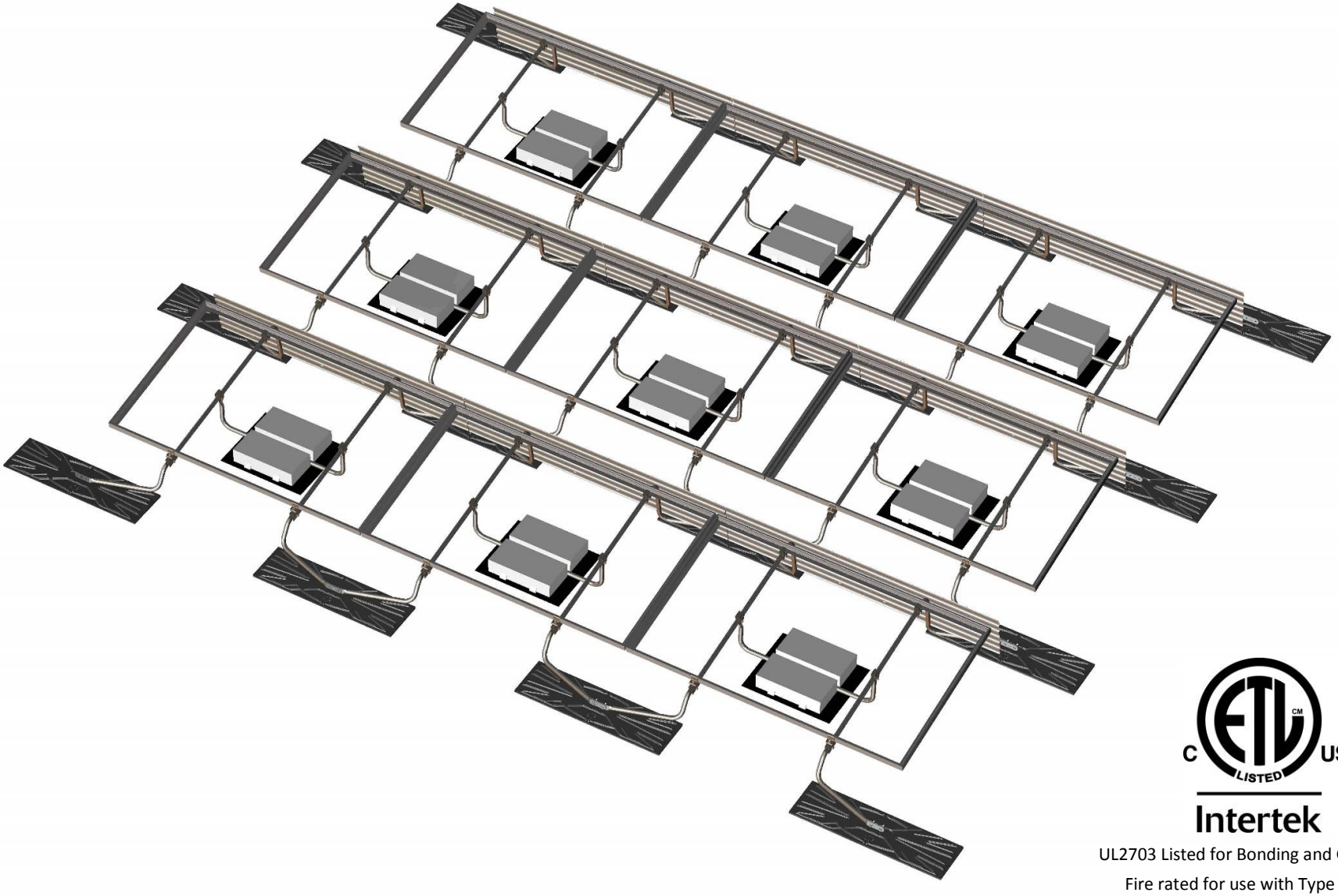


UL2703 Listed for Bonding and Grounding

Fire rated for use with Type I and II Modules on Class A roofing Materials

CSA LTR AE-001:2012 Classified for Bonding and Grounding

Table of Contents

1. Safety, UL 2703 and CSA LTR AE-001:2012

Basic Safety Considerations

The following basic safety instructions and the warning notes are an essential part of this manual and are of fundamental importance for handling the product and its conformity to UL.

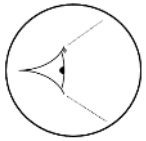
Warnings

Throughout this manual you will notice several warning notes which consist of:

- Warning Symbols
- Information regarding the source and type of the danger
- Measures for avoiding the hazard, and ways to prevent injuries or property damages

Caution

Denotes a potential hazard which may lead to damage to racking, physical injury and/or property damage



Visually Inspect

Denotes a manual inspection process must take place before proceeding with the installation.

Check and Compare

Denotes that the installer must check the installation on site and compare it to the image before proceeding.

Responsibilities Of The Installer

It is the responsibility of the installer to ensure all applicable safety measures are strictly adhered to while installing this PV Racking system. Any modifications are to be performed only by authorized personnel and must be approved by Polar Racking prior to implementation. The installer must have adequate skill and knowledge with any materials and tools used to install this system.
Furthermore, the installer must be able to recognize any possible dangers, whether they are stated in this manual or not. Every person installing this system must read, and fully understand, every section of this manual prior to working on the system.

Responsibilities Of The Operator

It is the responsibility of the operator to ensure all scheduled maintenance is performed on time. He must ensure that the installation of the system is performed only by qualified personnel with adequate skill and knowledge. The operator must ensure a copy of this manual is available to any installer and/or maintenance person as it is part of the overall system. A replacement manual may be obtained by contacting Polar Racking through our website at www.polarracking.com.

UL 2703 Conformance

The PRG system is rated under UL 2703/ULC ORD 1703 by following the below guidelines.
The racking system has been designed to be installed over a fire resistant roof covering with a class A rating only.
The racking system is to be used with ballast stones as a primary means of securement to roofing structure. See layout for site ballasting information.
The racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.
The racking system has been tested to withstand downward pressures up to 50 PSF, upward pressure of up to 5 PSF and down-slope loads of up to 5 PSF.

CSA LTR AE-001:2012 Conformance

The PRG system is rated under CSA LTR AE-001:2012 by following the below guidelines. Photovoltaic Racking System Installed using PRG March 26, 2019.

2. Parts and Tools

Tools

Power Drill with

½” Socket Drive Adapter

Sockets:

13mm Deep Socket with ½” Drive

8mm Socket with ½” Drive

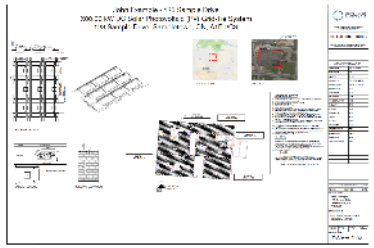
Calibrated Torque Wrench with ½” Drive

Tape Measure

13mm Wrench

Chalk Line

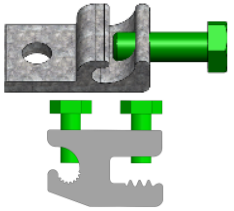
Level



Approved Construction Layout

System Components

Number	Description	Image	Part #
1.	Right Hand Runner		300106001-5° 300228001-5° 300107001-10° 300209001-10° 300108001-15°
2.	Left Hand Runner		300109001-5° 300229001-5° 300110001-10° 300210001-10° 300111001-15°
3.	North Clamp/ Cross Member Clamp		300102001 300199001 300227001
4.	South Clamp/ Accessory Bracket		300103001 300198001
5.	Top Clamp		300104001 - 31-35mm 300104002 - 37-40mm 300104003 - 43-46mm 300104004 - 47-50mm 300104005 - 26-30mm
6.	Rubber Mat		500068001
7.	Wind Deflector		300124001 - 15°/1954-1972mm 300124002 - 15°/1639-1660 mm 300124003 - 10°/1954-1972mm 300124004 - 10°/1639-1660 mm 300124005 - 5°/1954-1972mm 300124006 - 5°/1639-1660 mm 300124007 - 15°/2001-2018 mm 300124008 - 10°/2001-2018 mm 300124009 - 5°/2001-2018 mm 300124010 - 15°/2019-2036mm 300124011 - 10°/2019-2036mm 300124012 - 5°/2019-2036mm 300124013 - 15°/1982-2000mm 300124014 - 10°/1982-2000mm 300124015 - 5°/1982-2000mm 300124016 - 15°/2050-2067mm 300124017 - 10°/2050-2067mm 300124018 - 5°/2050-2067mm

Number	Description	Image	Part #
8.	Cross Member		300188001 - 5°/1639-1660 mm 300188002 - 5°/1954-1972mm 300188003 - 5°/1982-2000mm 300188004 - 10°/1639-1660 mm 300188005 - 10°/1954-1972mm 300188006 - 10°/1982-2000mm 300188007 - 15°/1639-1660 mm 300188008 - 15°/1954-1972mm 300188009 - 15°/1982-2000mm 300188010 - 5°/2000-2018mm 300188011 - 10°/2000-2018mm 300188012 - 15°/2000-2018mm 300188013 - 5°/2018-2036mm 300188014 - 10°/2018-2036mm 300188015 - 15°/2018-2036mm 300188016 - 5°/2050-2067mm 300188017 - 10°/2050-2067mm 300188018 - 15°/2050-2067mm
9.	Ballast Bracket		300115001
10.	Grounding Lug		400007001 400023001
11.	Side Shield		300163001 - 5°/Right 300163002 -10°/Right 300163003 -15°/Right 300164001 -5°/Left 300164002 -10°/Left 300164003 -15°/Left
12.	Side Shield Connection Bracket		300165001- 5° 300165002-10° 300165003-15°
13.	J Hook		900235001
14.	Roof Anchor Connection Bracket (Optional)		200312001
15.	Ballast Substrate (Optional)		500014015

Hardware

Number	Description	Image	Part #
1.	M8 Cap Screw, 35mm Long		100018011
2.	M8 T-Bolt, 25mm Long		100075001
3.	M8 Hex Nut		100017003
4.	M6 Trilobular Screw, 12mm Long		100074002

3. Storage and Handling

Site Handling and Storage

The following conditions must be met for proper onsite handling and storing of the product to avoid damage to product or roof prior to installation:

- All boxes and components delivered to site should be kept dry and under cover,
- Do not stack anything on racks or pallets of components,
- Lift pallets from designated handling areas,
- Contractors are responsible to make sure all OSHA guidelines and/or local guidelines are followed including the state regulations.
- Any and all parts removed from packaging must be visually inspected for any damage or before its use in installation
- Installer is not to use any damaged parts on the installation site. Any and all damage must be reported to Polar Racking immediately.

Annual Maintenance

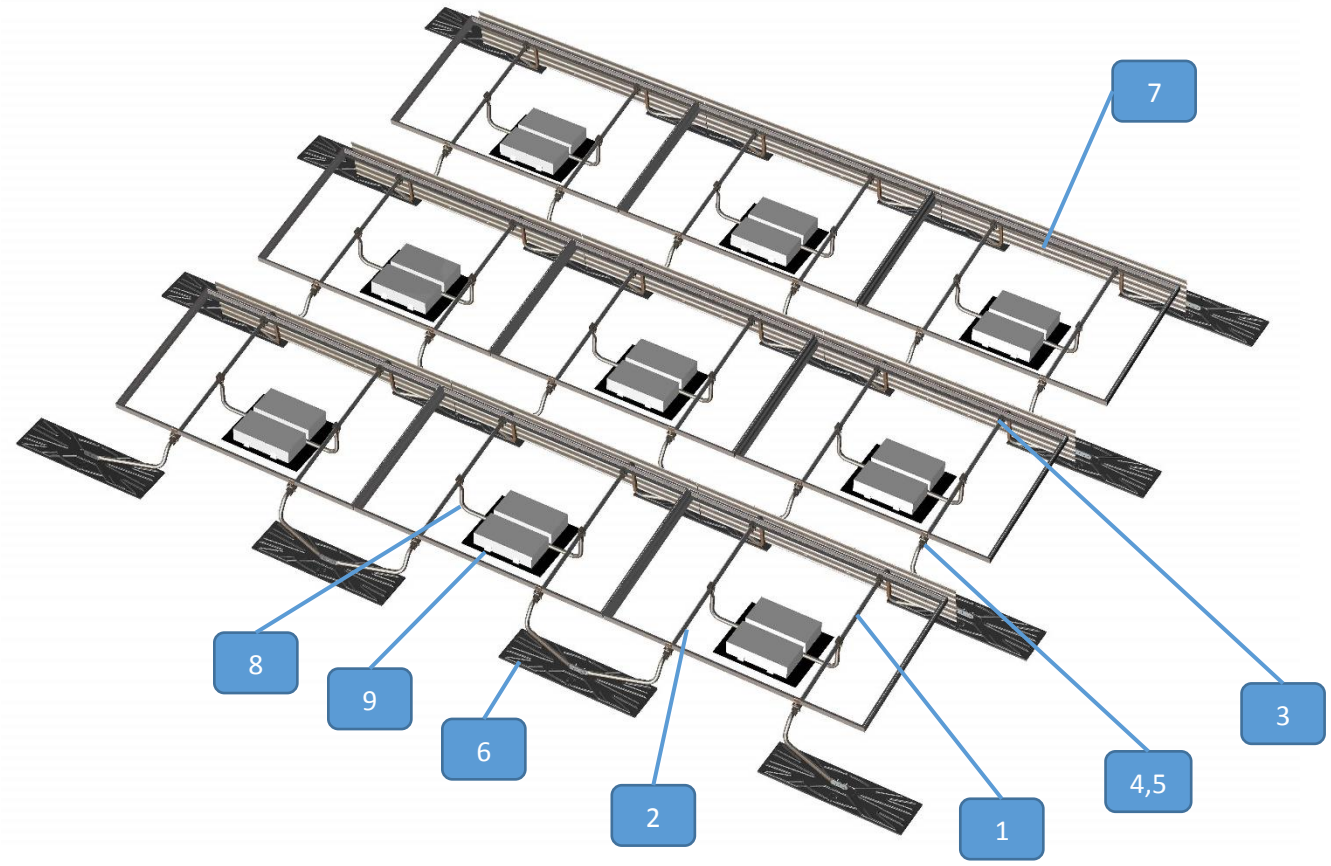
The maintenance work described below must be performed once every year from the date of installation until the site is decommissioned and product is removed from the roof.

- Inspect all fasteners and component connections. Observe for any deformation, cracks, penetrating corrosion or other defects on the PRG components and immediately replace if deemed necessary.
- Check bolts and all hardware for specified torque (or torque marks) and re-tighten if required while ensuring all solar modules are seated correctly.
- Ensure runners are retained within grooves of rubber mats. Check all rubber substrates located under each set of ballast stones. Adjust to original installed condition if necessary.

  IMPORTANT NOTE: Due to the properties of mating fasteners, please ensure the limiting speed of cordless drivers (RPM) is set to the lowest setting and does not exceed 3500 RPM. All fasteners provided by Polar Racking have been pre-treated to prevent material corrosion, however, this is highly dependent upon the speed at which they are fastened.

4. Racking Overview

1. Right Hand Runner
2. Left Hand Runner
3. North Clamp
4. South Clamp
5. Top Clamp
6. Rubber Mat
7. Wind Deflector
8. Cross Member
9. Ballast Bracket



Drawing Map - Sample Layout:

1 *Array Layout and Ballasting Information*

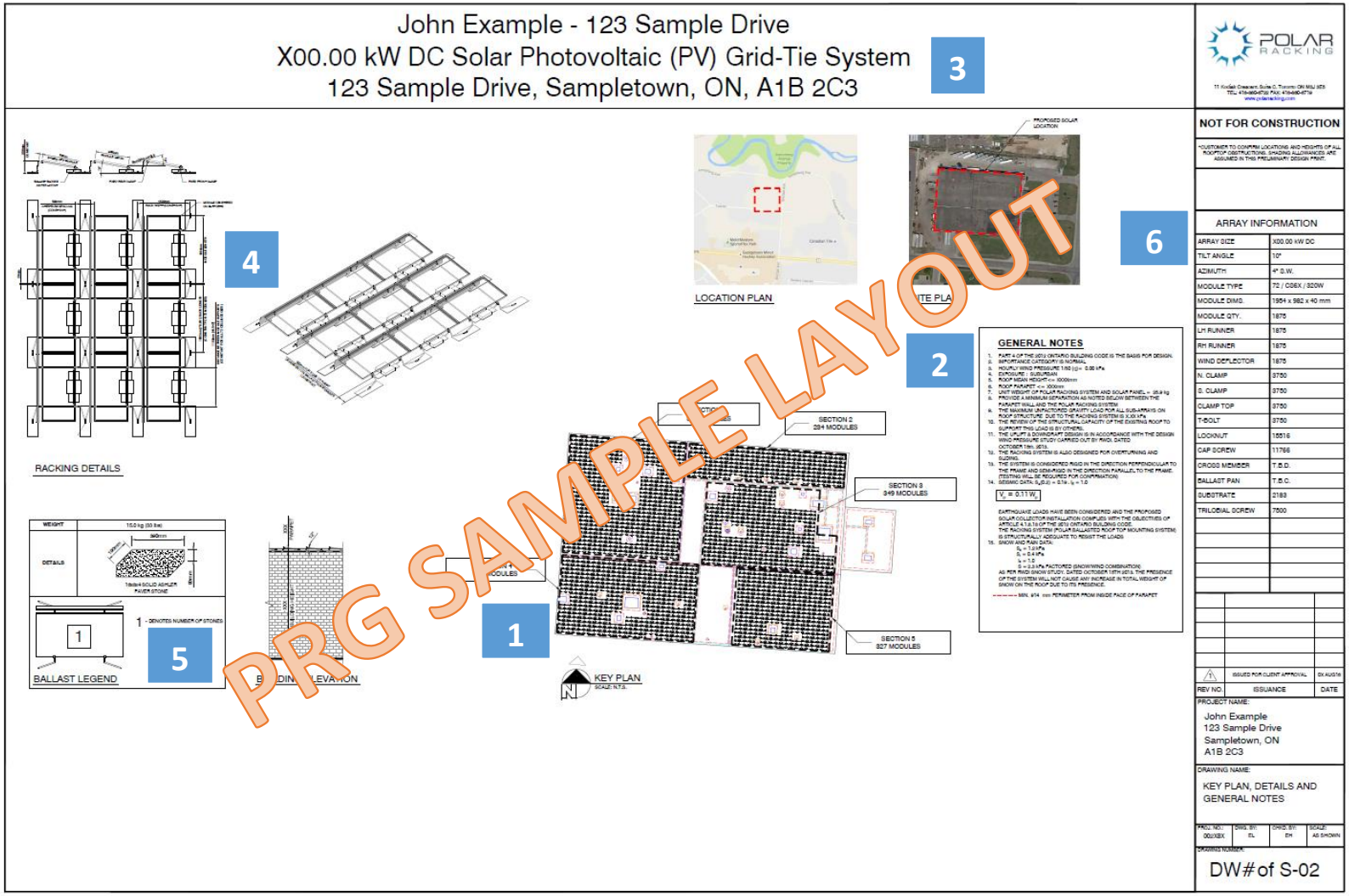
2 *Project and Configuration Specific Notes*

3 *Project Details / Names / Titles*

4 *Ballasting Information*

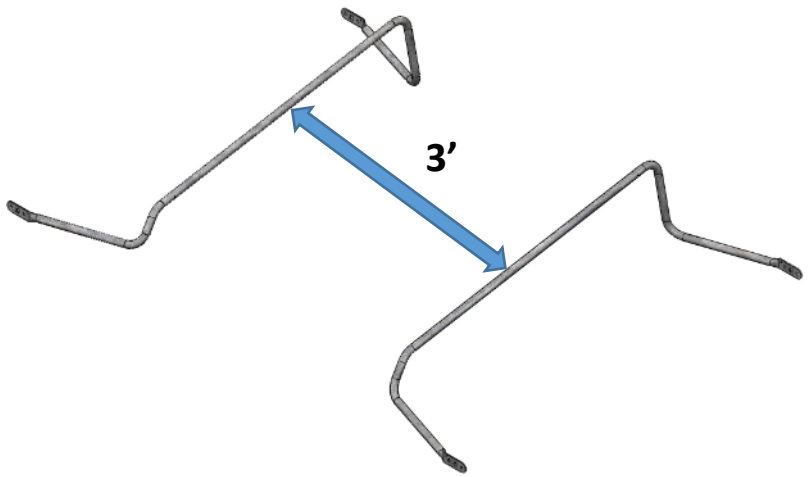
5 *Racking Critical Dimensions*

6 *Array Information*

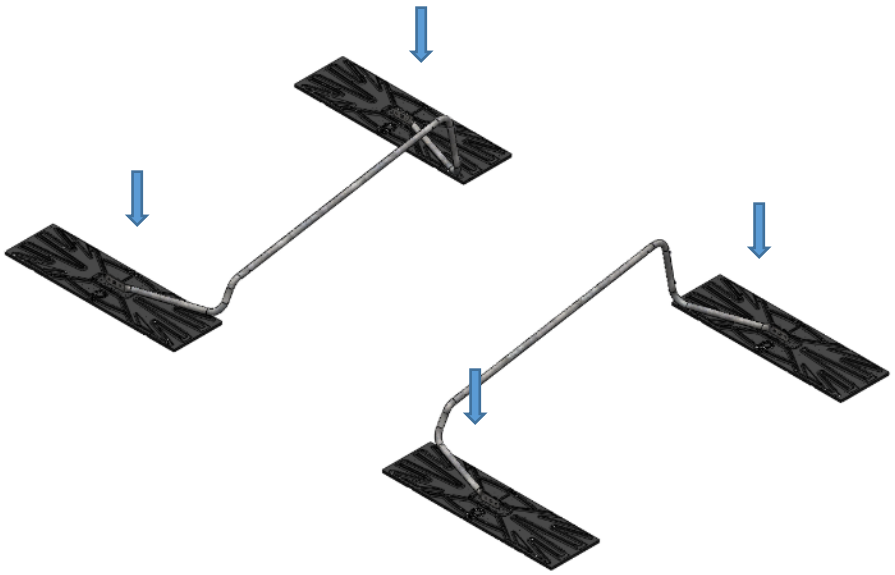


5. Racking System Installation Instructions

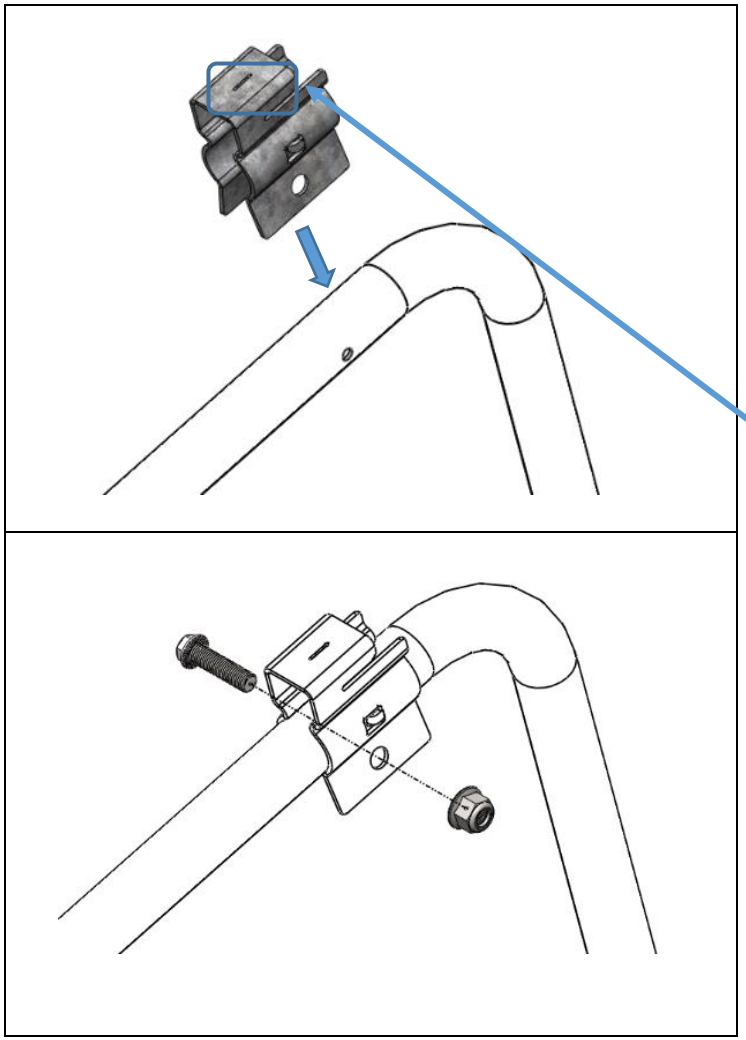
Step 1: Place the first right and left hand PRG runners down. Space them approximately 3’ apart from each other (Refer to section 9, step 1 if achors are required)



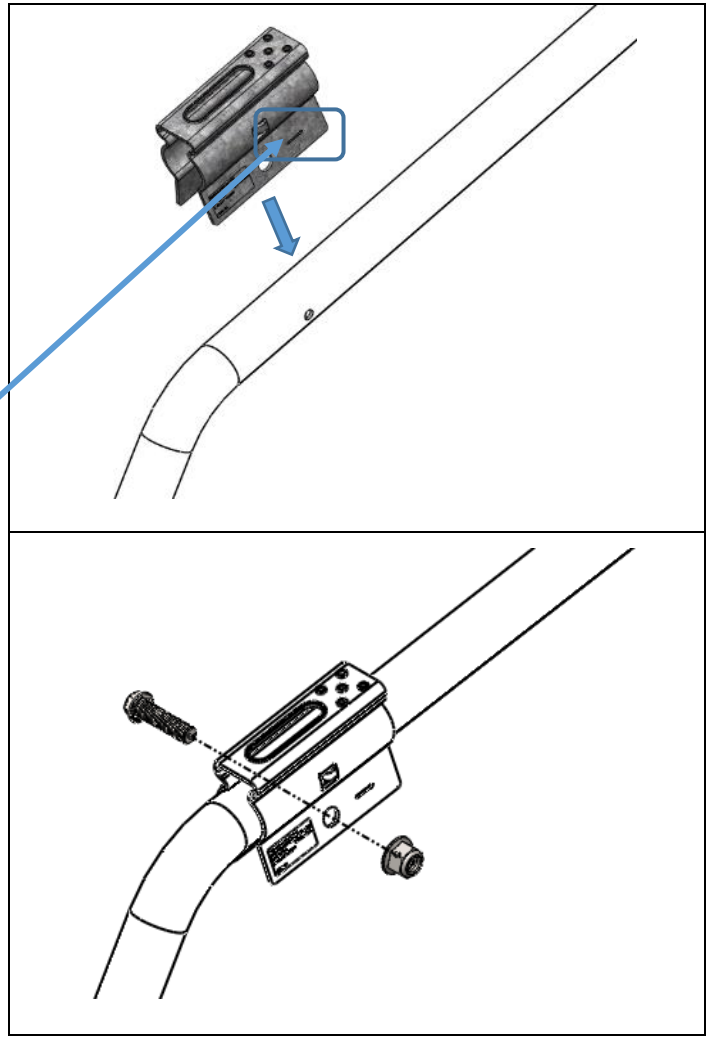
Step 2: Position runners in grooves of rubber mats.



Step 3: Align arrows (shown) on clamps towards north and clip them on runners. Ensure tabs on clamps match into runner holes. Loosly attach with M8x35mm. Torquing instructions in Step 8.

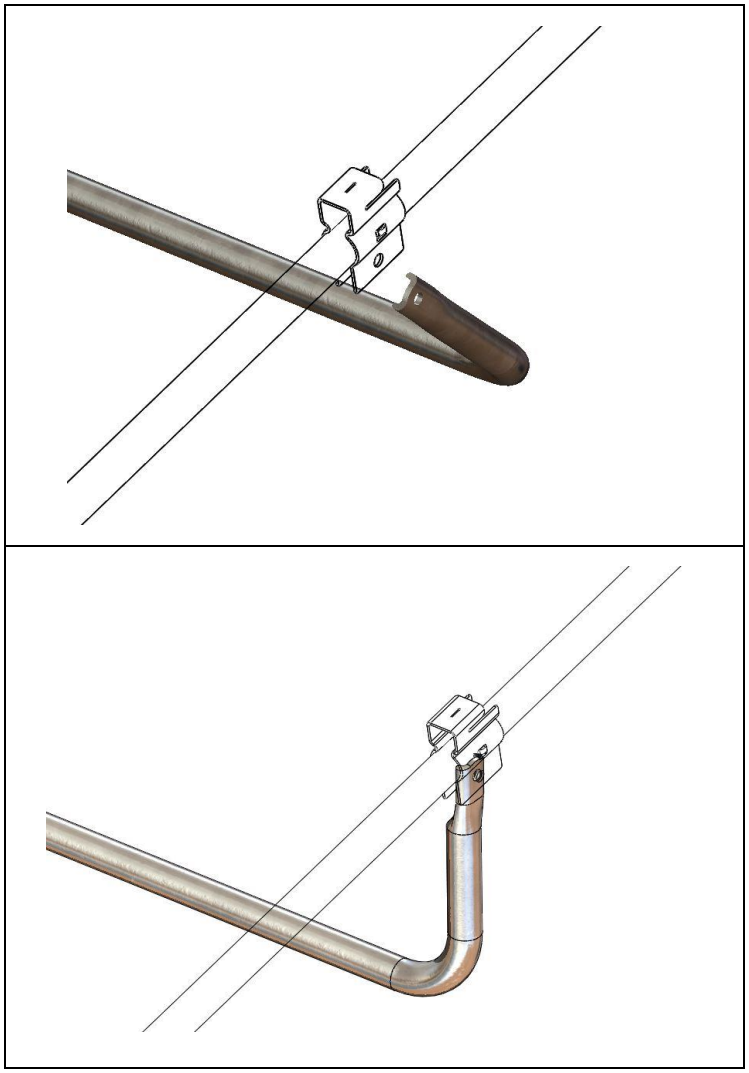


Installation of North Clamp

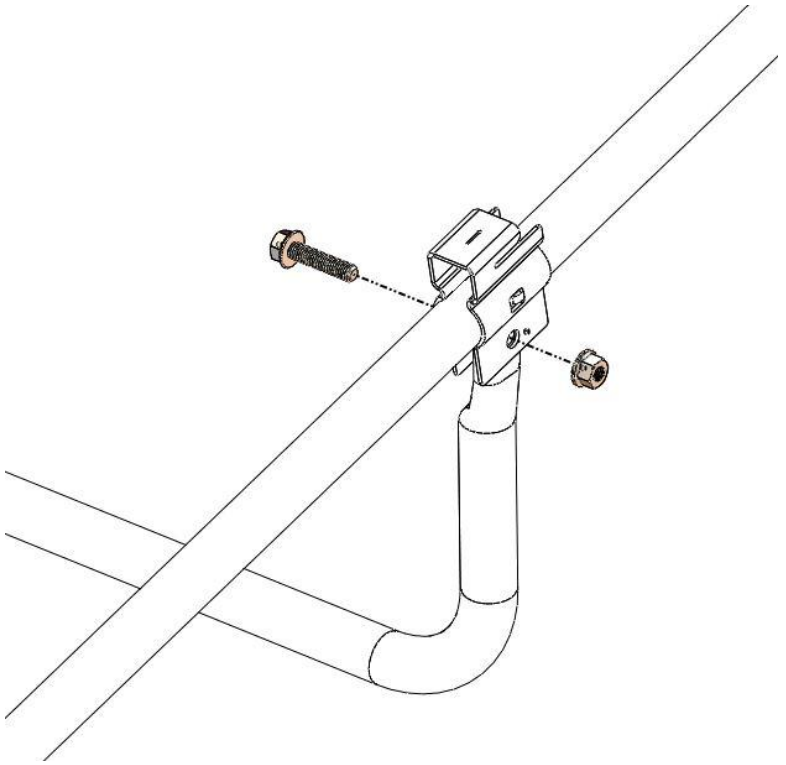


Installation of South Clamp

Step 4: Where required, install cross members between each runner as per ballasting plan. Additonal north clamps are used to connect the cross member to the midspan of the runners. Ensure tabs in clamps align to holes in runners, and install M8 x 35 fasteners. Torque to 7-9 ft-lbs

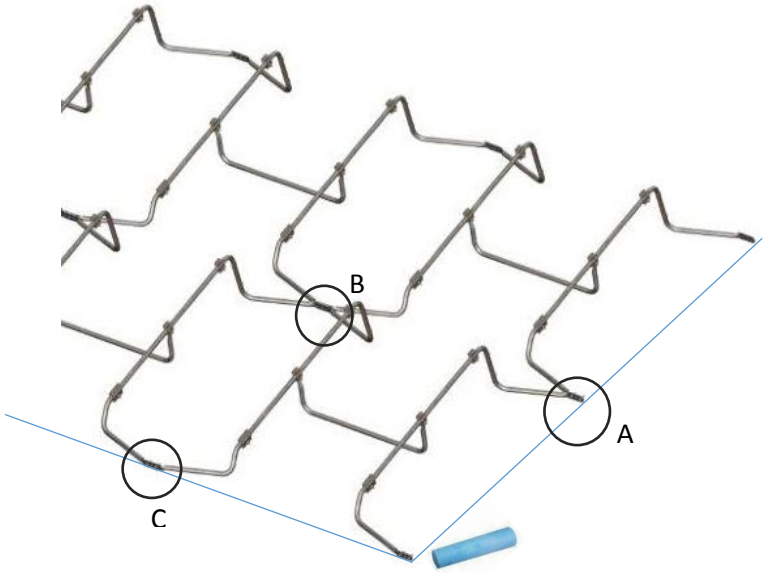


Installation of Cross Member

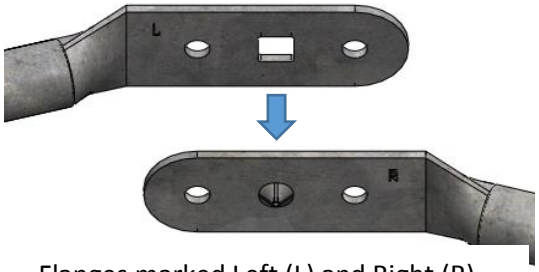


Installation of Cross Member hardware
M8 x 35 fasteners, torque to 7-9 ft-lbs

Step 5: Following Steps 1 through 4, layout entire first row and start building columns. Connect flanges as shown below. Use M8 x 35mm fasteners at connection points.

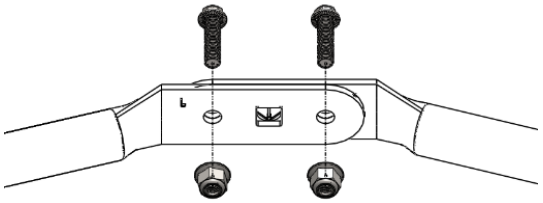


Install first rows and columns

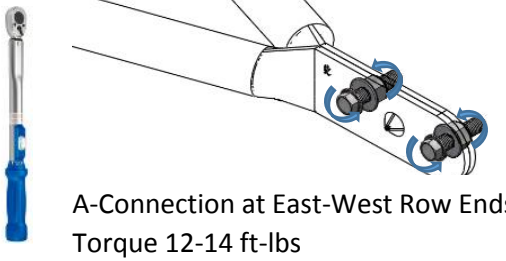


Flanges marked Left (L) and Right (R) with alignment features

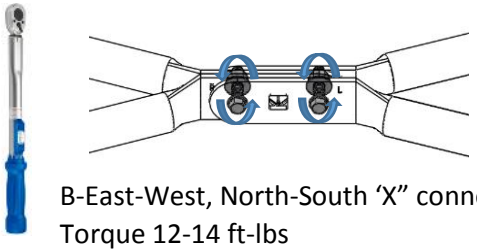
Left flanges are placed within right runners as shown



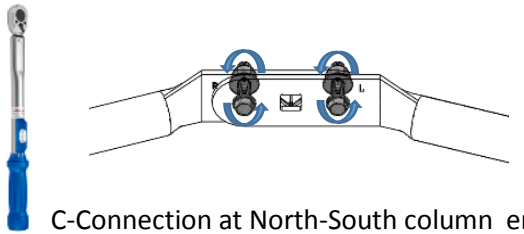
Loosly connect hardware and adjust alignment if necessary



A-Connection at East-West Row Ends
Torque 12-14 ft-lbs

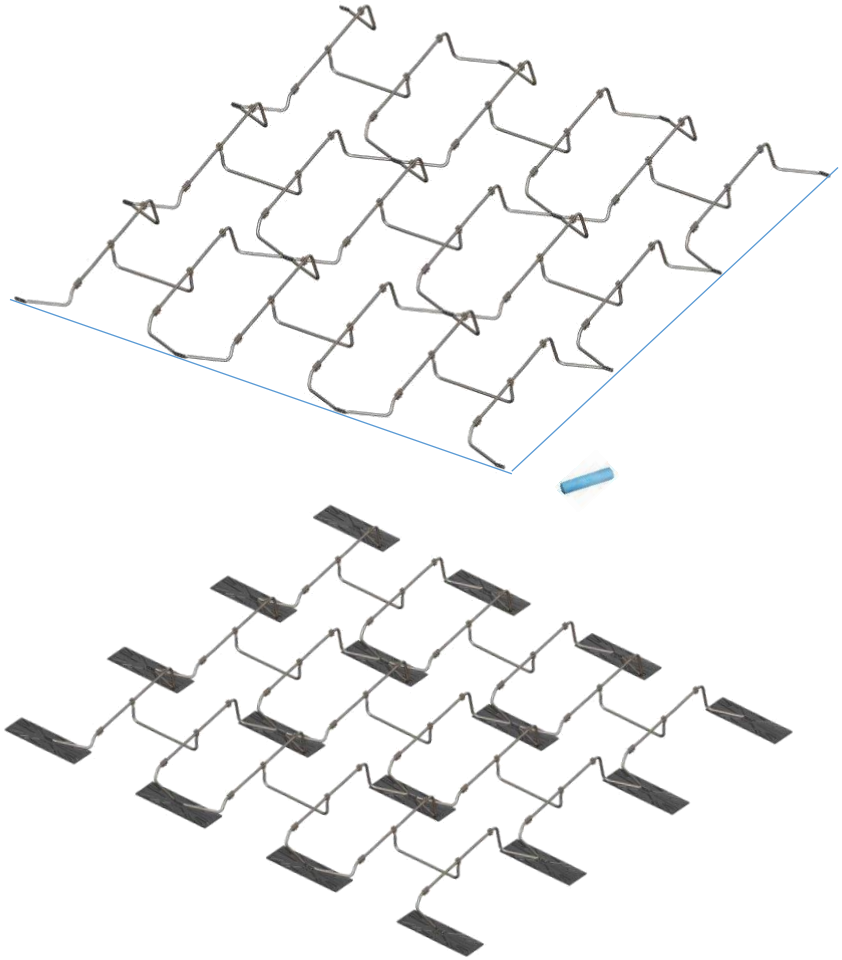


B-East-West, North-South ‘X” connection
Torque 12-14 ft-lbs

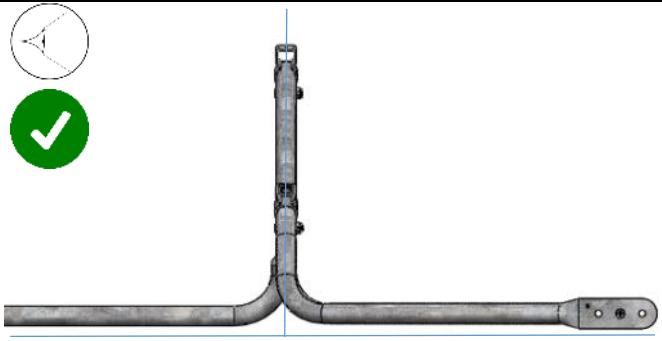


C-Connection at North-South column end
Torque 12-14 ft-lbs

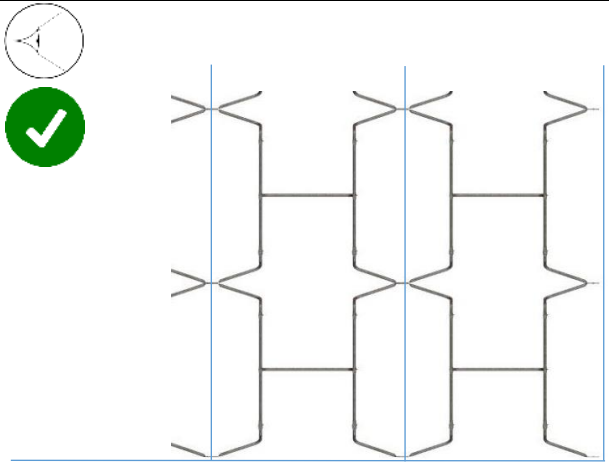
Step 6: Continue steps 1 through 5 to install remainder of array base structure and place rubber mats as shown.



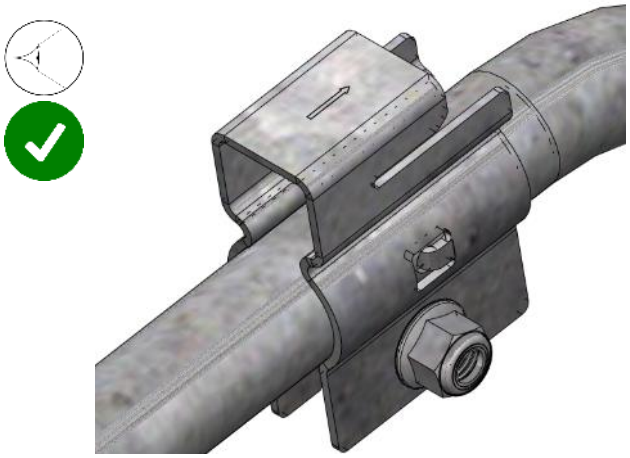
Check array for straightness about each chalk line and adjust if necessary. Visually inspect the system for any defects or inconsistencies. Loosen connections if required, re-align, and re-torque runner connections to 12-14 ft-lbs.



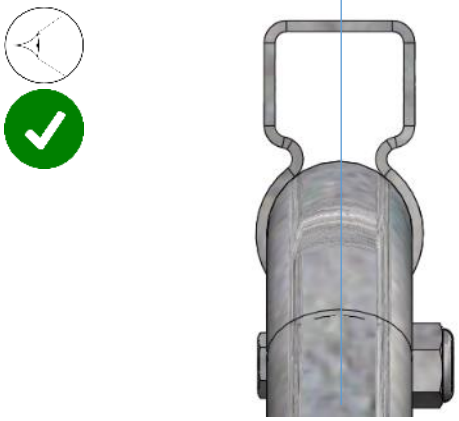
Visually inspect alignment. Use string lines on each row to improve installation alignment.



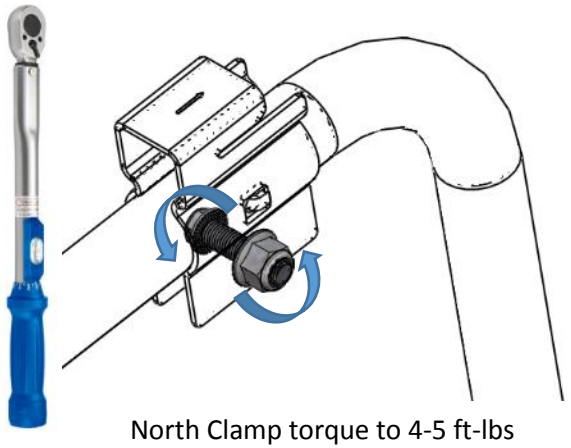
Step 7: Torque and inspect all clamps ensuring tabs are seated in runner holes, and aligned vertically to each other. Torque all south clamps to 7-9 ft-lbs and north clamps to 4-5 ft-lbs.



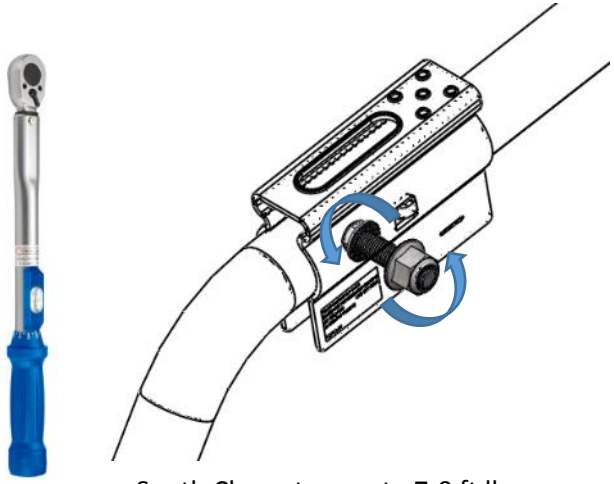
Clamp tabs seated in runner holes



Check clamps are straight and no gaps between mating surfaces

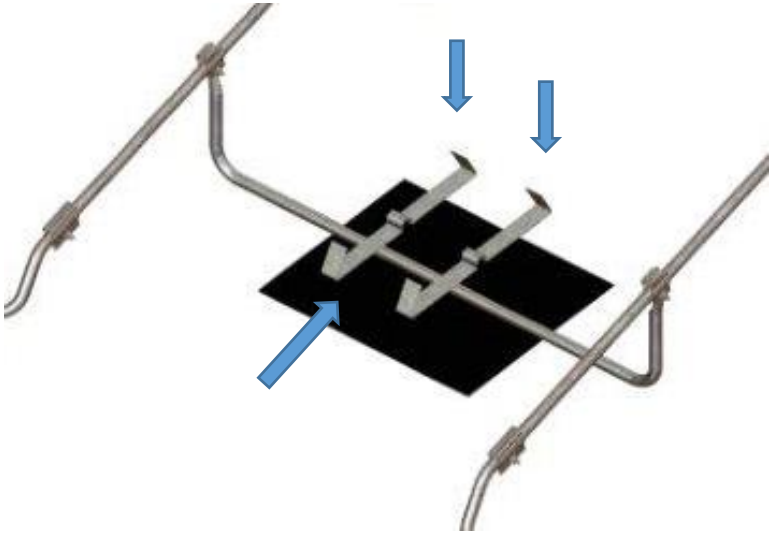


North Clamp torque to 4-5 ft-lbs

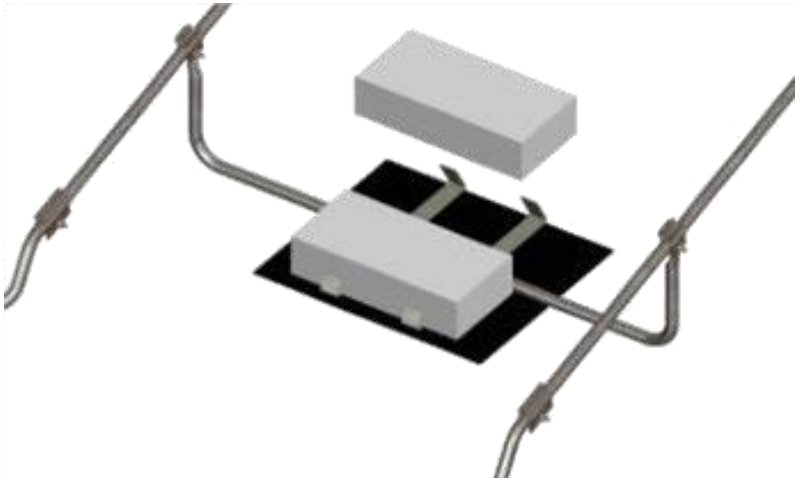


South Clamp torque to 7-9 ft lbs

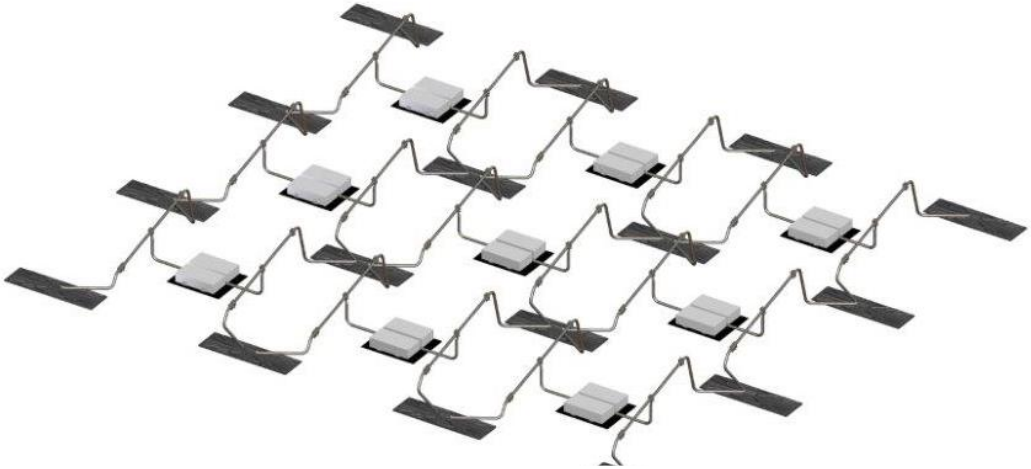
Step 8: Ballast brackets and ballast stone installation.



Position ballast bracket over cross member and engage with tube. Install optional rubber substrate if required.

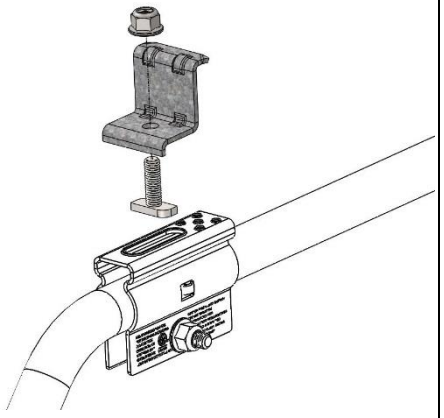


Install ballast blocks ensuring they maintain a snug fit on brackets. Refer Appendix 10.2 for more information.

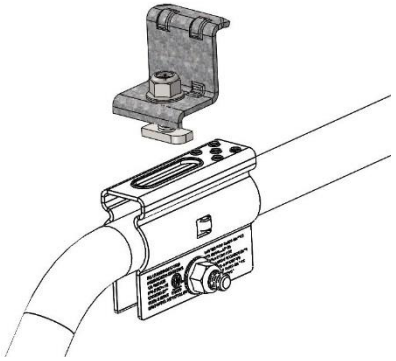


Continue ballasting remaining array.

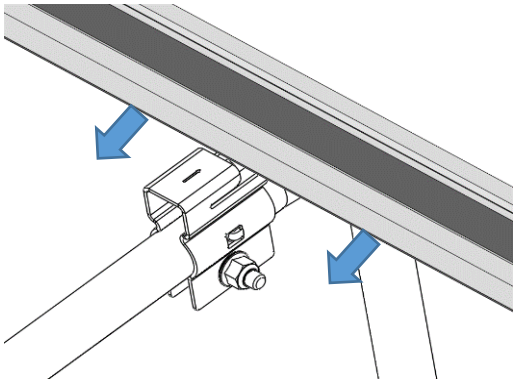
Step 9: Module Installation and Clamping



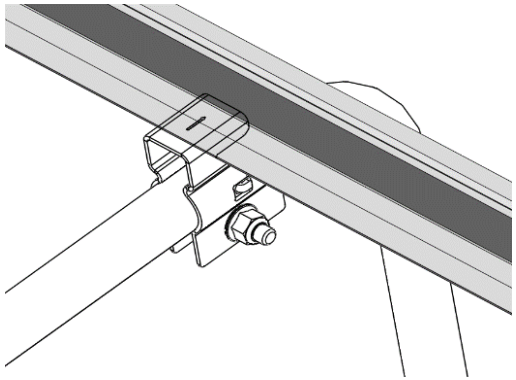
Loosly assemble top clamp



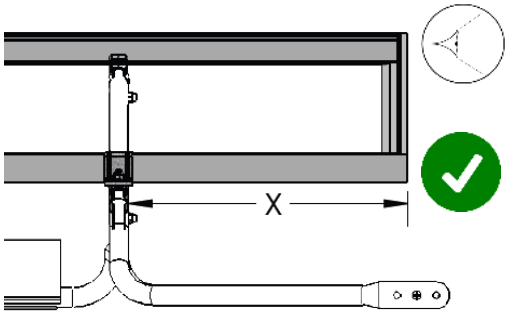
Insert into south clamp slot



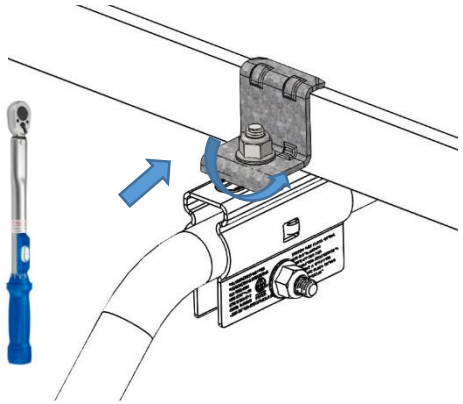
Place module on to shoulder of north clamp and slide into slot



Ensure module frame is fully seated



Check alignment of modules and center within each bay

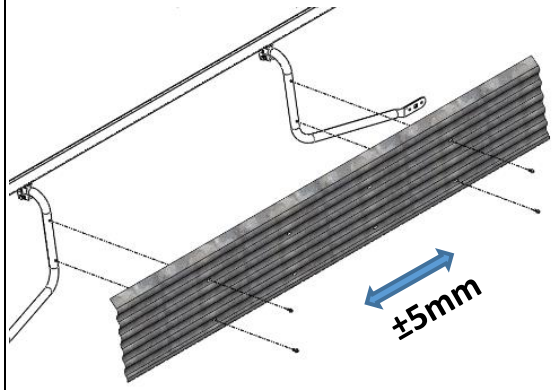


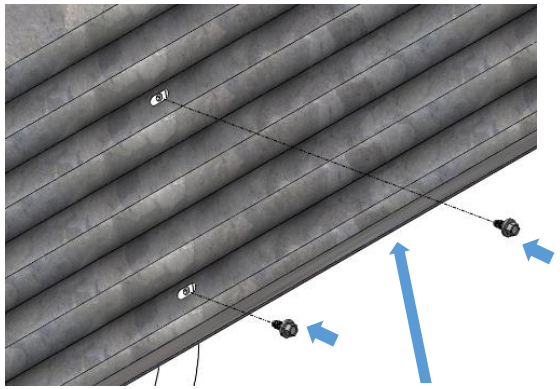
Slide top clamp assembly on to frame and torque nut to 8-10 ft-lbs

*Note: Ensure module installation is done on a **per module basis**. No modules shall be left unattended/unattached without wind deflectors for an extended period of time or during inclement weather.*

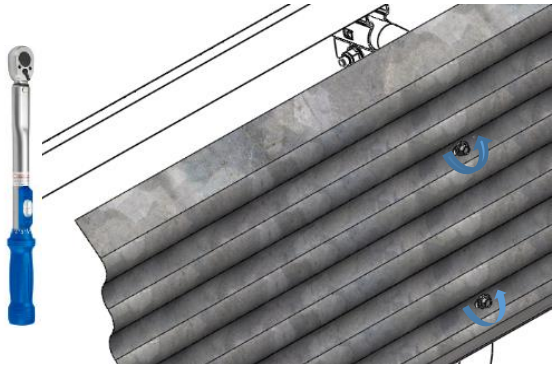
Step 10: Install wind deflectors by aligning holes on deflectors with pre-punched holes on runners. Hemmed/folded edge should be facing down. Align securing holes and place M6 Trilobial screws and secure to runners. Torque to 4-5ft-lbs (50-60 in-lbs).

Note: Ensure that wind deflectors are fully installed and/or secured during installation due to risk of damage and/or injury in high winds.



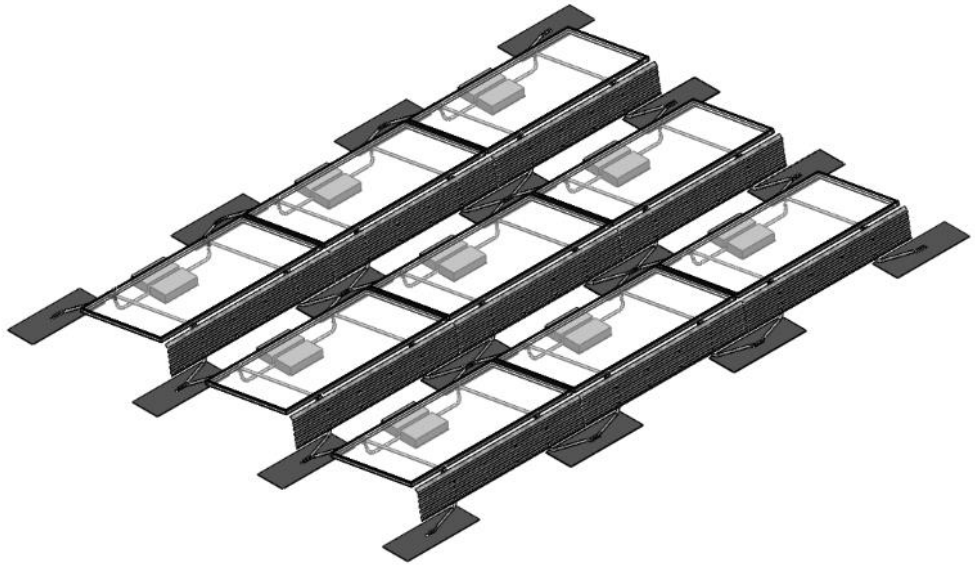


Hemmed/folded edge facing down



M6 Triolobial screws torque to 4-5 ft lbs (50-60 in-lbs).

Do not over-torque. Use power tools at the lowest torque and speed settings

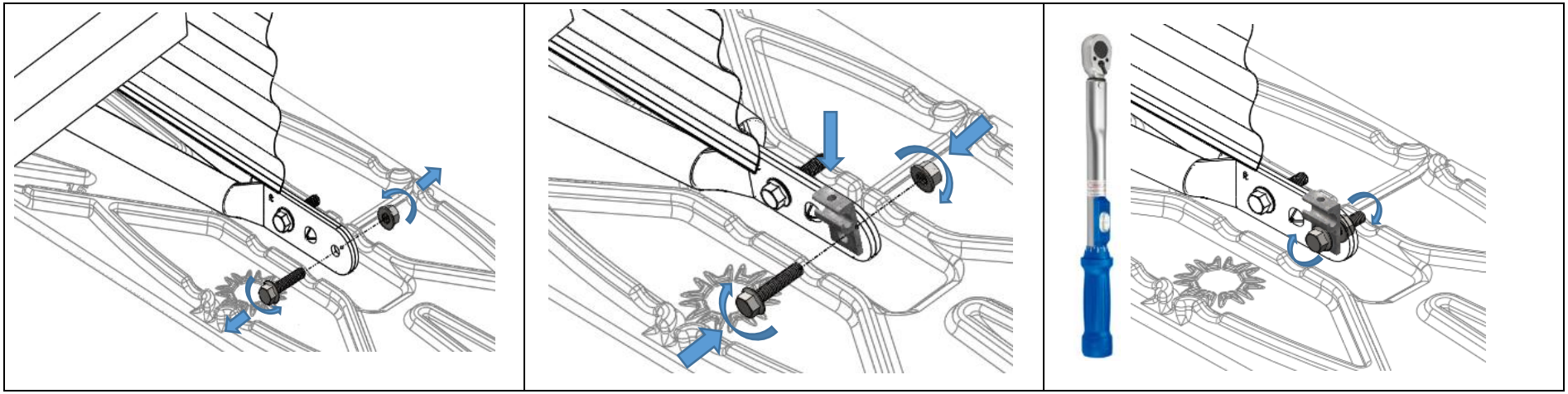


6. Grounding Instructions

Note: A UL 467 approved grounding lug must be used with the PRG racking system to conform to the UL 2703 Electrical rating. Each sub array requires a means of grounding.

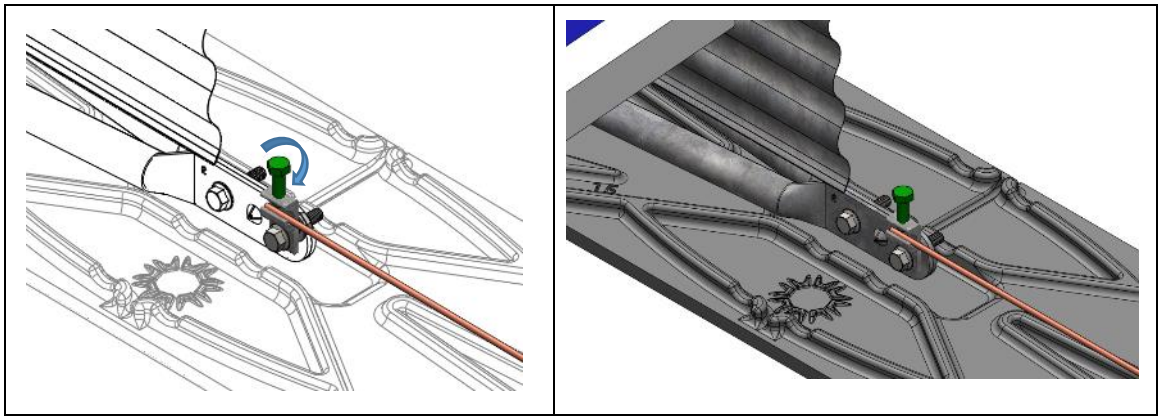
Installer is responsible for and shall provide an appropriate method of direct-to-earth grounding in accordance with the latest edition of the Canadian Electrical Code Part 1, CSA 22.1 Safety Standard for Electrical Installations or the National Building Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems.Please refer to your local Building and Electrical Codes.. The system is rated to a maximum fuse size of 30 A.

Step 1: A Wiley WEEB 8.0 grounding lug should be connected at any outside rack flange connection point. The M8 x 35 hardware can be used for connecting to the rack. Torque hardware to 12 ft-lbs.



Step 2: Attach a single #6 or #8 AWG 105 °C copper wire grounding lug. Tighten the grounding lug to 5 ft-lbs.

Keep Copper away from steel components in a fashion that maintains a minimum of ¼" separation.



Bonding and Grounding Marking

POLAR RACKING INC/PRG

FOR BONDING & GROUNDING

30A FUSE MAX

MFG YEAR: XX/20XX

CNTRL#: XXXXX

LOAD/FIRE RATING:

SEE INSTALLATION INSTRUCTIONS

POLAR RACKING INC / PRG

POUR COLLAGE ET MISE À LA TERRE

30A FUSIBLE MAX

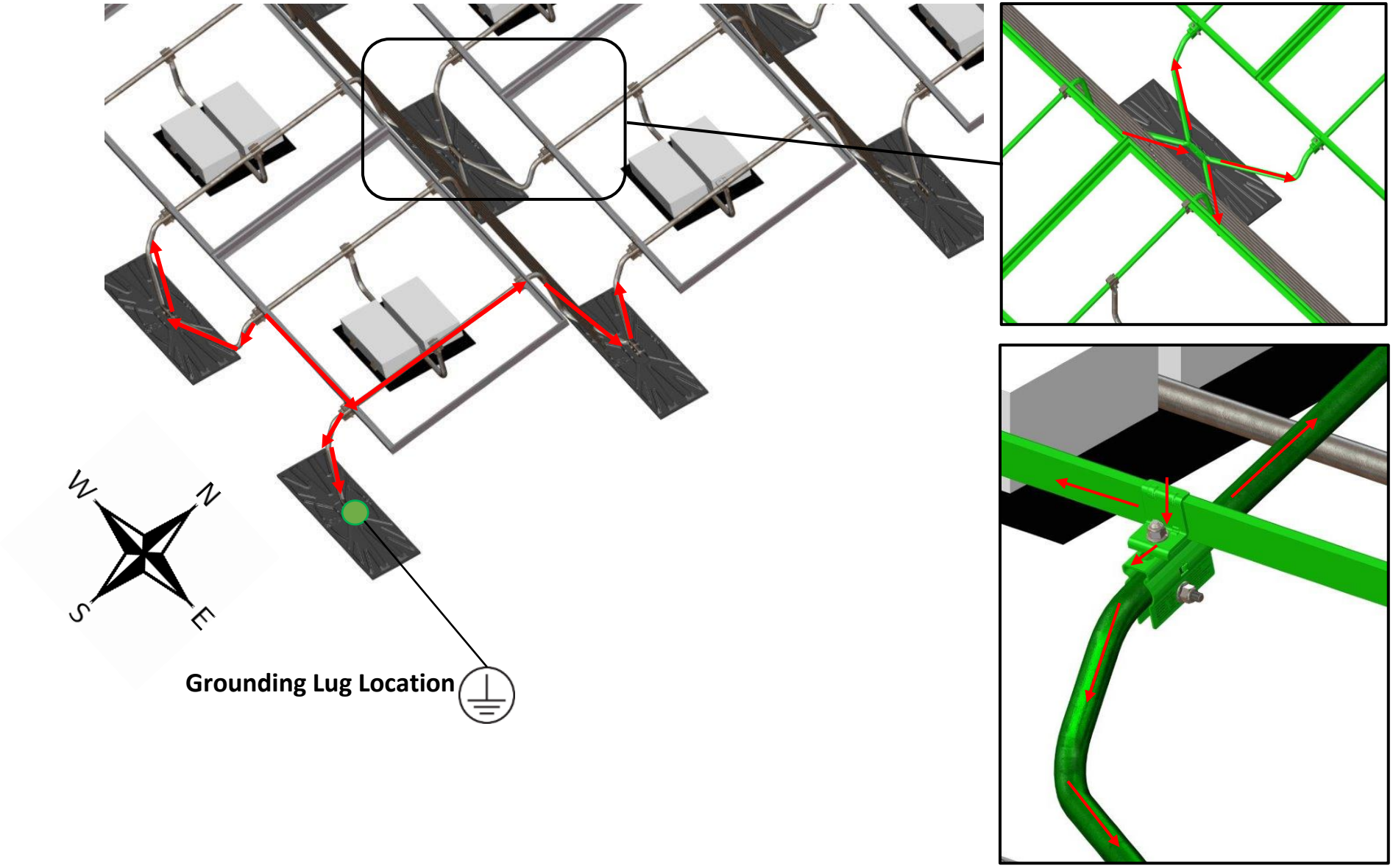
Année MFG: XX / 20XX

CNTRL #: XXXXX

CHARGE / FEU:

VOIR LES INSTRUCTIONS D'INSTALLATION

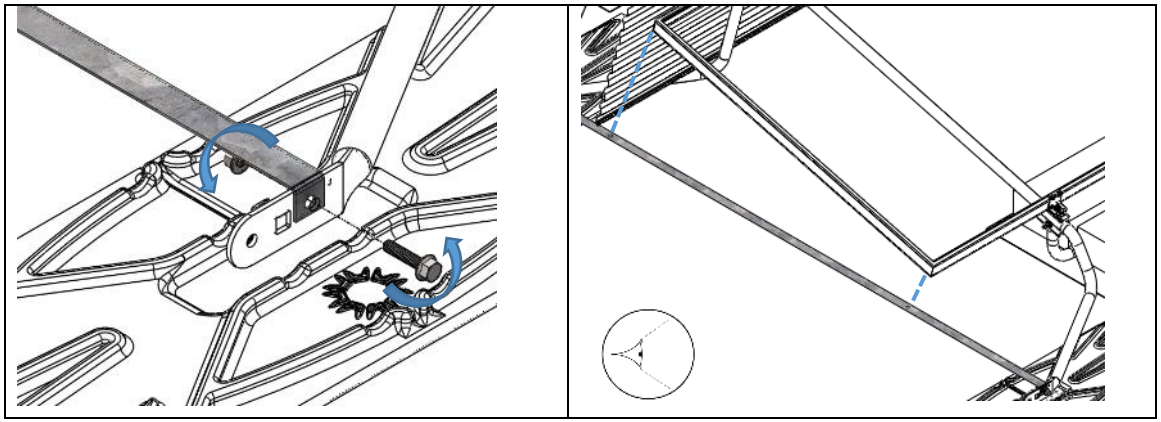
Bonding Path Diagram



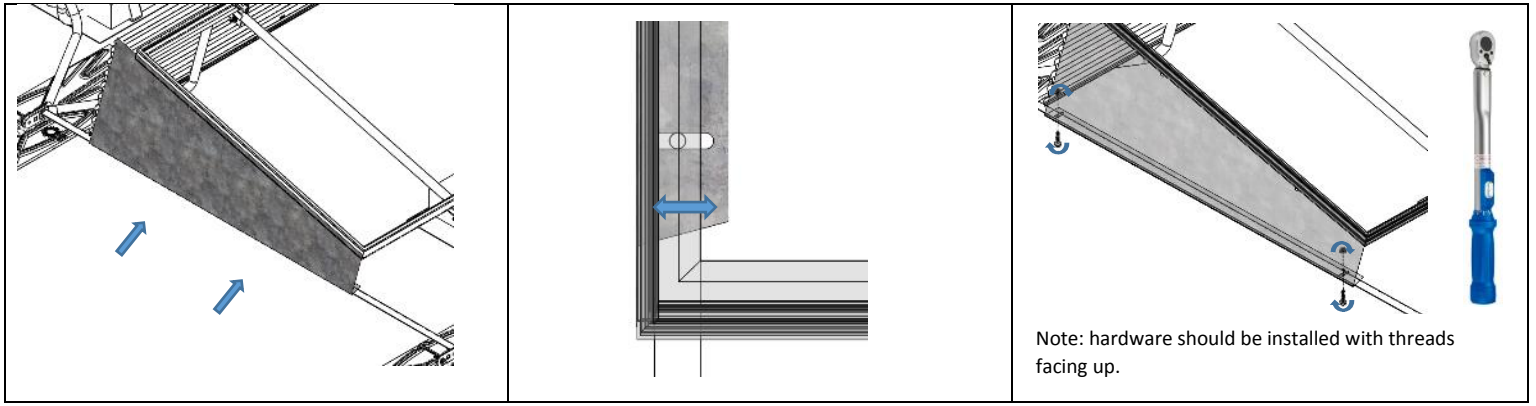
7. Side Shield Instructions

Note: To comply with UL2703 and ULC ORD 1703 Fire Ratings, the PRG racking system must be installed with side shields. All racks at the far east and west of each sub array require side shields. In the case of a single bay, side shields are required on both sides of the rack.

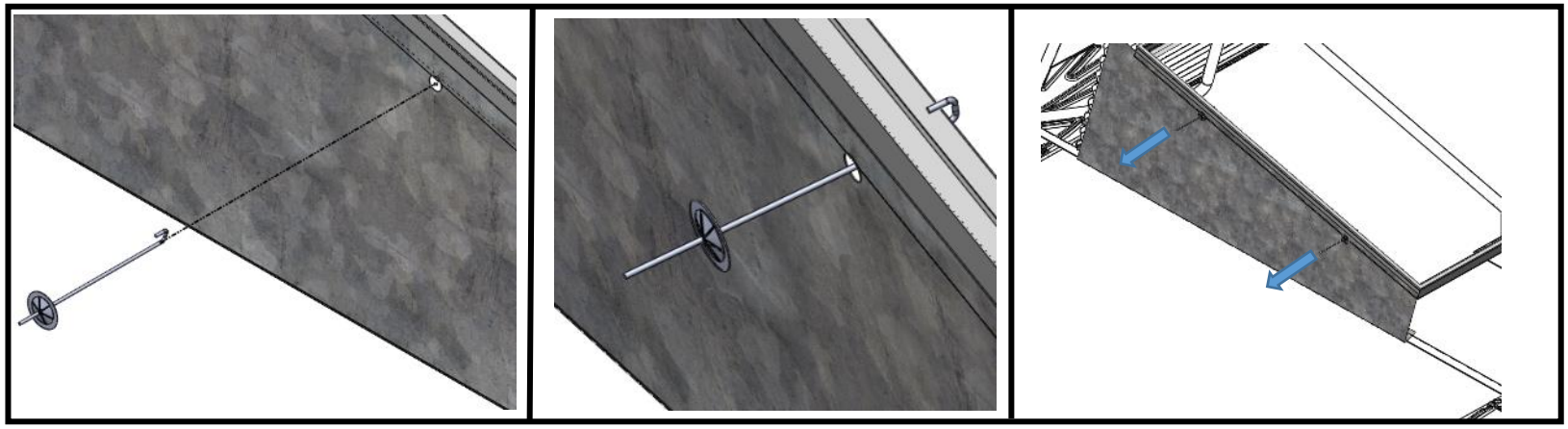
Step 1: Using M8 x 35 bolts and nuts, install the Side Shield Connection Bracket to the outer flanges as shown below. Hardware should be torqued to 12-14ft-lbs.



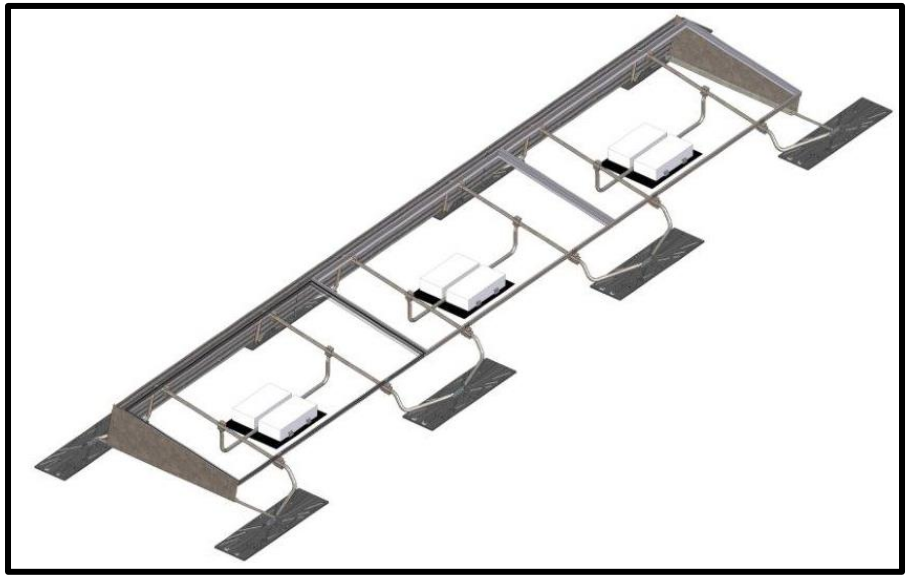
Step 2: Place the Left/Right Side Shield in place and fasten to Side Shield Connection Bracket using M8 x 35 hardware torqued to 12-14 ft-lbs.



Step 3: Using the supplied J Hooks, place the hooks in the top mounting holes of the side shield. Hook to module frame and slide retaining washer to secure tightly. Trim end of J hook if desired



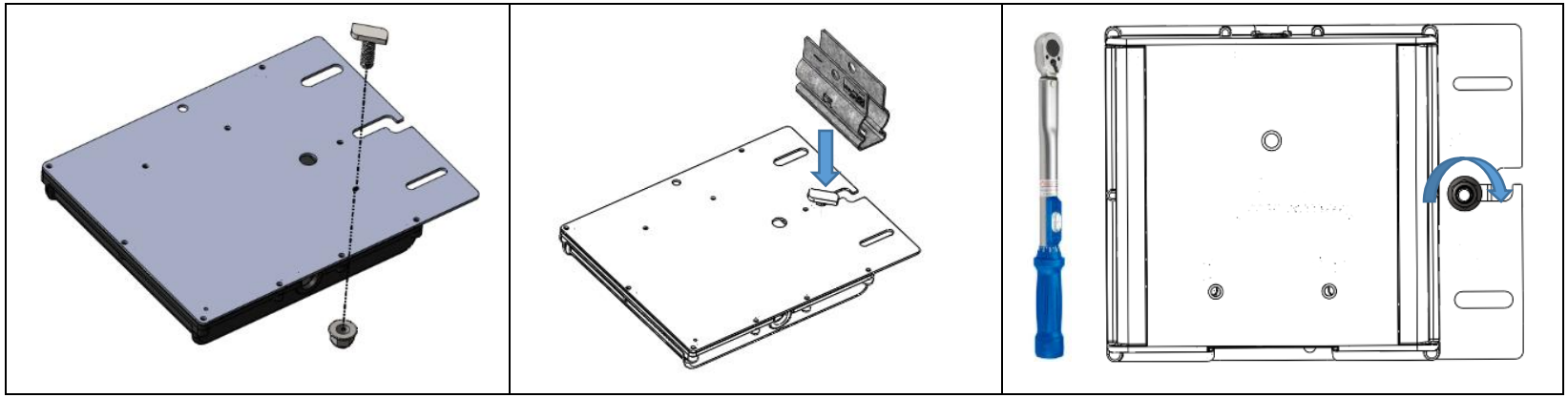
Step 4: Using steps 1-3 install remainder of side shields at each row end.



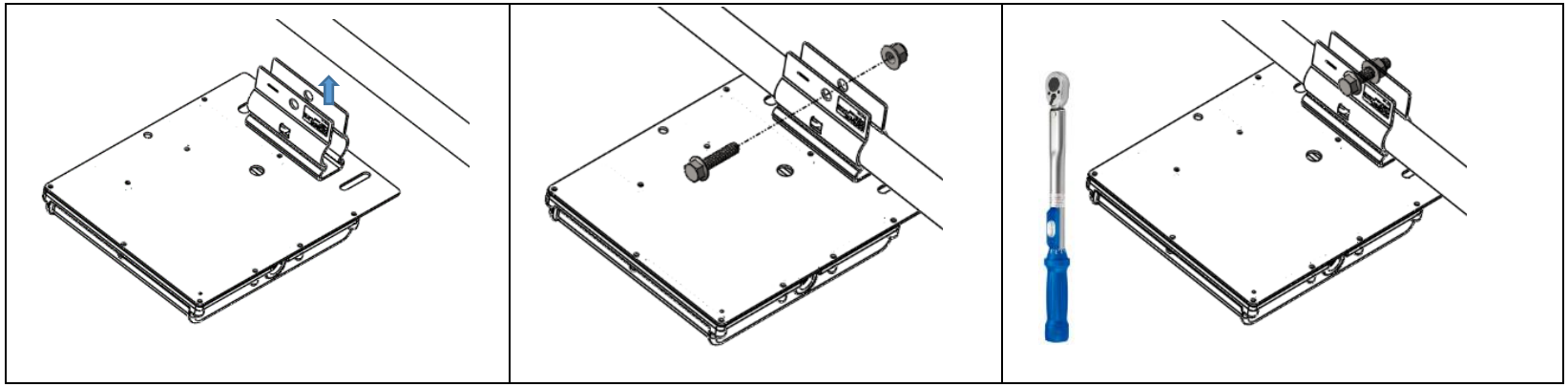
8. Optimizer/Micro Inverter Installation

The PRG racking system can accomodate a wide variety of anchors. PRG South Clamps provide a means of attaching solar accessories while also connecting them to the racking systems bonding path. Accessories should be installed prior to module installation.

Step 1: Install the optional equipment onto the Accessory Bracket as shown below using a M8 hammer head bolt along with a M8 hexnut. Place the hammer head bolt into the channel of the accessory bracket and tighten to 7-9 ft-lbs.



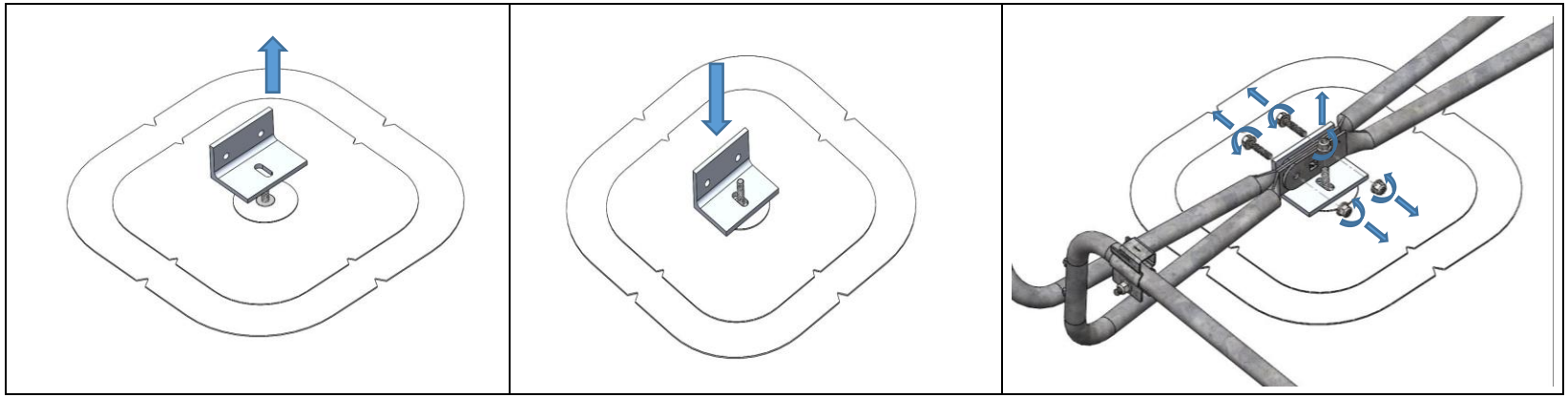
Step 2: Install accessory onto runner on the side closest to the module junction box location. Place an M8 x 35mm hex head holt and M8 Hexnut through the top of the accessory mount and torque to 7-9 ft-Lbs.



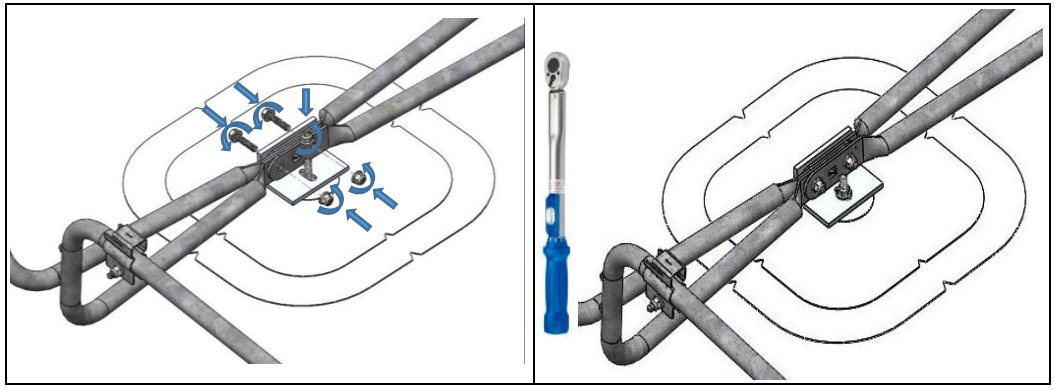
9. Anchor Bracket Installation

The PRG racking system can accomodate a wide variety anchors. PRG anchor brackets are connecting the racking systems with the anchor.

Step 1: Install the Anchor Bracket as shown below using a M8 hex head bolt along with a M8 hexnut. Place the anchor bracket on the anchor and hex head bolt into the slot of the anchor bracket and tighten to 12-14 ft-lbs



Step 2: Install runners as shown. Place an M8 hex head bolt and M8 Hexnut through the runners and torque to 12-14 ft-Lbs.



10. Appendices

Appendix 10.1 (Solar Module Compatibility)

Mechanical/ Electrical/Fire Rating Compatibility

Manufacturer	Module Line		Manufacturer	Module Line
Trina	PD05/ PD14		**Winaico**	WSP/WST Series
	TSM-xxxPD05.10/TSM-xxxPD14			WSP-M6/WST-P6 PERC series
Hanwha Q Cells	HSL60		**Solar World**	SW Protect, SW Protect XL, SW Pro Series
	HSL72			SW xxx 31mm/SW xxx 33mm FR
	Q Plus L-G4			SW xxx XL 33mm FR /SW Protect XL
Jinko	JKM270/ JKM320		**Rec Solar**	RECxxxPE Peak Energy Series (Multi)
Canadian Solar	CS6P-xxxP			Peak 60 Cell /Peak 72 Cell
	CS6K-xxxM		**LG**	Neon Series/ Mono X & X Plus Series
	CS6K-xxxMS, CS6X-P			LG xxxN1C-G3/G4, LG xxxN2W-B3/G4/A5,
Risen Energy	High Performance Mono Module 60X6/72X6			LG xxxS2W-A5
Heliene	60M/72M HD Series		**ET Solar**	ET-P6
Hyundai Solar	TI Series			
XXX – Denotes Power Rating (Example: " LGxxxN1C-G4" includes " LG320N1C-G4")				

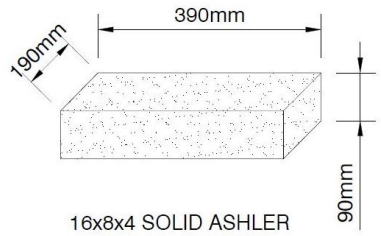
Module max size compatibility

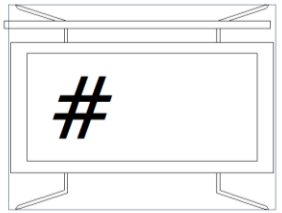
Maximum Size of Modules to be used with system: 1024 mm wide by 2024 mm Length

Module Orientation

Orientation of PV Modules to be installed: Landscape Orientation.

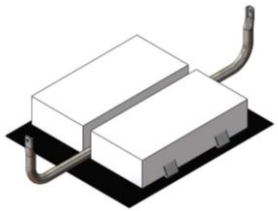
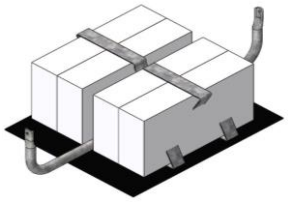
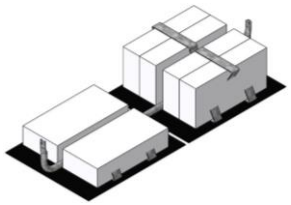
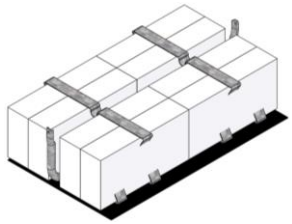
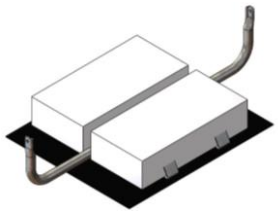
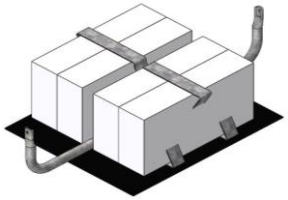
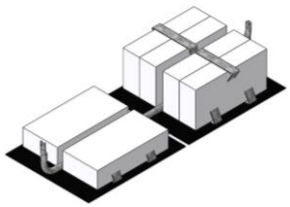
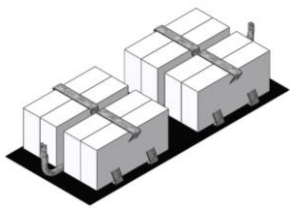
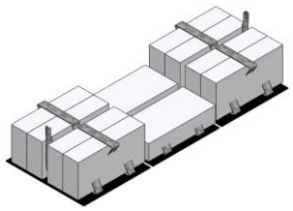
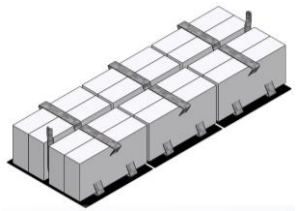
Appendix 10.2 (Ballast Stones, Specifications, Installation)

WEIGHT	32.5 lbs (14.7 kg)
DETAILS	 16x8x4 SOLID ASHLER PAVER STONE



- DENOTES NUMBER OF STONES

BALLAST LEGEND

	2 Stones	4 Stones	6 Stones	8 Stones	10 Stones (10° & 15°)	12 Stones (10° & 15°)
1639-1660mm Module Ballasting						
1954-2036mm Module Ballasting						

11. Warranty and Product Maintenance

IMPORTANT WARNING	
It is critical that the Polar Racking be properly and securely attached together and installed on a roof. Improper installation could result in injury or damage to people and property including, but not limited to, the installer(s), building, roof, solar modules and other people and equipment. You are responsible for installing and securing the Polar Racking system properly and checking the attachments prior to module installation.	Read and understand all of the instructions and cautions supplied with your Polar Racking Product prior to installation or use. If you do not understand all of the instructions and cautions, or if you do not have sufficient mechanical and electrical experience and are not thoroughly familiar with the installation procedures, you should have the Product installed by a professional installer.

Polar Racking Inc. (“Polar”) , warrants to the original purchaser (“Purchaser”) of its racking Product(s) (“Product”) that the Product shall be free from defects in material and workmanship for a period of ten (10) years from the date or original purchase (“Racking Warranty”), save and except for the finish of said Product.

• What Does The Warranty Cover?
The Racking Warranty covers any defects in material and workmanship, but does not include on-site labour.

• How Long Does The Coverage Last?
The Racking Warranty lasts for a period of ten (10) years from the date of original purchase. The warranty, during its term, is transferable from the Purchaser to a new owner of the Product upon written notice of said change of ownership being given from original purchase to Polar within 60 days of said change of ownership.

• What Will Polar Do?
If within the specified Warranty periods the Product shall be reasonably proven to be defective, then Polar shall at its option, and subject to the limitations described herein, Polar will: (i) repair or replace any defective Product at no charge; (ii) refund the full purchase price of the Product; or (iii) issue credit in the amount of the purchase price to be used toward the purchase of new Product or accessories from Polar. Such repair or replacement shall completely satisfy and discharge all of Polar’s liability with respect to this limited Warranty.

• What Does This Warranty Not Cover?
The following are not covered by these warranties: on-site labour in any form and any problem or damage that is caused by abuse; negligence; failure to follow professional engineer stamped drawings for the specific installation; normal wear and tear; defective roofing; modifications or repairs not performed or authorized by Polar; overloading; misuse, including but not limited to failure to assemble, mount, or use the Product in accordance with its written instructions or guidelines included with the Product or made available to the Purchaser; or an act of God (such as wind storms or similar events). Polar is not liable for or warranty material used on or fixed to the bottom of Product, which in all installations are chosen by the original purchaser/ installer/ user of the Product. All installations in corrosive atmospheric conditions are excluded and void said Racking Warranty. This Racking Warranty shall be Void if installation of the Product is not performed in accordance with any Professional Engineer stamped drawings created for the specific installation, or Polar’s written installation instructions, or if the Product has been modified, repaired, or reworked in a manner not previously authorized in writing by Polar, or if the Product is installed in an environment of fashion for which it was not designed.

The Racking Warranty does not cover damage to the Product that occurs during its shipment, storage, or installation.

No warranty is given for Products purchased or used outside the United States, Canada, or Mexico. To the furthest extent permitted by law, (i) this warranty does not cover damage to property other than the Product itself; and (ii) the remedies provided for herein shall be exclusive.

POLAR LIMITS THE DURATION OF ALL IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE TO THE SHORTEST PERIOD PERMITTED BY LAW, WHICH IN ANY EVENT SHALL NOT EXCEED THE DURATION OF THIS WARRANTY. Some provinces/states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. ALSO, CONSEQUENTIAL AND INCIDENTAL DAMAGES ARE NOT RECOVERABLE UNDER THIS WARRANTY. Under no circumstances shall Polar be liable for special, indirect or consequential damages arising out of or related to use by Purchaser of the Product. Manufacturers of related items. Some provinces/ states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Polar will not be held responsible for any modification or alterations made to any approved design layout and/ or specification provided by Polar. Any and all proposed changes must first be reviewed, and approved in writing by Polar’s Engineering team. No warranty is provided or implied by Polar with regards to longevity or leak-resistance of the roof, validity of any roof warranty, ballasting or anchoring of the Product, suitability of the roof to support the installation of such Product, or otherwise. By acceptance of this document, the Purchaser acknowledges that they understand and agree to/ with the above statement and any and all limitations detailed in this warranty.

• How Do You Get Service?
In order to be eligible for service under this warranty you must immediately notify Polar, in writing, upon learning of any defect of its Products by either calling the phone number listed above or writing to the address listed above and explaining the nature of defect. If appropriate, arrangement for service under this warranty will be made. You may be required to provide proof of purchase prior to obtaining service under this warranty. In addition, Polar may require you to return the Product to Polar, in its sole discretion, as to whether the Product is defective