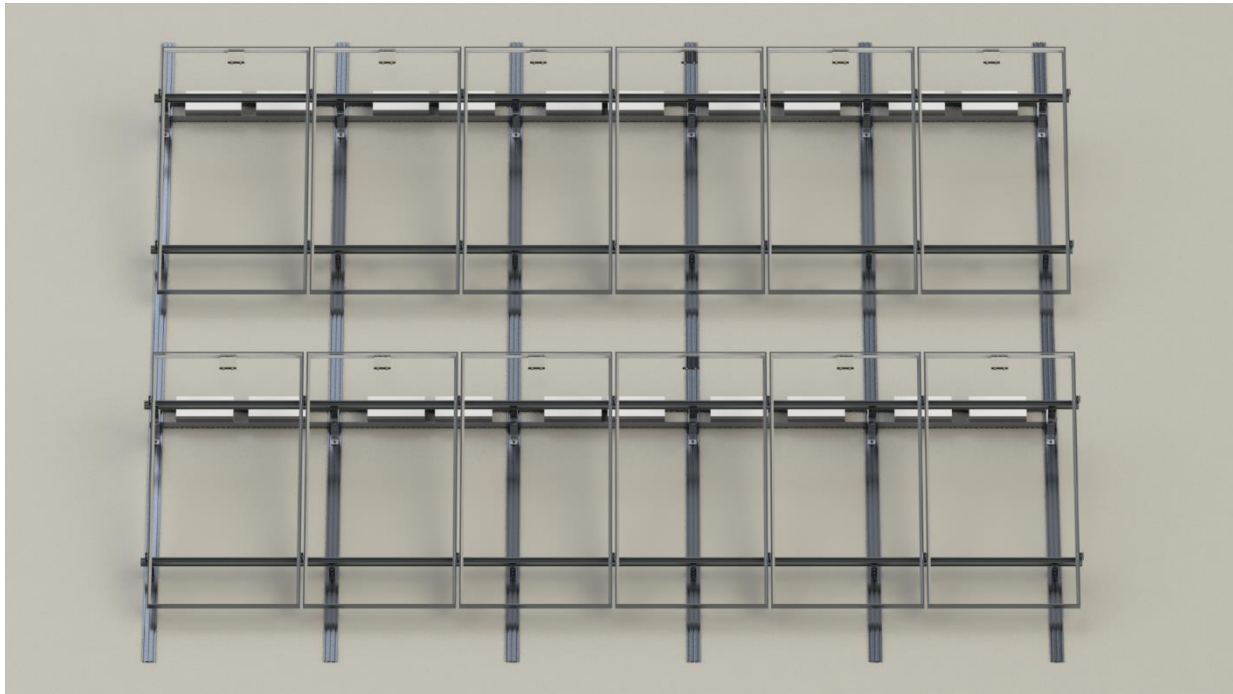


# Skyrack-Ballasted Installation Field Guide

July 2023



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# Notes:

## UL2703 verified compatible modules

Modules chosen for UL2703 grounding/bonding testing were chosen to represent a range of available solar modules. Modules tested were from the following manufacturers:

*Canadian Solar:* CS6P-XXXM

*Yingli:* YLXXXP-29b

*LG:* LGXXXN2T-A5, LGXXXN2W-A5

*Hanwha:* Q.PLUS L-G4.2 XXX, Q.PEAK L-G4.2 XXX, Q.PEAK DUO L-G5.2 XXX, Q.PEAK DUO L-G8.3 XXX, Q.PEAK DUO L-G8 XXX, Q.PEAK DUO L-G7 XXX, Q.PEAK DUO LG7.2 XXX, Q.PEAK DUO L-G7.3 XXX, Q.PEAK DUO L-G6 XXX, Q.PEAK DUO L-G5 XXX

*HT-SAAE:* HT72-156M

*Talesun:* TP6G72M

## Grounding/Bonding

Only grounding/bonding devices listed in this manual have been approved for use with this racking and qualified per UL2703 - installation details provided in this document

This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific modules has been evaluated for grounding and/or mounting in compliance with the included instructions.

## Periodic Inspection

Periodic re-inspection of installed racking components must take place to identify any loose components, loose fasteners or corrosion. Loose or corroded components or fasteners must be replaced immediately.

## Fire Rating

This system is not fire rated.

## Design Load Rating

This system has not been evaluated for UL2703 Design Load Ratings. Each set of site-specific plans must have system loads evaluated and approved by an appropriate structural engineer. This system is designed to be expandable and is not limited by a maximum number of PV modules. A typical modular rail length is approximately 6.45m (254") and could hold up to 6 modules.

## Company trademark

Company logo, name & trademark can be found on racking system after and during installation. The marking can be found on top of the end clamps located at the start/end of each row and at every expansion gap location.



## Sharp Edges and Piercing Module Clamps

Ensure wiring is kept away from any sharp edges that may have resulted from cutting rails etc. Module clamps contain pre-installed bonding nodes which are designed to pierce the module frame when tightened to proper torque.

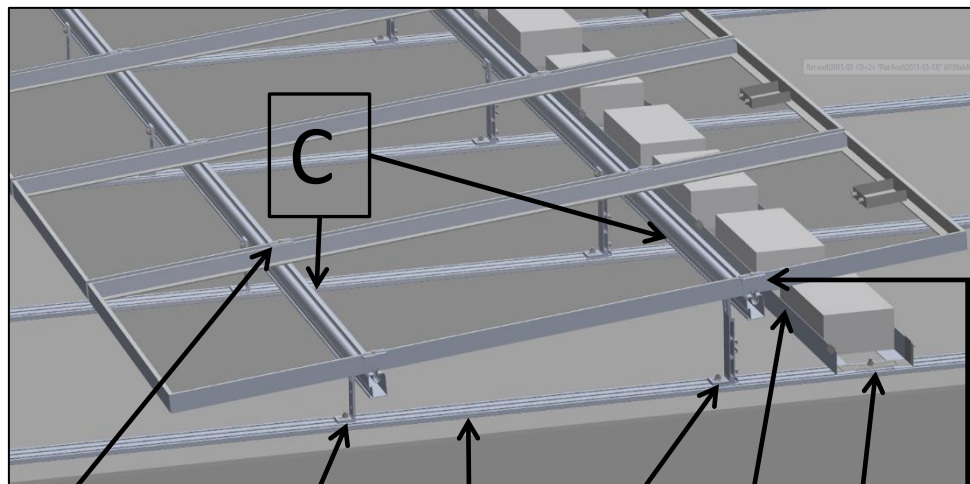
## Site-Specific Engineering Drawings

This manual is to be used in conjunction with any site-specific engineering drawings that have been developed for your specific project.

# Skyrack-Attached – Components

## Tools Required:

- Impact Driver
- Chalk Line
- Measuring Tape
- Sharpie
- 10 & 13mm sockets for impact
- Torx 40 Impact Bit
- Nut driver set (std)
- Saw for cutting rail



**E**

**A**

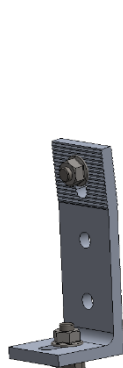
**F**

**B**

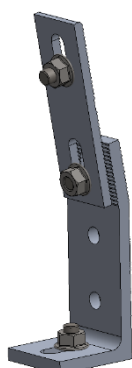
**G**

**H**

**D**



**A - 91851-5**  
TriBracket  
(5° tilt)



**A - 91851-10**  
TriBracket  
(10° tilt)



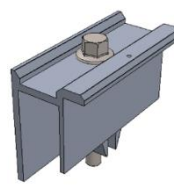
**B - 91881-5**  
Rear Foot  
(5° tilt)



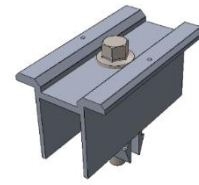
**B - 91881-10**  
Rear Foot  
(10° tilt)



**C - 8395-6450**  
SkyRail3

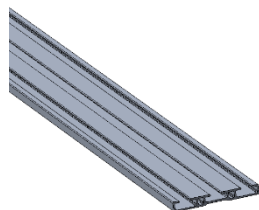


**D - 1422b\_EC**  
hb end-clamp

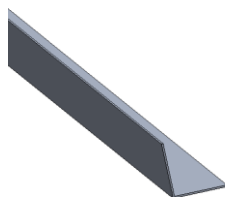


**E - 1421b\_MC**  
hb mid-clamp

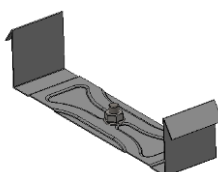
(6-8 ft•lbs / 8-11 Nm)



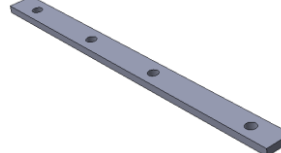
**F - 8375-6000**  
N-S Base Rail



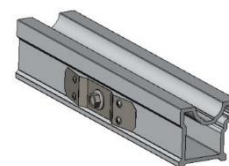
**G - 1305-4965**  
E-W Ballast Support  
Angle



**H - 6513-SBR**  
Speed Clamp



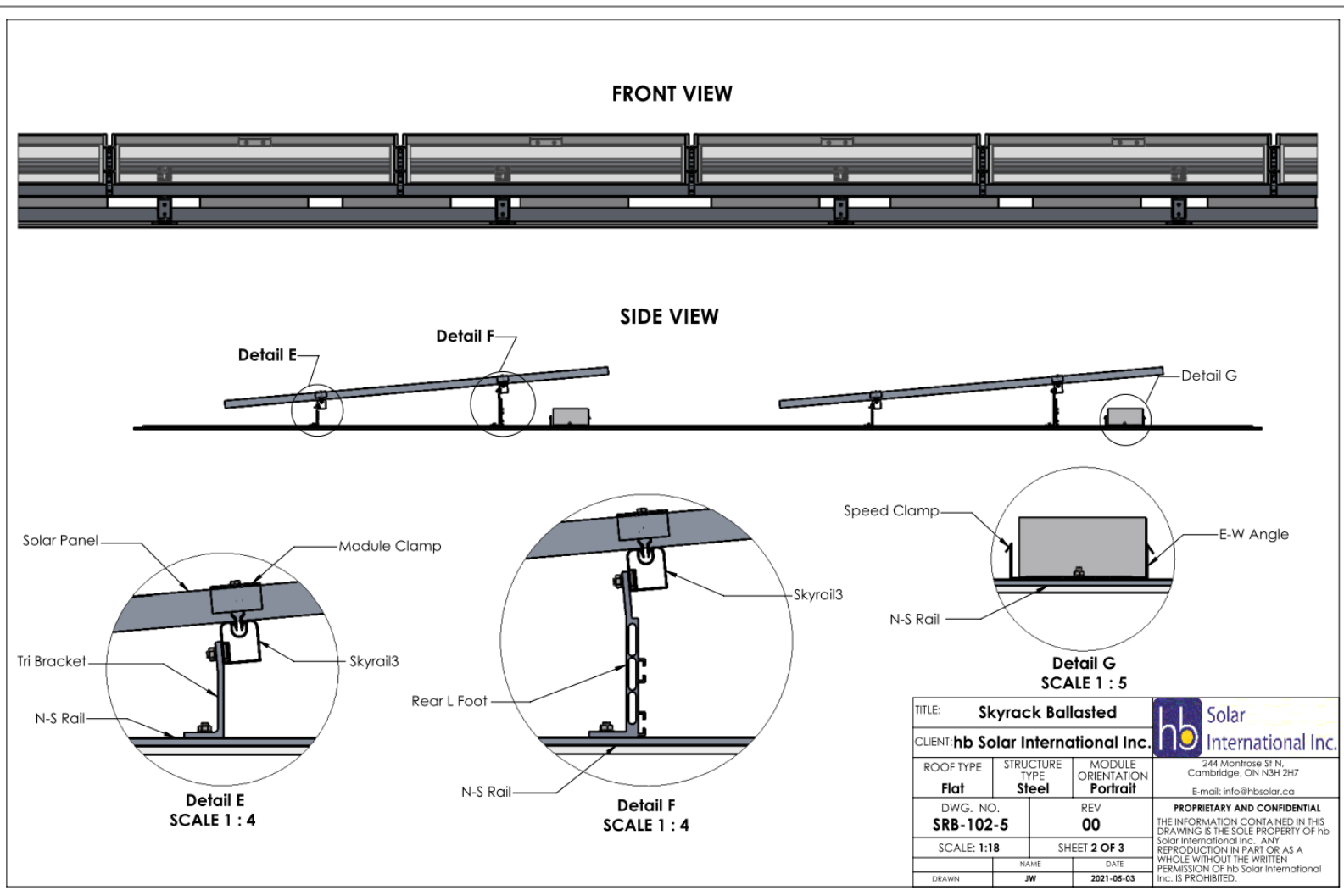
N-S Base Rail Splice  
**2106 - 2 hole (5°)**  
**2106-01 - 4 hole (10° - shown)**

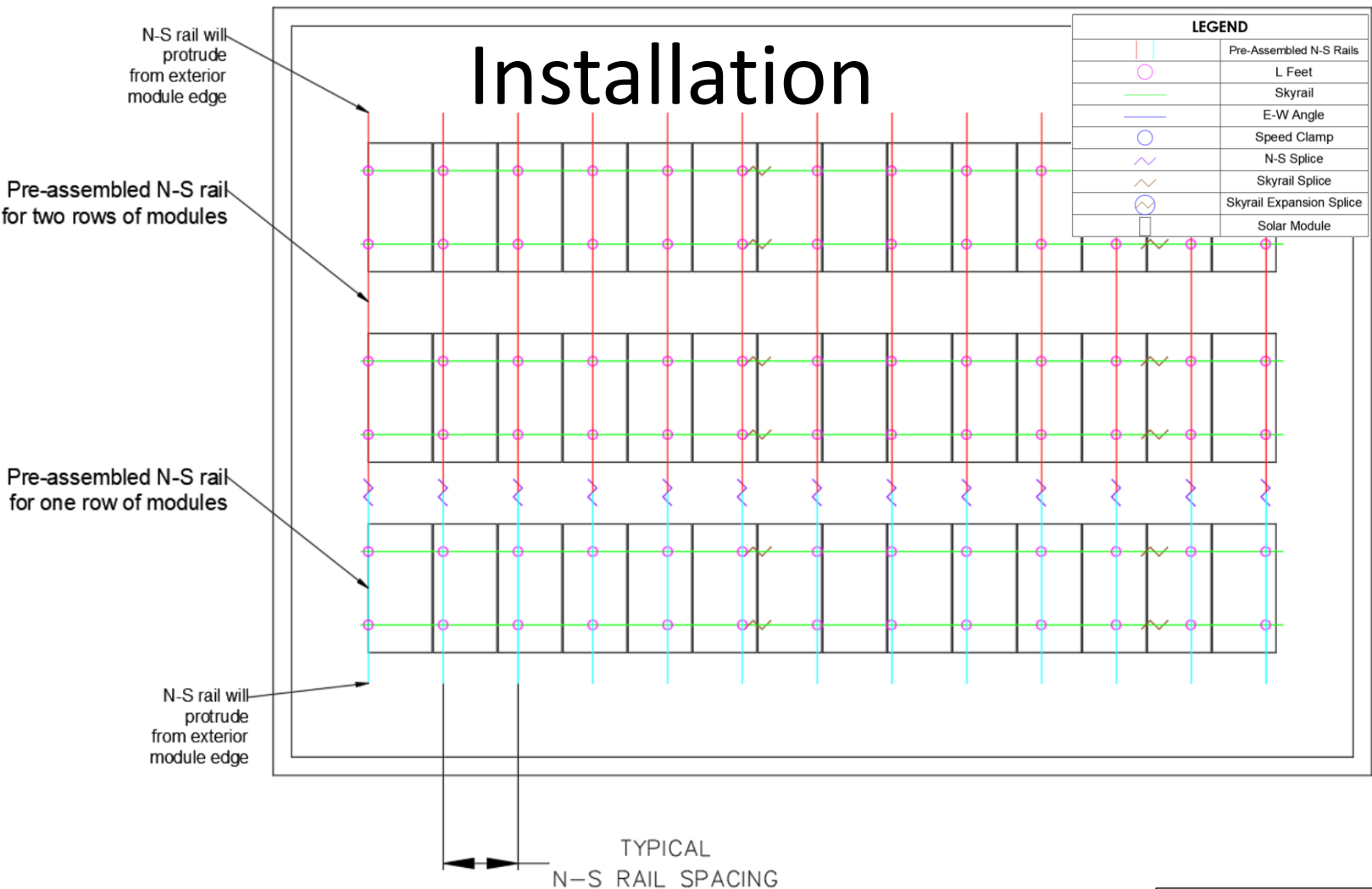


**1946**  
SkyRail3 Splice with  
Integrated Bonding  
(details on Page 8)

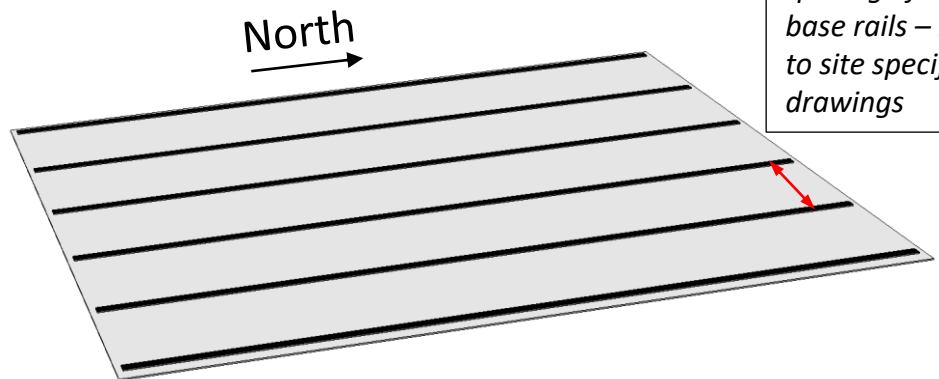
# Layout & Cross Sections

- BEFORE YOU BEGIN MAKE SURE YOU HAVE THE CURRENT SITE-SPECIFIC ENGINEERING DRAWINGS AND MODULE LAYOUT DEVELOPED FOR YOUR PROJECT.
- Using measurements from your site-specific Module Layout, locate your starting location on the roof
- East/West Spacing of N-S Base Rails: spacing should not exceed the limits shown on the span table for the applicable rail. Follow spacing given in drawing package for your project.





1. Refer to the stamped engineering package to find the starting dimensions of your first N-S base rail. The starting dimensions will be located at the corner of a given array from the end of the N-S base rail to the inside edge of the parapet. Refer to the engineering drawings for your typical east/west spacing of the N-S base rails.

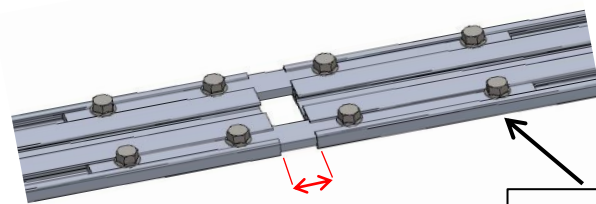


*East/West spacing of N-S base rails – refer to site specific drawings*

2. Splice N-S base rail sections using **two** N-S splice bars (#2106) at each splice location. **Leave 25mm (1") gap between rail ends for thermal expansion.**

For 5° systems, install 2 bolts per splice bar (4 bolts total). For 10° systems (#2106-01), install 4 bolts per splice (8 bolts total).

Torque bolts to **14Nm (10 ft-lbs)**. **Do not over-torque.**



**IMPORTANT:** Leave 25mm (1") gap.

**IMPORTANT:** Torque splice bolts to 14Nm (10 ft-lbs).

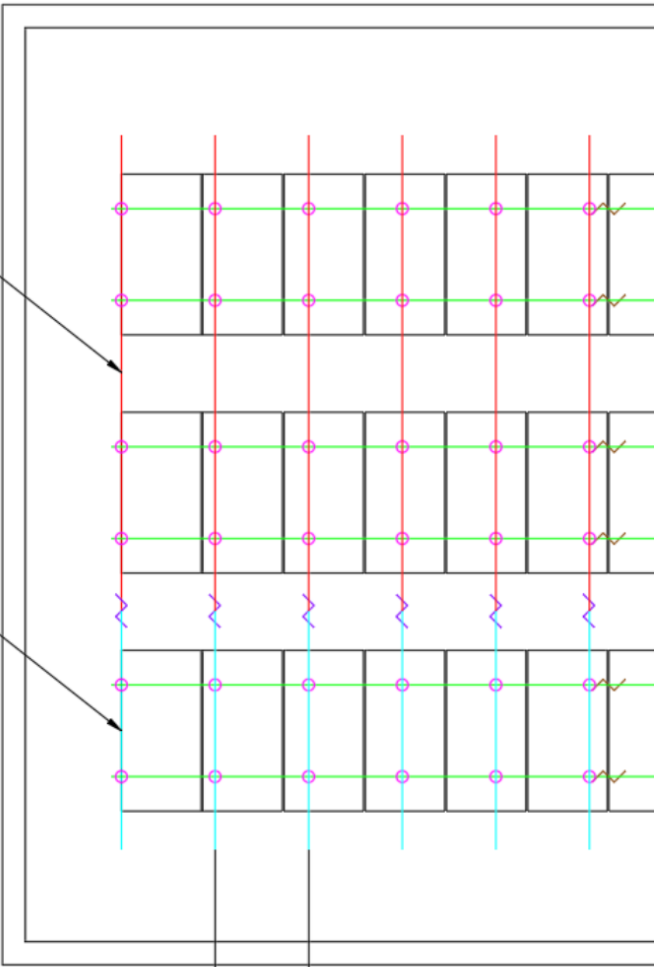
# Installation

3. The N-S rails come pre-installed with PEM studs to secure the L feet. The N-S rails will come in two lengths:

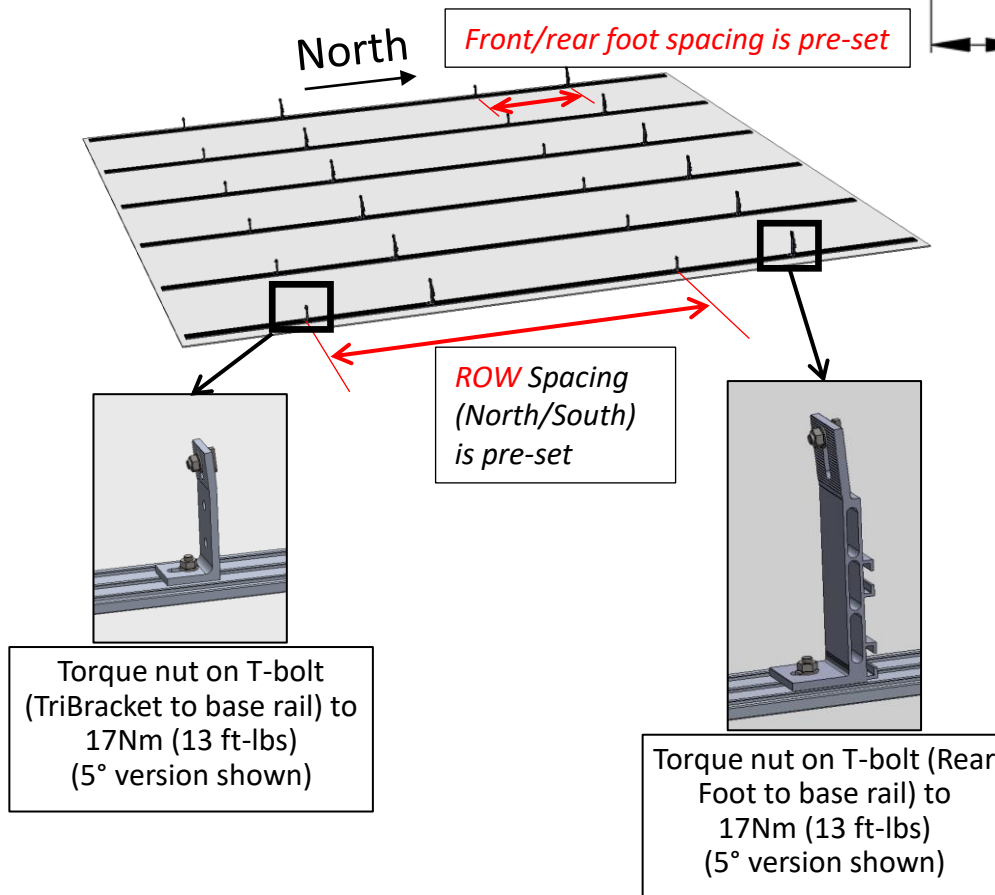
- A length to accommodate one row of modules (**blue** on the engineering package)
- A length to accommodate two rows of modules (**red** on the engineering package)

Pre-assembled N-S rail for two rows of modules

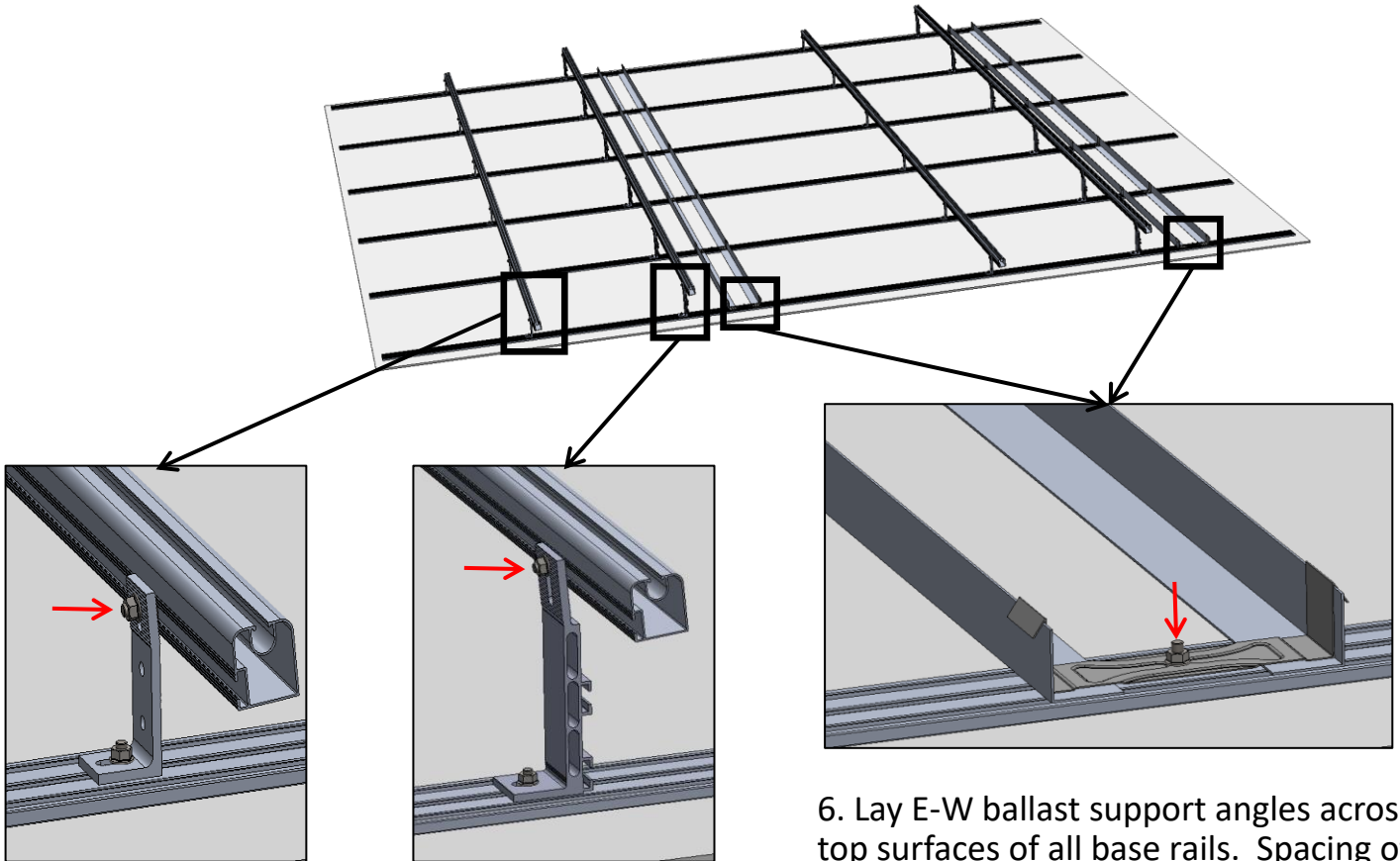
Pre-assembled N-S rail for one row of modules



4. When installing front L feet, torque bolts to **17Nm (13 ft-lbs)**.



# Installation



5. Install top rails to front and rear feet with tbolts/nuts.

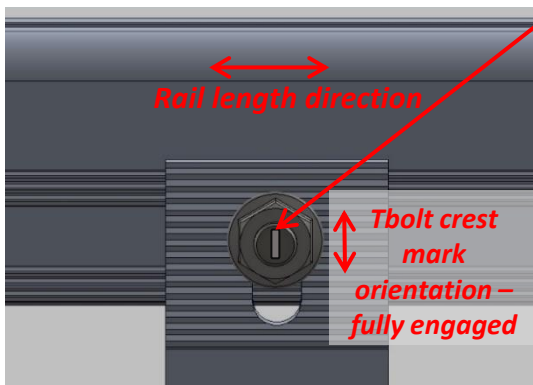
Torque to **17Nm (13 ft-lbs)**.

6. Lay E-W ballast support angles across top surfaces of all base rails. Spacing of E-W angles will be set automatically by the speedclamp. **Refer to site specific engineering plans for speedclamp spacing/location.**

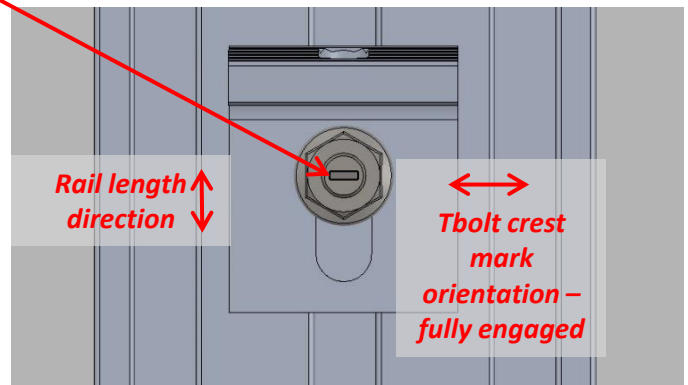
Torque to **17Nm (13 ft-lbs)**.

## **IMPORTANT – FOR ALL T-BOLT CONNECTIONS:**

- Note crest mark on tbolt end
- Crest mark becomes perpendicular to rail length when tbolt is fully engaged in side slot
- Always ensure crest mark is perpendicular to rail length on all tbolt connections to confirm full engagement of tbolt

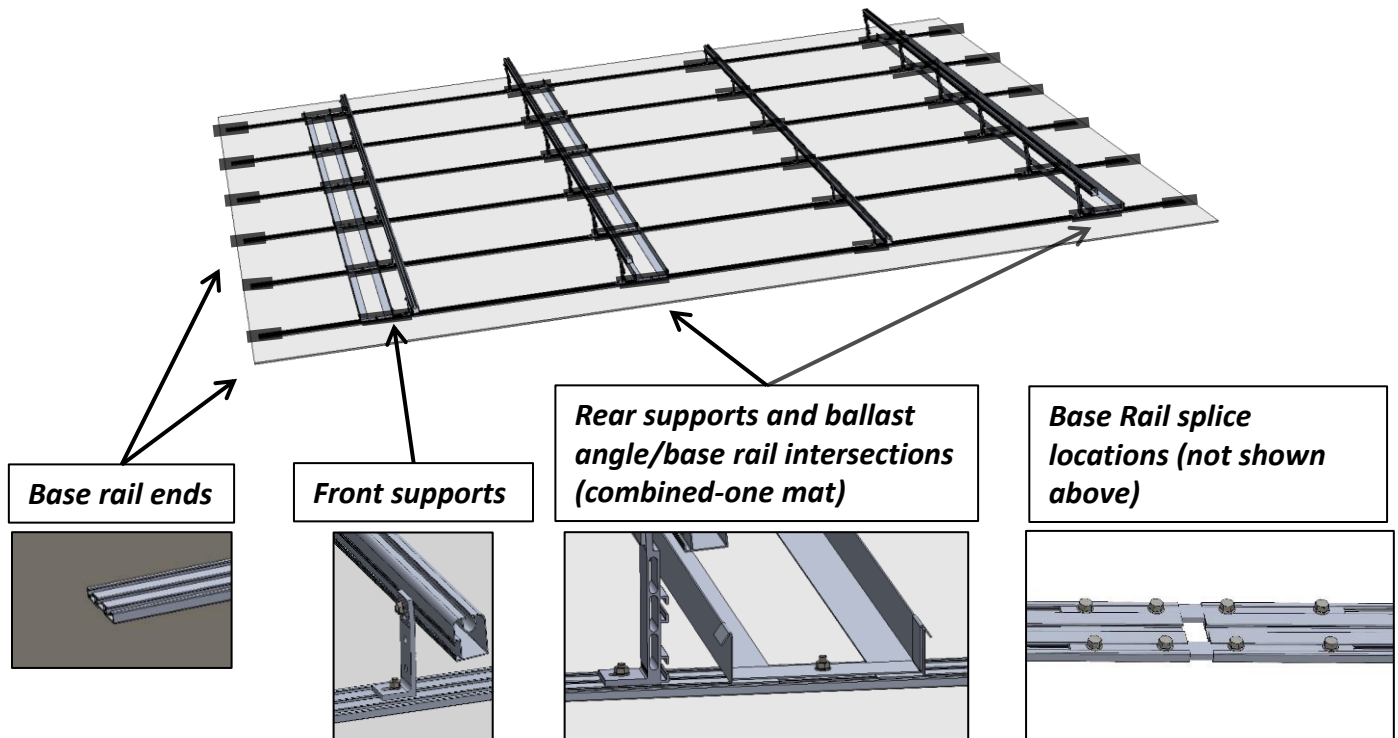


Front view of tbolt in top rail



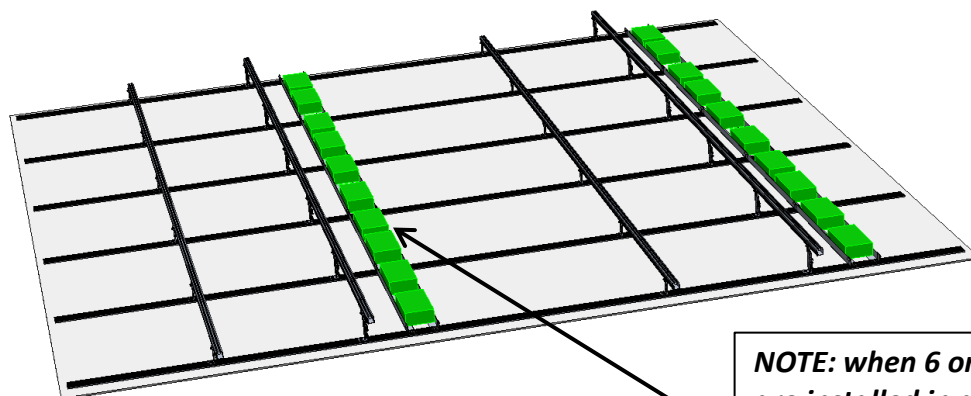
Top view of tbolt in base rail

# Installation



7. Install roof protection pads between base rail and roof at all weight bearing, base rail splice and base rail end-cut locations as shown.

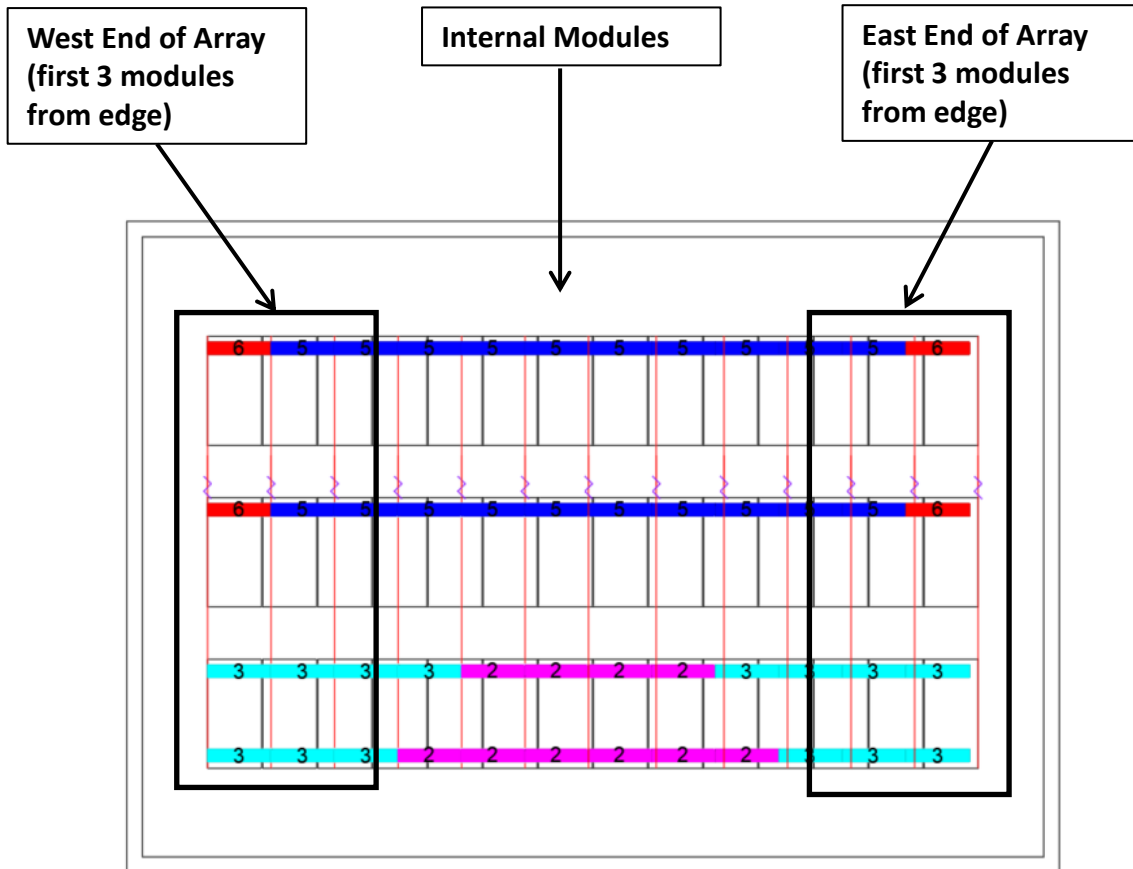
**NOTE: for any areas where pad is not fully pinned by the rail above, use 2 x 100mm strips of butyl tape to stick the pad to the N-S rail.**



8. Lay ballast blocks between E-W ballast support angles per your site-specific module layout and ballast plan.

# Installation

When laying down blocks in the ballast angle, be sure to follow the below ballast positioning details:



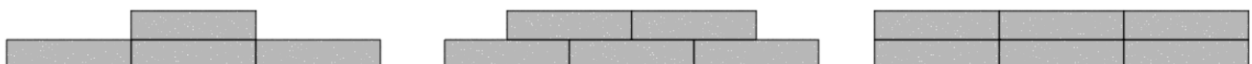
## FIRST 3 MODULES @ WEST END OF ARRAY



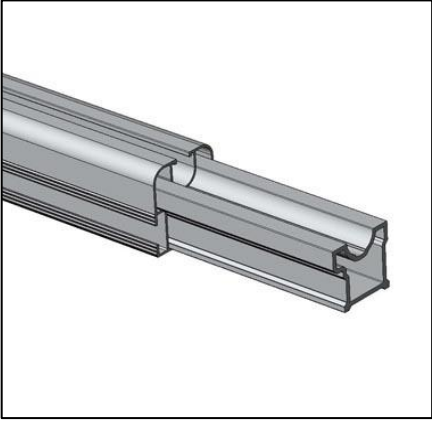
## FIRST 3 MODULES @ EAST END OF ARRAY



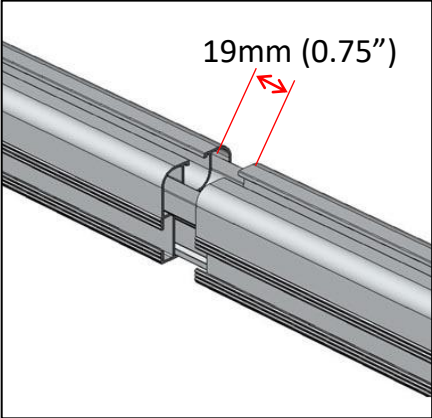
## INTERNAL MODULES IN ARRAY



## Module Rail Splicing:

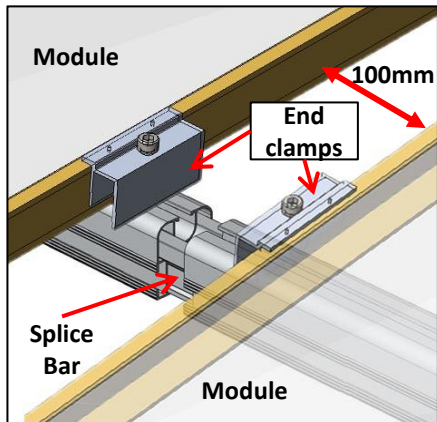


Step 1 – Insert splice bar into first rail



Step 2 – Slide second rail over splice – gap between rails = 19mm (0.75")

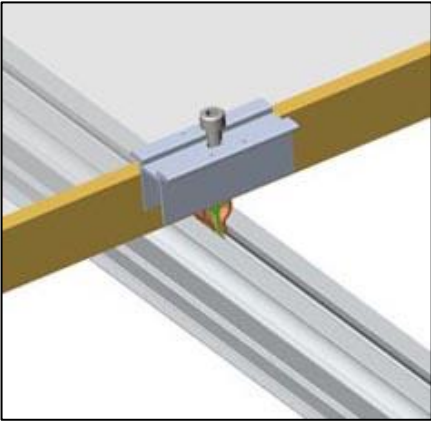
## Expansion Splice:



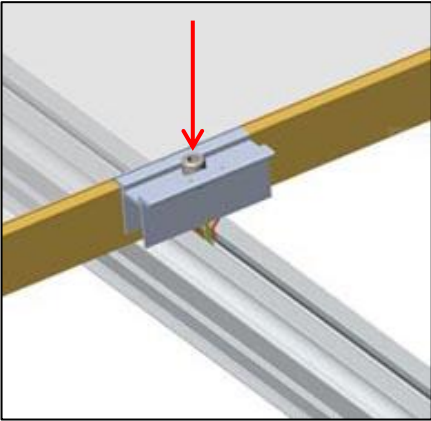
Expansion splices - *only where indicated on Layout (using end-clamps and standard splice bar):*

- Expansion splices typically installed after every 18m of continuously joined rails
- Leave 100mm (4") between modules. Cut rails in between modules if needed.
- *Leave 19mm (0.75") between rail ends*
- Use end-clamps on either side of expansion splice

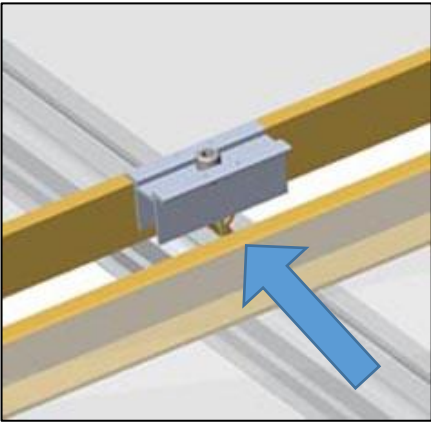
## Module Clamping:



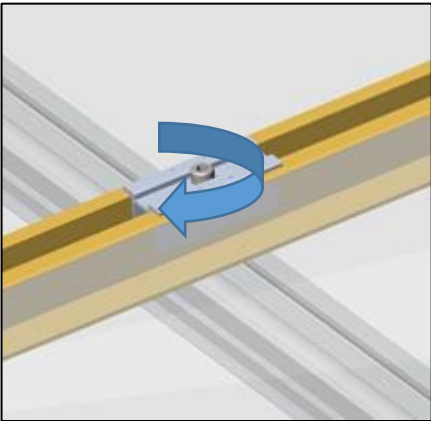
Step 1 – Place clamp on rail near first module



Step 2 – Push down sharply on bolt with tool. Confirm teeth are engaged with rail



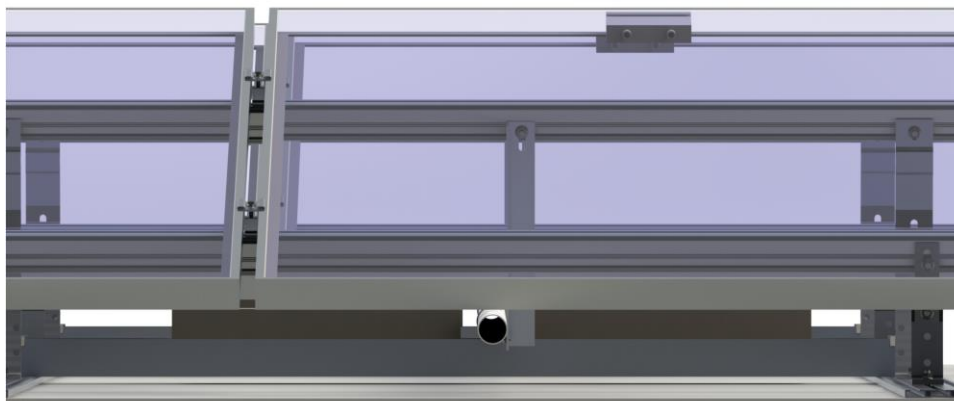
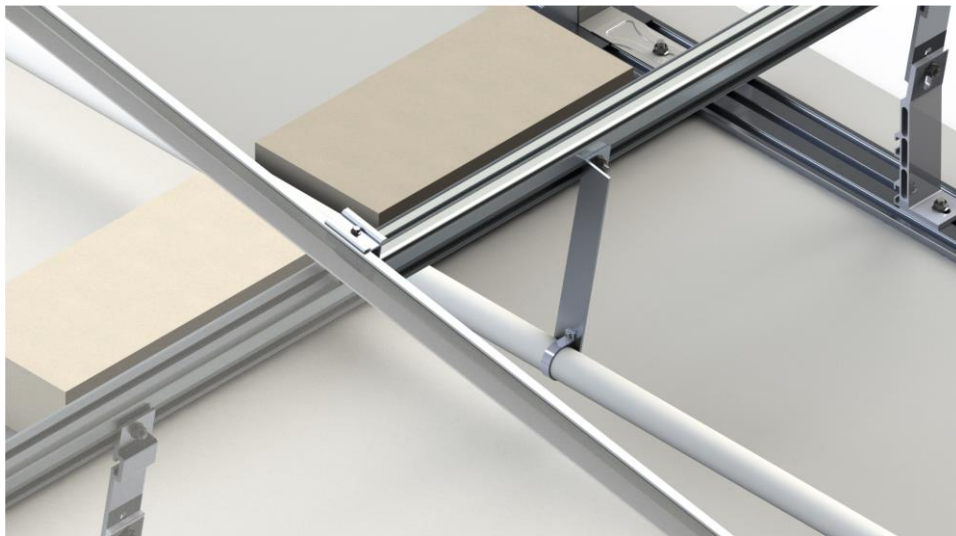
Step 3 – Slide next module tight to/under clamp

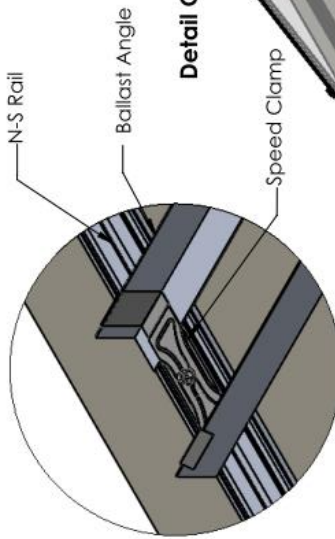
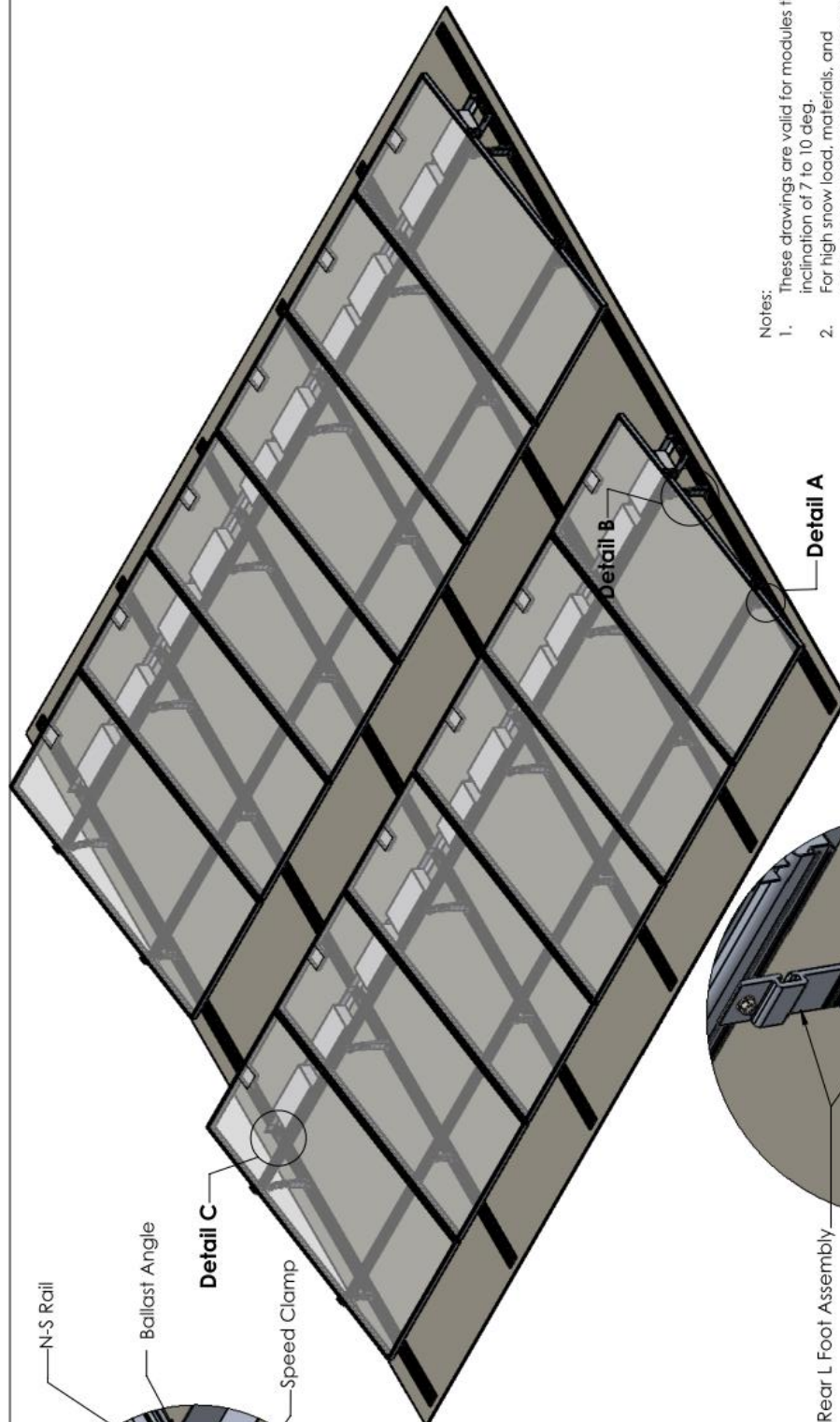


Step 4 – *Torque bolt to 6-8 ft•lbs (8-11 Nm) or to module manufacturer's specified torque.*

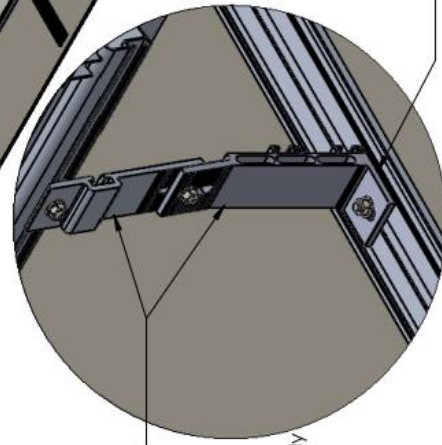
# Wire Management

An option for wire management is to utilize hb Solar's conduit brackets that can be attached to the rear skyrail using a tbolt and nut. Torque bolts to **17Nm (13 ft-lbs)**.

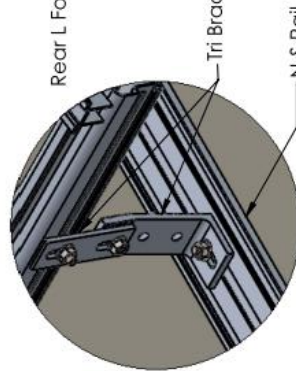




**Detail C**  
SCALE 1 : 5



**Detail B**  
SCALE 1 : 4



**Detail A**  
SCALE 1 : 4

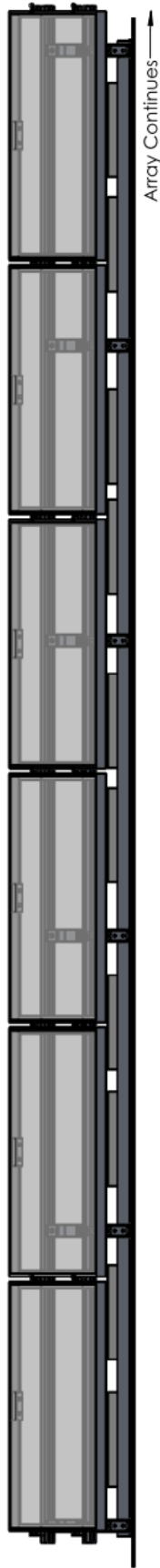
- Notes:
1. These drawings are valid for modules tilted at inclination of 7 to 10 deg.
  2. For high snow load, materials, and engineering notes refer to drawing SRB-103.
  3. These drawings are to be used in conjunction with drawing M-001.

TITLE: <b>Skyrack Ballasted</b>			
CLIENT: <b>hb Solar International Inc.</b>			
ROOF TYPE	STRUCTURE TYPE	MODULE ORIENTATION	REV
Flat	Steel	Portrait	00
DWG. NO.	SCALE	SHEET 1 OF 3	DATE
<b>SRB-101-10</b>	1:28		
DRAWN	NAME	JW	2021-05-12

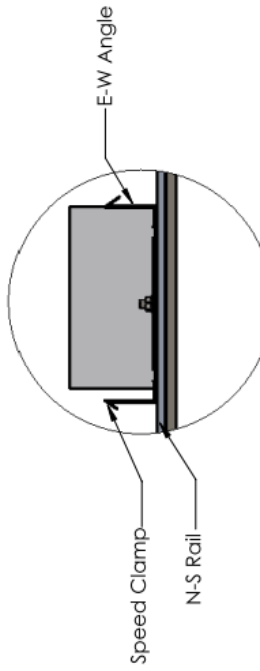
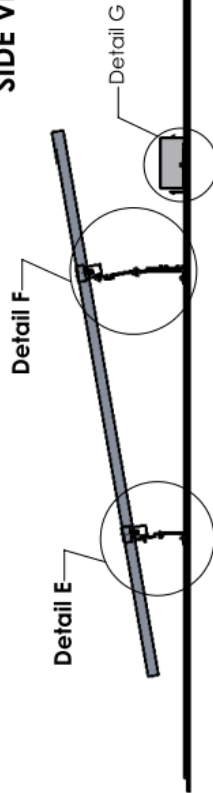
244 Montrose St N  
Cambridge, ON N3H 2H7  
Email: info@hbsolar.ca

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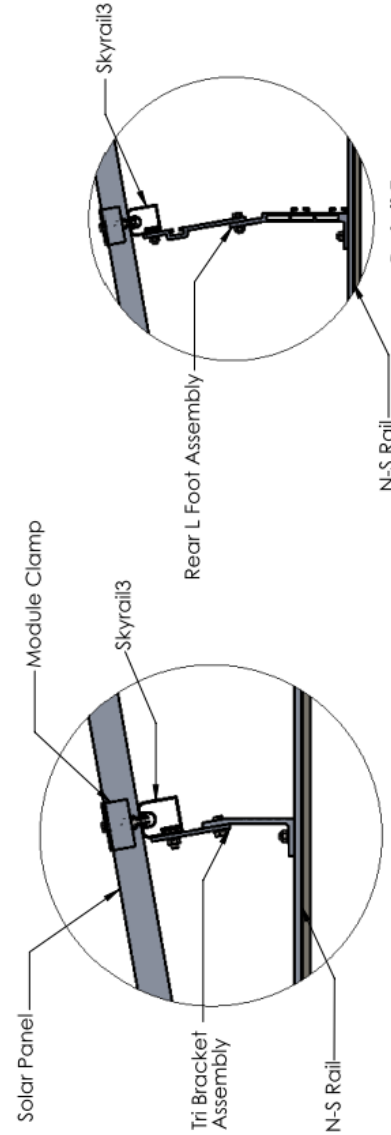
## FRONT VIEW



## SIDE VIEW



**Detail G**  
**SCALE 1 : 5**



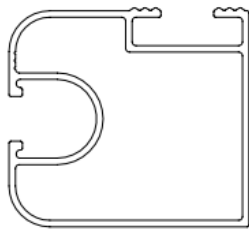
**Detail E**  
**SCALE 1 : 6**

**Detail F**  
**SCALE 1 : 8**

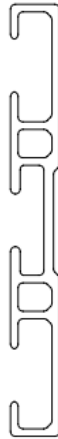
TITLE: <b>Skyrack Ballasted</b>			
CLIENT: <b>hb Solar International Inc.</b>			
ROOF TYPE <b>Flat</b>	STRUCTURE TYPE <b>Steel</b>	MODULE ORIENTATION <b>Portrait</b>	
DWG. NO. <b>SRB-102-10</b>	REV <b>00</b>		
SCALE: 1:18	SHEET 2 OF 3	DATE	
DRAWN	NAME <b>JW</b>		
			2021-05-12

**hb Solar**  
**International Inc.**  
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Cambridge, ON N3H 2H7  
E-mail: info@hsolar.ca

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**SKYRAIL 3**  
**PART # 8395**  
**SCALE 1:1**



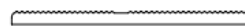
**N-S RAIL**  
**SCALE 1:1**



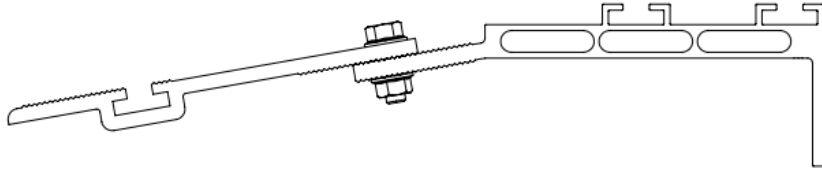
**FRONT TRI BRACKET**  
**PART # 1851**  
**SCALE 1:2**



**SPEED CLAMP**  
**SCALE 1:2**



**I-FOOT FLAT**  
**PART # 1871**  
**SCALE 1:2**



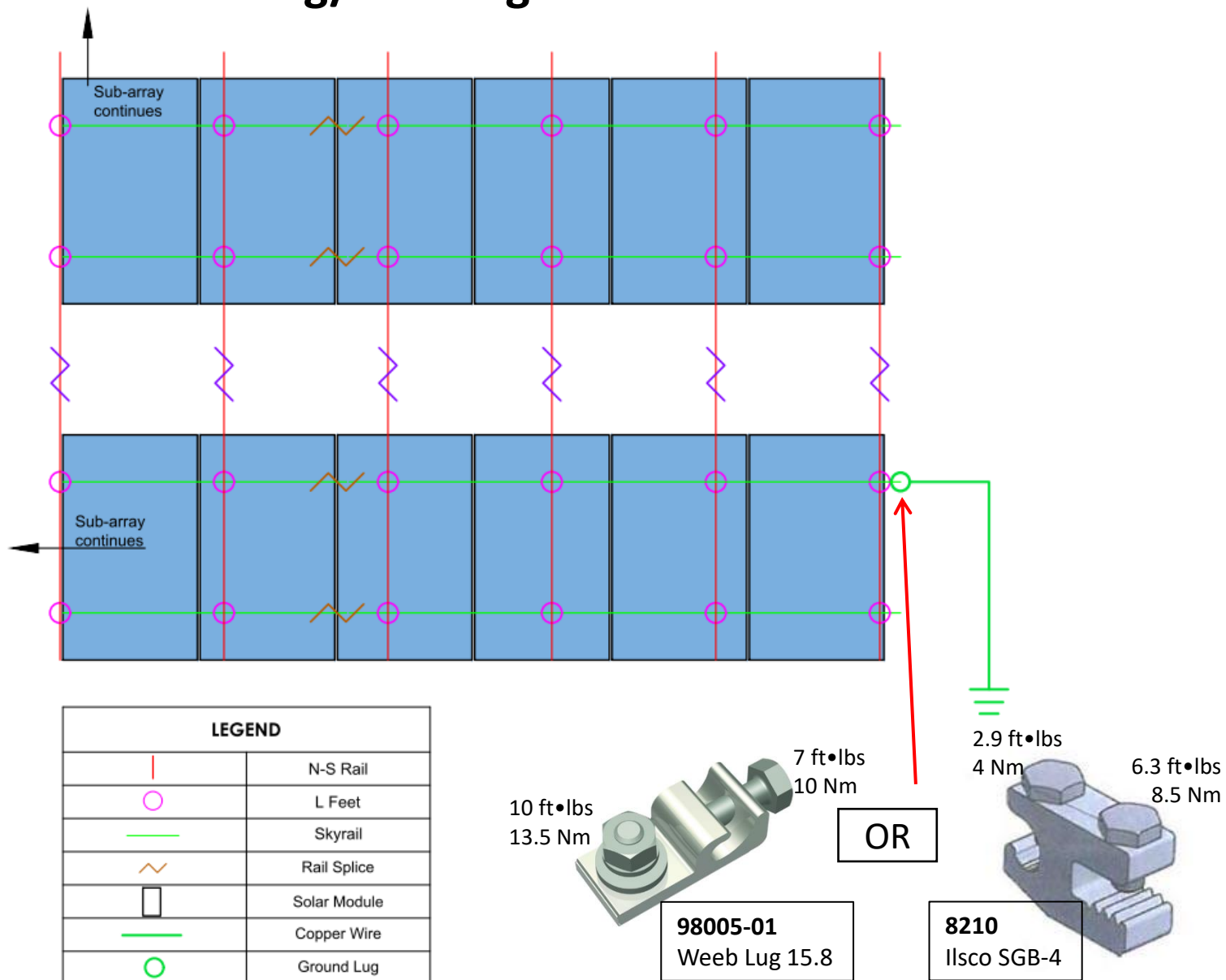
**REAR STRUT ASSEMBLY**  
**PART # 91881-A10**  
**SCALE 1:2**

TITLE: <b>Skyrack Ballasted</b>			
CLIENT: <b>hb Solar International Inc.</b>			
ROOF TYPE <b>Flat</b>	STRUCTURE TYPE <b>Steel</b>	MODULE ORIENTATION <b>Portrait</b>	
DWG. NO. <b>SRB-103-10</b>	REV <b>00</b>		
SCALE: 1:1	SHEET 3 OF 3		
DRAWN	NAME <b>JW</b>	DATE <b>2021-05-12</b>	

244 Montrose St N  
Cambridge, ON N3H 2H7  
E-mail: info@hbsolar.ca

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# Grounding/Bonding



- Module clamps bond modules to the rails
- Rail splices bond rails which have been spliced together
- As per diagram, use Ground Lug to bond corner of every contiguous sub-array.
- **Weeb Lug 15.8:** *Per manufacturer's instructions: apply general purpose anti-seize compound on fastener threads when installing. (not supplied)*
- **IlSCO SGB-4:** *Per manufacturer's instructions: apply a liberal amount of anti-oxidant conductor compound into both openings of lug before attaching. (not supplied)*
- **Torque bolts as shown in images above.**
- System grounding must be in accordance with the National Electrical Code, ANSI/NFPA 70.
- Maintain a minimum of ¼" separation between the copper wire and aluminum or galvanized steel.

**NOTE: ISOLATE COPPER FROM ALUMINUM AND GALVANIZED STEEL CONTACT TO PREVENT CORROSION**

**MODULE CLAMP NOTE: if module clamps are loosened for maintenance, the location of the frame piercing pins should be moved to create a new bonding connection.**