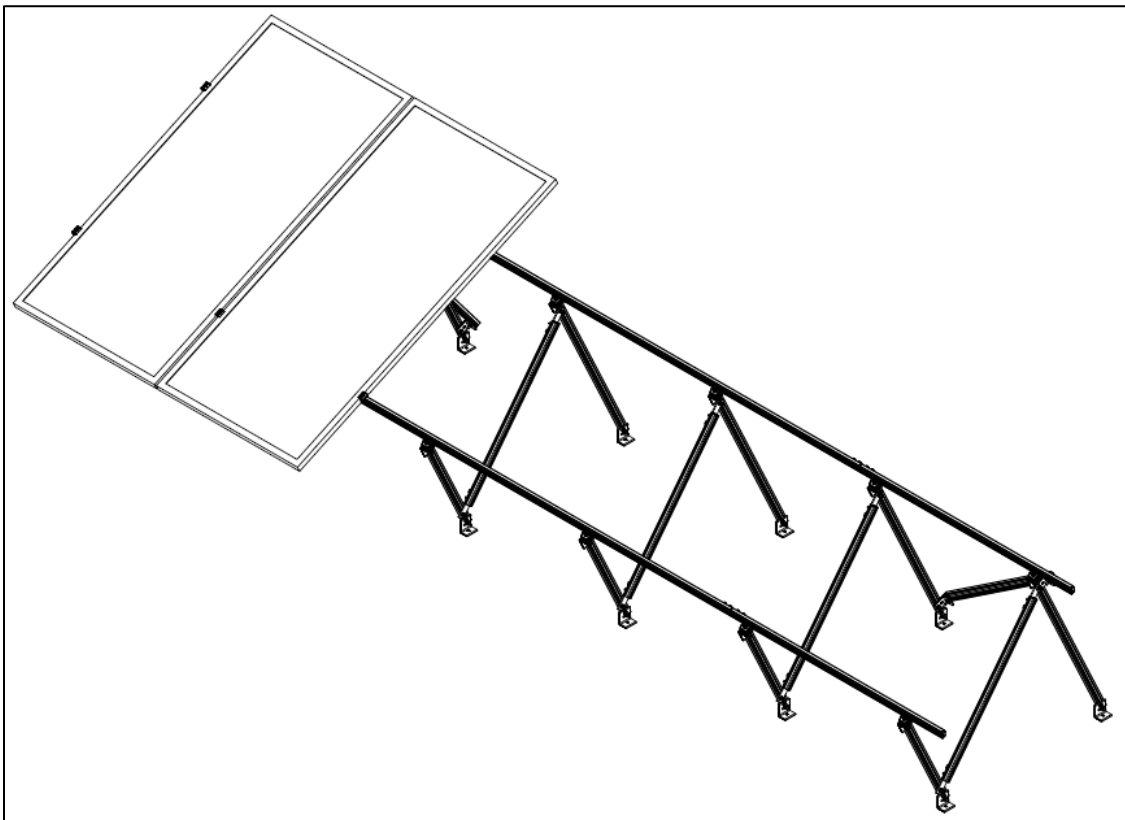
Using L-Feet and rail, attach EW Bracings at locations designated by the calculator. The orientation of the EW Bracing at the two ends should be in accordance with the shown direction on figures H & I. Based on cantilever or thermal break, the last bay may have a different span than the rest of the system (see Figure I). Check the calculator tool for these occurrences.

TORQUE VALUE (See PG. E STEP A & B) 3/8" nut to 30 ft-lbs



STEP 18. CANTILEVER LENGTH LIMIT CHECK

See Figure J. Maximum length of the cantilever beam should be $1/3^{\text{rd}}$ of the span and minimum cantilever should be 12.7 cm. Refer to the calculator sheet for span chart details.



STEP 19. INSTALL PV MODULES

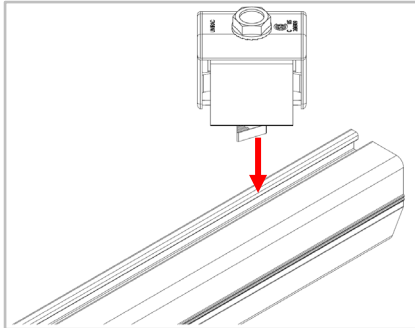
Using supplied clamps, attach modules to EW rails. Install end-clamp first then continue to use mid-clamps along the array until the final module, then use an end-clamp.

Consult the next two pages for mid and end clamp installation instructions.

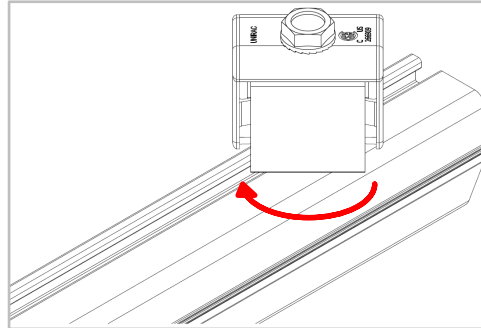
Ensure modules overhang is not more than 50.8 cm from the ground at front edge.

END CLAMP INSTALLATION

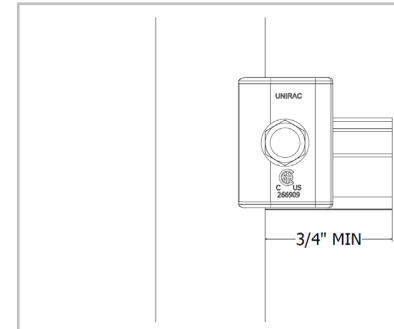
Follow the instructions on this page for the end clamp installation, and the next page for the mid clamps.



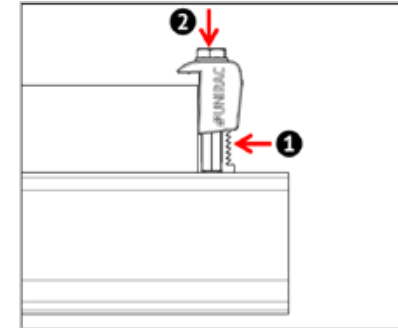
1. Position clamp to align T-bolt with rail slot. Lower clamp and Insert T-bolt into rail slot.



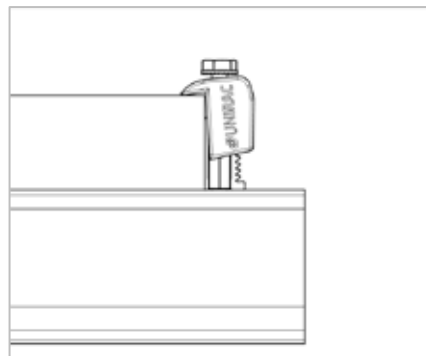
2. Rotate clamp clockwise until the T-bolt engages to the inside of the rail slot.



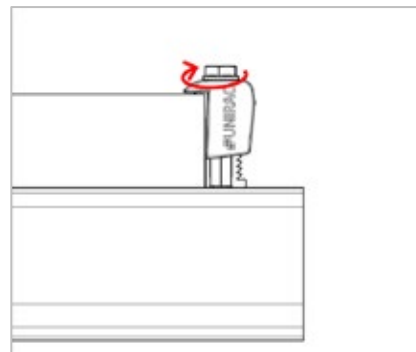
3. Place module at least 0.75 inches from end of rail and position clamp against the module frame.



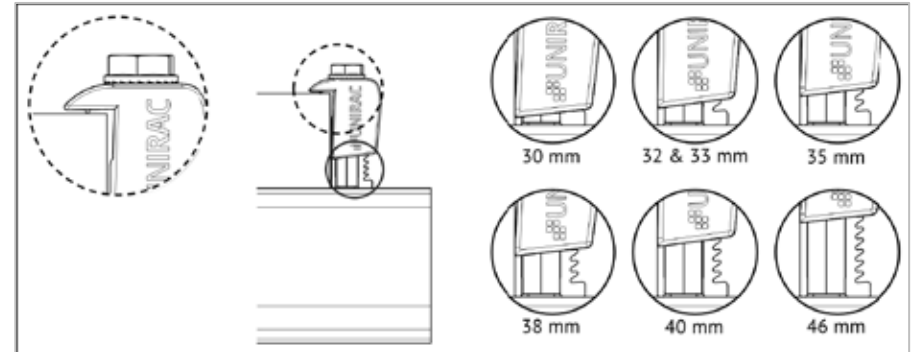
4. While applying pressure to hold the clamp against the module, push down on the module side of the clamp cap.



5. When the cap contacts the module frame, release pressure and it will re-engage to the clamp base.



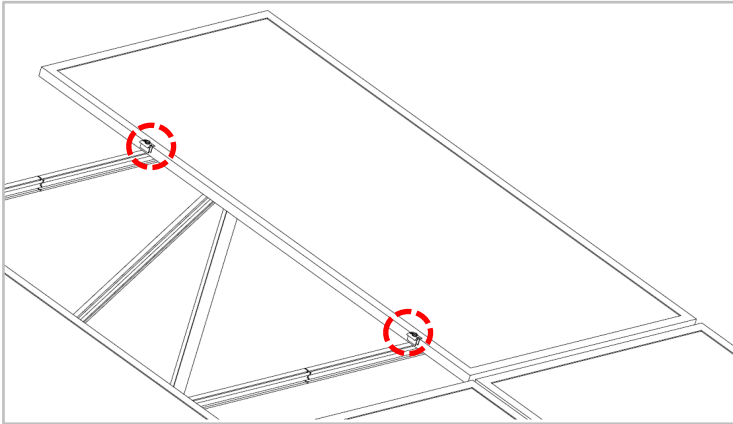
6. Tighten bolt and torque to 15 ft-lbs.



7. Confirm clamp is engaged in correct module height position and that the top of the cap is sitting level with the module frame.

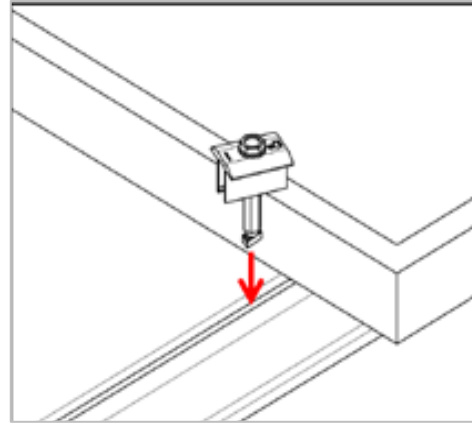
NOTE: When installing 46mm modules, loosen bolt by 1 turn before positioning clamp against module frame. Do not force clamp onto module frame as this may damage the bonding pin.

NOTE: Clamp is certified for single use only.

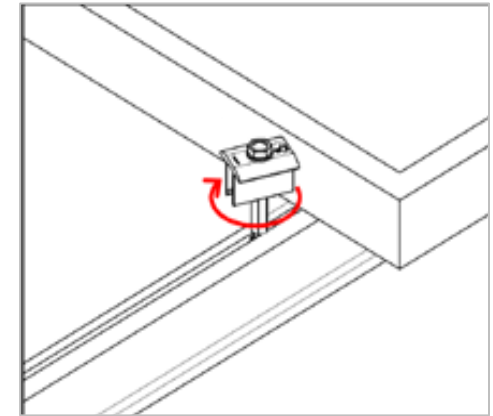


MID CLAMP INSTALLATION

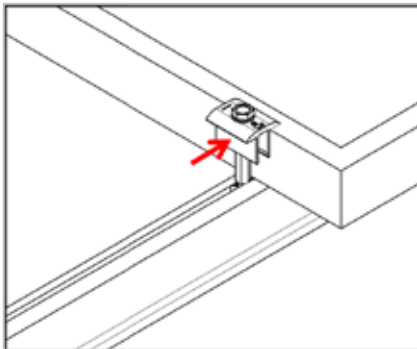
Mid clamp is supplied as an assembly with a T-bolt. Clamp assemblies can be positioned in rail prior to module placement.



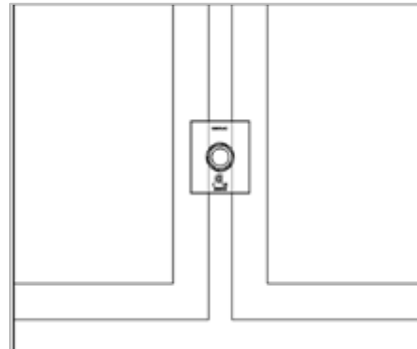
1. Position clamp to align T-bolt with rail slot. Lower clamp and insert T-bolt into rail slot



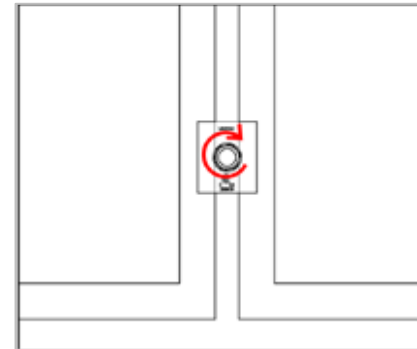
2. Rotate clamp clockwise until the T-bolt engages to the inside of the rail slot.



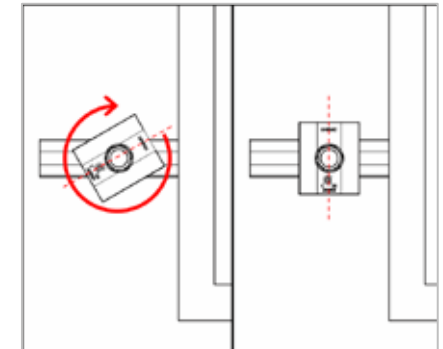
3. Slide clamp into position against module.



4. Place second module.



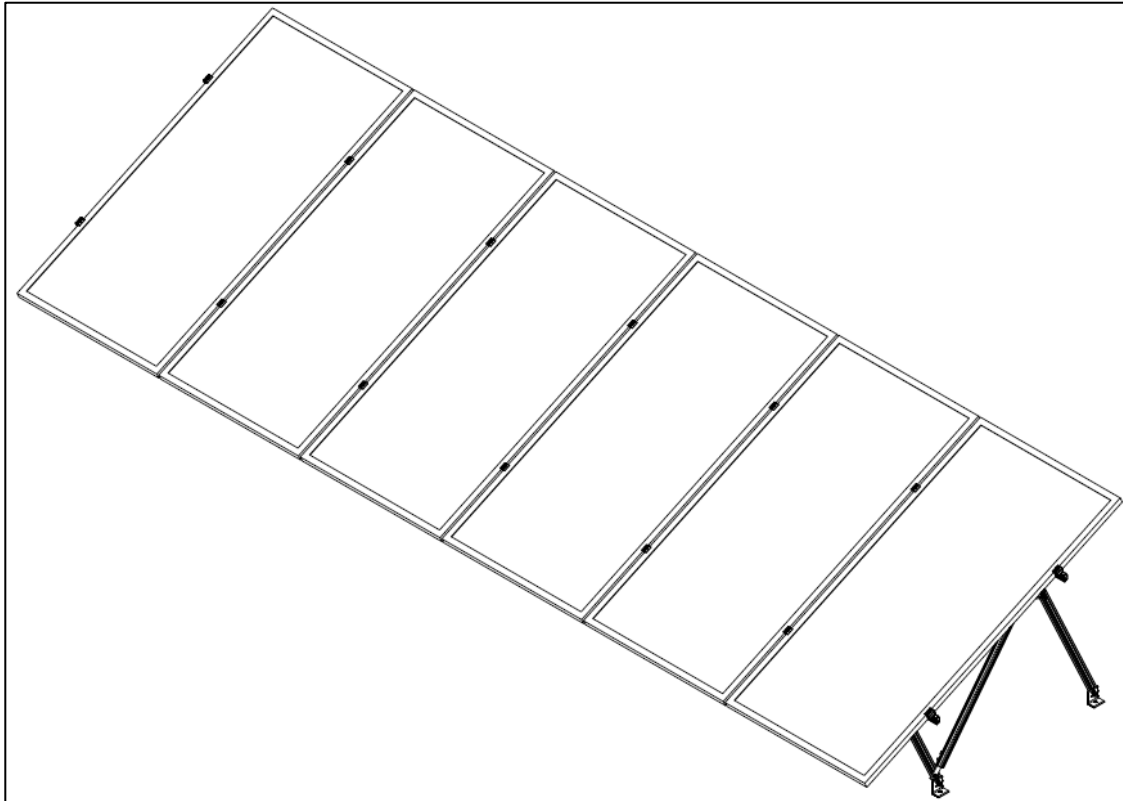
5. Tighten bolt and torque to 15 ft-lbs.



NOTE: If excessive force is applied in step 2, the cap may over-rotate causing it to be mis-aligned with the module frame.

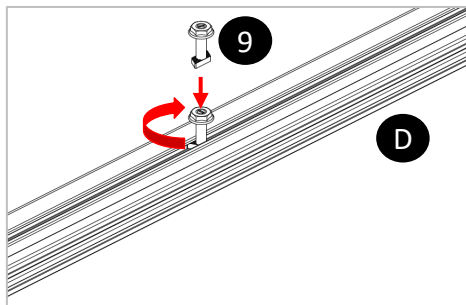
If this occurs, keep rotating the cap clockwise until it returns to the original position.

NOTE: Clamp is certified for single use only.

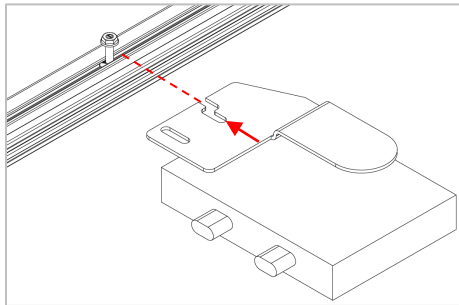


STEP 20. FINAL CHECK

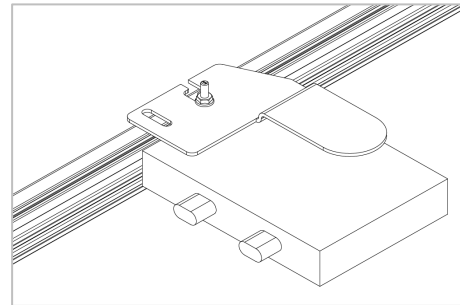
Check all nuts to verify correct torque values and proper T-bolt engagement with rail.

**INSTALL MICROINVERTER
MOUNT T-BOLT:**

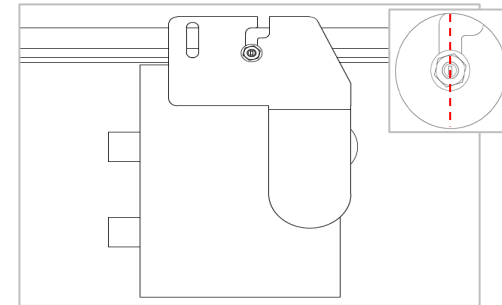
Apply Anti-Seize and install pre-assembled 1/4" diameter bonding T-Bolts into top 1/4" rail slot at microinverter locations. Rotate bolts into position.

**INSTALL MICROINVERTER:**

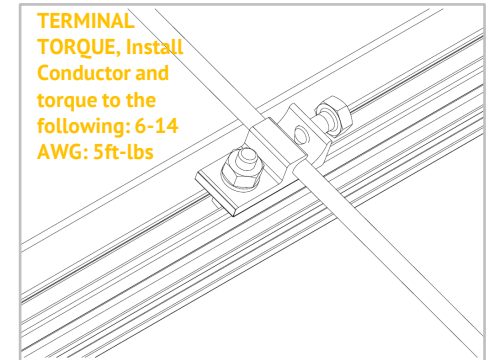
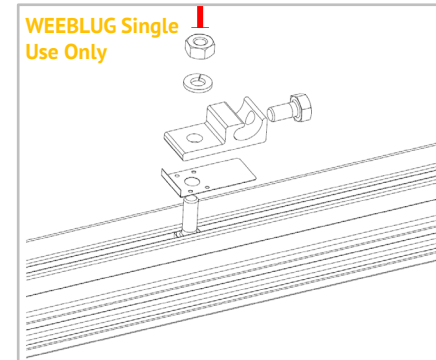
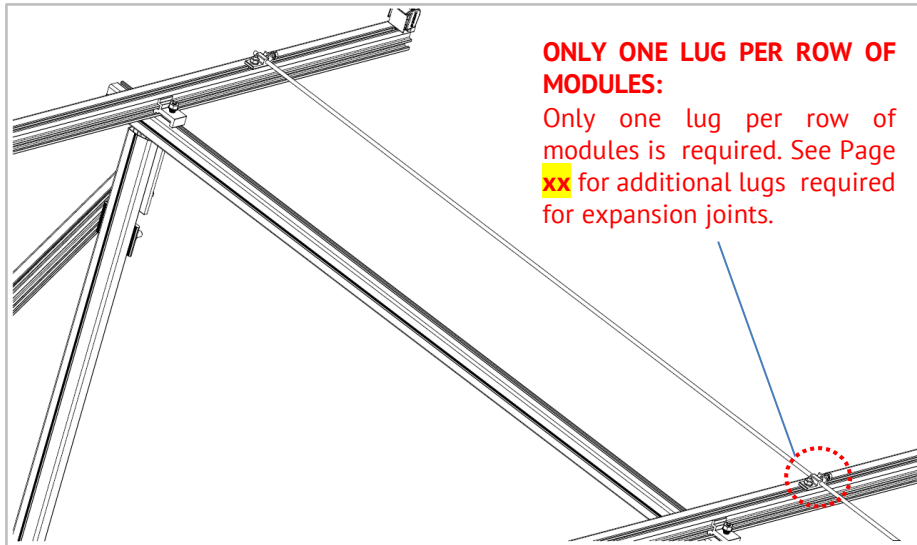
Install microinverter on to the rail. Engage with bolt.

**INSTALL MICROINVERTER:**

**Torque the 1/4" nut to 10 ft-lbs
w/Anti-Seize**

**ALIGN POSITION INDICATOR:**

Verify that position indicator on the T-bolt is perpendicular to rail.

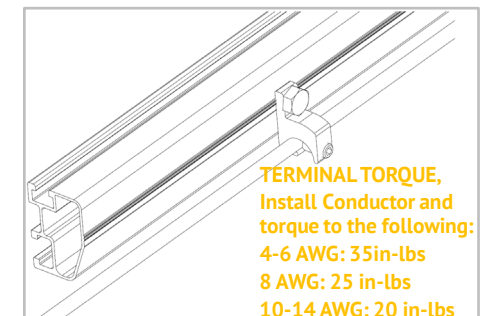
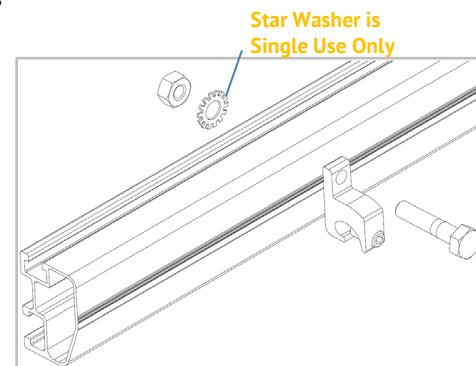


WEEBLUG CONDUCTOR - UNIRAC P/N 008002S:

Apply Anti Seize and insert a bolt in the aluminum rail through the clearance hole. Place the stainless-steel flat washer on the bolt, oriented so the dimples will contact the aluminum rail. Place the lug portion on the bolt and stainless-steel flat washer. Install stainless steel flat washer, lock washer and nut. Tighten the nut until the dimples are completely embedded into the rail and lug.

TORQUE VALUE 10 ft lbs.

See product data sheet for more details, Model No. WEEB-LUG-6.7



ILSCO LAY-IN LUG CONDUCTOR - UNIRAC P/N 008009P: Alternate Grounding Lug - Drill, deburr hole and bolt thru both rail walls per table.

TORQUE VALUE 5 ft lbs.

See ILSCO product data sheet for more details, Model No. GBL-4DBT.

GROUNDING LUG MOUNTING DETAILS:

Below are the details provided for both the WEEB and IlSCO products. The WEEB Lug has a grounding symbol located on the lug assembly. The IlSCO lug has a green colored set screw for grounding indication purposes. Installation must be in accordance with NFPA NEC 70, however the electrical designer of record should refer to the latest revision of NEC for actual grounding conductor cable size.

GROUNDING LUG - BOLT SIZE & DRILL SIZE		
GROUND LUG	BOLT SIZE	DRILL SIZE
WEEBLug	1/4"	N/A - Place in Top SM Rail Slot
ILSCO Lug	#10-32	7/32"

- Torque value depends on conductor size.
- See product data sheet for torque value.

NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION

The SM ASCENDER system has been certified and listed to the UL 2703 standard (Rack Mounting Systems and Clamping Devices for Flat-Plate Photovoltaic Modules and Panels). This standard included electrical grounding, electrical bonding, mechanical load and fire resistance testing.

In conducting these tests, specific modules are selected for their physical properties so that the certifications can be broadly applied. The following lists the specific modules that were tested and the applicability of those certifications to other modules that might come onto the market.

In addition to UL 2703 certification, Unirac performs internal testing beyond the requirements of certification tests in order to establish system functional limits, allowable loads, and factors of safety. These tests include functional system tests, and destructive load testing.

Mechanical Load Test Modules	System Level Fire Classification																										
The modules selected for UL 2703 mechanical load testing were selected to represent the broadest range possible for modules on the market. The tests performed cover the following basic module parameters: • Frame thicknesses greater than or equal to 1.0 mm • Basic single and double wall frame profiles (some complex frame profiles could require further analysis to determine applicability) • Clear and dark anodized aluminum frames • UL2703 Certification Load Ratings: ○ Down- 113 PSF, Up - 50 PSF, Down-Slope - 15 PSF • Tested Loads: ○ Down - 170 PSF, Up - 76 PSF, Down-Slope - 24 PSF • Naximum Area of Module = 22.20 sqft <table><tr><th colspan="2">Tested Modules</th></tr><tr><th>Module Manufacturer</th><th>Model/Series</th></tr><tr><td>Hyundai</td><td>HiS-S325TI</td></tr><tr><td>SunPower</td><td>SPR-P19-395-COM</td></tr></table>	Tested Modules		Module Manufacturer	Model/Series	Hyundai	HiS-S325TI	SunPower	SPR-P19-395-COM	The system fire class rating requires installation in the manner specified in the SM ASCENDER Installation Guide. SM ASCENDER has been classified to the system Level fire portion of UL 1703. This UL 1703 classification has been incorporated into our UL 2703 product certification. Class A system level fire performance is inherent in the SM ASCENDER design, and no additional mitigation measures are required. The fire classification rating is only valid on roof pitches greater than 2:12 (slopes ≥ 2 inches per foot, or 9.5 degrees). There is no required minimum or maximum height limitation above the roof deck to maintain the system fire rating for SM ASCENDER. Module Types & System Level Fire Ratings are listed below: <table><tr><th>Rail Type</th><th>Module Type</th><th>System Level Fire Rating</th><th>Rail Direction</th><th>Module Orientation</th><th>Mitigation Required</th></tr><tr><td>Standard Rail</td><td>Type 1, Type 2, Type 3, Type 10, Type 19, Type 22, & Type 25</td><td>Class A, B, & C</td><td>East-West North-South</td><td>Landscape OR Portrait</td><td>None Required</td></tr><tr><td>Light Rail</td><td>Type 1 & Type 2</td><td>Class A, B, & C</td><td>East-West North-South</td><td>Landscape OR Portrait</td><td>None Required</td></tr></table>	Rail Type	Module Type	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required	Standard Rail	Type 1, Type 2, Type 3, Type 10, Type 19, Type 22, & Type 25	Class A, B, & C	East-West North-South	Landscape OR Portrait	None Required	Light Rail	Type 1 & Type 2	Class A, B, & C	East-West North-South	Landscape OR Portrait	None Required
Tested Modules																											
Module Manufacturer	Model/Series																										
Hyundai	HiS-S325TI																										
SunPower	SPR-P19-395-COM																										
Rail Type	Module Type	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required																						
Standard Rail	Type 1, Type 2, Type 3, Type 10, Type 19, Type 22, & Type 25	Class A, B, & C	East-West North-South	Landscape OR Portrait	None Required																						
Light Rail	Type 1 & Type 2	Class A, B, & C	East-West North-South	Landscape OR Portrait	None Required																						

Electrical Bonding and Grounding Test Modules

The list below is not exhaustive of compliant modules but shows those that have been evaluated and found to be electrically compatible with the SM ASCENDER system.

Manufacture	Module Model/ Series	Manufacture	Module Model/ Series	Manufacture	Module Model/ Series
Aleo	P-Series & S-Series	Canadian Solar (cont.)	CS6P-(M/P) CS6U-(M/P/P HE) CS6X-P, CSX-P ELPS CS6(A/P)-MM	JA Solar	JAP6 60-xxx JAM6(k)-60/xxx, JAP6(k)-72-xxx/4BB JAP72S##-xxx/** JAP6(k)-60-xxx/4BB, JAP60S##-xxx/** JAM6(k)-72-xxx/**, JAM72S##-xxx/** JAM6(k)-60-xxx/**, JAM60S##-xxx/** i. ##: 01, 02, 03, 09, 10 ii. **: SC, PR, BP, HiT, IB, MW **= Backsheet, ## Cell Technology
Aptos Solar	DNA-120-(MF/BF)23 DNA-144-(MF/BF)23 DNA-120-(MF/BF)26 DNA-144-(MF/BF)26		Centrosolar America		C-Series & E-Series
Astronergy	CHSM6612 M,M/HV CHSM6612P Series CHSM6612P/HV Series CHSM72M-HC	CertainTeed	CT2xxMxx-01, CT2xxPxx-01, CTxxxMxx-01 CTxxxPxx-01, CTxxxMxx-02, CTxxxMxx-03 CTxxxMxx-04, CTxxxHC11-04		
Auxin	AXN6M610T AXN6P610T AXN6M612T AXN6P612T	Eco Solargy	Orion 1000 & Apollo 1000		Jinko
		ET Solar	ET AC Module, ET Module	Kyocera	KD-F & KU Series
Axitec	AC-xxx(M/P)/60S, AC-xxx(M/P)/72S AC-xxxP/156-60S AC-xxxMH/120(S/V/SB/VB) AC-xxxMH/144(S/V/SB/VB)	Flextronics	FXS-xxxBB	LG Electronics	LGxxx(E1C/E1K/N1C/N1K/N2T/N2W/S1C/ S2W/Q1C/Q1K)-A5 LGxxx(A1C/M1C/M1K/N1C/N1K/Q1C/Q1K/ QAC/QAK)-A6 LGxxxN2W-B3 LGxxxN2T-B5 LGxxxN1K-B6 LGxxx(N1C/N1K/N2T/N2W)-E6 LGxxx(N1C/N1K/N2W/S1C/S2W)-G4 LGxxxN2T-J5 LGxxx(N1K/N1W/N2T/N2W)-L5 LGxxx(M1C/N1C/Q1C/Q1K)-N5 LGxxx(N1C/N1K/N2W/Q1C/Q1K)-V5
		GCL	GCL-P6 & GCL-M6 Series		
		Hanwha SolarOne	HSL 60		
Boviet	BVM6610, BVM6612	Hansol	TD-AN3, TD-AN4 UB-AN1, UD-AN1		
BYD	P6K & MHK-36 Series	Heliene	36M, 36P 60M, 60P, 72M & 72P Series		
Canadian Solar	CS1(H/K/U/Y)-MS CS3K-(MB/MB-AG/MS/P/P HE/PB-AG) CS3L-(MS/P) CS3U-(MB/MB-AG/MS/P/P HE/PB/PB-AG) CS3W-(MS/P/P-PB-AG) CS5A-M CS6K-(M/MS/MS AllBlack/P/P HE)	HT Solar	HT72-156(M/P) HT72-156P-C, HT72-156P(V)-C HT72-156M(PDV)-BF, HT72-156M(PD)-BF HT60-156M-C HT60-156M(V)-C		
		Hyundai	KG, MG, RW, TG, RI, RG,TI, KI, HI Series HiA-SxxxHG, HiD-SxxxRG(BK), HiS-S400PI		
		ITEK	iT-SE Series		
		Japan Solar	JPS-60 & JPS-72 Series		

- Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"
- Items in parenthesis are those that may or may not be present in a compatible module's model ID
- Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID
- The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system
- Use with a maximum over current protection device OCPD of 30A
- Please see the SM UL2703 Construction Data Report at Unirac.com to ensure the exact solar module selected is approved for use with SM
- **Listed models can be used to achieve a Class A fire system rating for steep slope applications. See Appendix A, page A**

Electrical Bonding and Grounding Test Modules

The list below is not exhaustive of compliant modules but shows those that have been evaluated and found to be electrically compatible with the SM ASCENDER system.

Manufacture	Module Model/ Series	Manufacture	Module Model/ Series	Manufacture	Module Model/ Series
LONGi	LR4-60(HPB/HPH)	Q.Cells	Plus, Pro, Peak, G3, G4, Peak GS(SC), G6(+)(SC)(AC), G7, G8(+), Plus, Pro, Peak L-G2, L-G4, L-G5 Peak L-G5, L-G6, L-G7, L-G8(BFF)	Sharp	NU-SA & NU-SC Series
	LR4-72(HPH)			Silfab	SLA-M, SLA-P, SLG-M, SLG-P & BC Series SILxxx(BL/NL/NT/HL/ML/BK/NX/NU/HC)
	LR6-60	Q.Cells (cont.)	Q.PEAK DUO(BLK)-G6+	Solaria	PowerXT-xxxR-(AC/PD/BD)
	LR6-60(BK/HPB/HPH/HV/PB/PE/PH)		Q.PEAK DUO BLK-G6+/TS		PowerXT-xxxC-PD
	LR6-72		Q.PEAK DUO (BLK) G8(+)		PowerXT-xxxR-PM (AC)
	LR6-72(BK/HV/PB/PE/PH)		Q.PEAK DUO L-(G8.1/G8.2/G8.3)	Solartech	STU HJT, STU PERC & Quantum PERC
	RealBlack LR4-60HPB		Q.PEAK DUO L-G8.3 BFF	SolarWorld	Sunmodule Protect, Sunmodule Plus/Pro
Mission Solar Energy	MSE Mono, MSE Perc		Q.PEAK DUO (BLK) ML-G9(+)	Suntech	STP
Mitsubishi	MJE & MLE Series		Q.PEAK DUO XL-(G9/G9.2/G9.3)	Suniva	MV Series & Optimus Series (35mm)
Neo Solar Rower Co.	D6M Series		Q.PEAK DUO (BLK) ML-G10(+)	Sun Edison	F-Series, R-Series
Panasonic	VBHNxxxSA06/SA06B/SA11/SA11B	REC	RECxxxAA (BLK/Pure)	SunPower	AC, X-Series, E-Series & P-Series
	VBHNxxxSA15/SA15B/SA16/SA16B,		RECxxxNP (N-PEAK)	Talesun	TP572, TP596, TP654, TP660
Peimar	VBHNxxxKA, VBHNxxxKA03/04,		RECxxxNP2 (Black)		TP672, Hipor M, Smart
	VBHNxxxSA17/SA17G/SA17E/SA18/SA18E,		RECxxxPE, RECxxxPE72	Tesla	SC, SC B, SC B1, SC B2,TxxxS
Phono Solar	VBHNxxxZA01/ZA02/ZA03/VBHNxxxZA04		RECxxxTP, RECxxxTP72	Trina	PA05, PD05, DD05, DD06, DE06
	EVVP		RECxxxTP2(M/BLK2)		PD14, PE14, DD14, DE14, DE15
	SGxxxM (FB/BF)		RECxxxTP2S(M)72	TSMC	TS-150C2 CIGSw
	SMxxxM		RECxxxTP3M (Black)	Upsolar	UP-MxxxP, UP-MxxxM(-B)
	PSxxxM1-20/U		RECxxxTP4 (Black)	URECO	D7Kxxx(H7A/H8A), D7Mxxx(H7A/H8A)
	PSxxxM1H-20/U	Renesola	All 60-cell modules		FAKxxx(C8G/E8G), FAMxxxE7G-BB
	PSxxxM1-20UH	Risen	RSM Series		FAMxxxE8G(-BB)
	PSxxxM1H-20UH	S-Energy	SN72 & SN60 Series	Vikram	Eldora, Somera, Ultima
Prism Solar	PSxxxM1-20/UH	Seraphim	SEG-(6PA/6PB/6MA/6MA-HV/6MB/E01/E11)	VSUN	VSUNxxx-60M-BB, VSUNxxx-72MH
	PSxxxM1H-20/UH		SRP-(6QA/6QB)		VSUN4xx-144BMH
	PSxxxM1H-20/UA		SRP-xxx-6MB-HV, SRP-320-375-BMB-HV,		
	PSxxxM-24/T		SRP-xxx-BMC-HV, SRP-390-450-BMA-HV,		
	PSxxxMH-24/T		SRP-xxx-BMZ-HV, SRP-390-405-BMD-HV		
	PSxxxM-24/TH				
	PSxxxMH-24/TH				

- Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"
- Items in parenthesis are those that may or may not be present in a compatible module's model ID
- Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID
- The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system
- Use with a maximum over current protection device OCPD of 30A
- Please see the SM UL2703 Construction Data Report at Unirac.com to ensure the exact solar module selected is approved for use with SM
- Listed models can be used to achieve a Class A fire system rating for steep slope applications. See Appendix A, page A

Electrical Bonding and Grounding Test Modules

The list below is not exhaustive of compliant modules but shows those that have been evaluated and found to be electrically compatible with the SM ASCENDER system.

Manufacture	Module Model/ Series
Vina	VNS-72M1-5-xxxW-1.5, VNS-72M3-5-xxxW-1.5, VNS-144M1-5-xxxW-1.5, VNS-144M3-5-xxxW-1.5, VNS-120M3-5-zxxW-1.0
Winaico	WST & WSP Series
Yingli	YGE & YLM Series
ZNShine Solar	ZXM6-72 Series

- Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"
- Items in parenthesis are those that may or may not be present in a compatible module's model ID
- Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID
- The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system
- Use with a maximum over current protection device OCPD of 30A
- Please see the SM UL2703 Construction Data Report at Unirac.com to ensure the exact solar module selected is approved for use with SM
- **Listed models can be used to achieve a Class A fire system rating for steep slope applications. See Appendix A, page A**