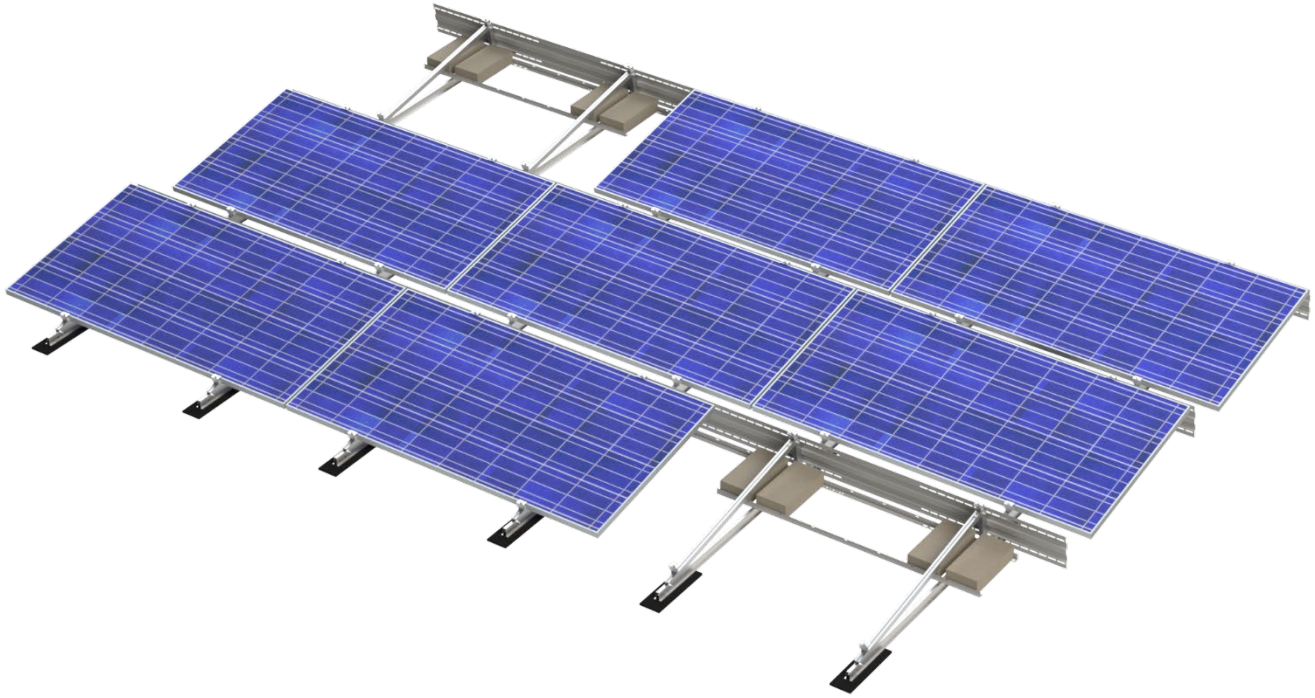
TerraGen
Solar Racking

TXL

INSTALLATION MANUAL



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General

Overview

This guide provides step-by-step assembly instructions for TerraGen's TXL flat roof racking system. This guide provides generic instructions to be used in conjunction with the project specific documentation where more detailed and applicable drawings will be provided. If the design calls for components or steps that are outside of the installation manual, the project specific documentation will supersede the installation manual where there is insufficient or conflicting information.

Material Receiving

Ensure product has been designed and supplied by TerraGen and is appropriate for the site-specific conditions. Ensure design parameters that were provided or assumed in the engineered documents are accurate to the project site.

It's the installers responsibility to ensure a safe environment and installation, conforming to all applicable codes & standards.

To ensure a proper installation and prevent a void of the warranty, it's the installers responsibility to follow the contents of this manual and the project specific documentation. TerraGen is not liable for improper installation or unauthorized modifications. TerraGen must be provided with the digital site inspection documentation outlined in 'Appendix D' and sufficient accompanying photo evidence. Annual records of the maintenance activities outlined in this manual must be kept and made available to TerraGen upon request.

It is the installer's responsibility to ensure safe handling of all materials. Appropriate PPE must be worn based on the hazards present, including, but not limited to, caution around sharp edges and assessment of material weight before lifting. Mechanical assistance or additional help should be used for items that are too heavy to lift safely.

Carefully inspect all parts upon delivery, with reference to the provided bill of lading. Document any damage with photos and report it to TerraGen within two business days, unless otherwise negotiated, to ensure claim remains valid. It's recommended to install the system shortly after receiving. If that is not possible, store in a safe and dry location. Claims as a result of improper storage are not covered by warranty.

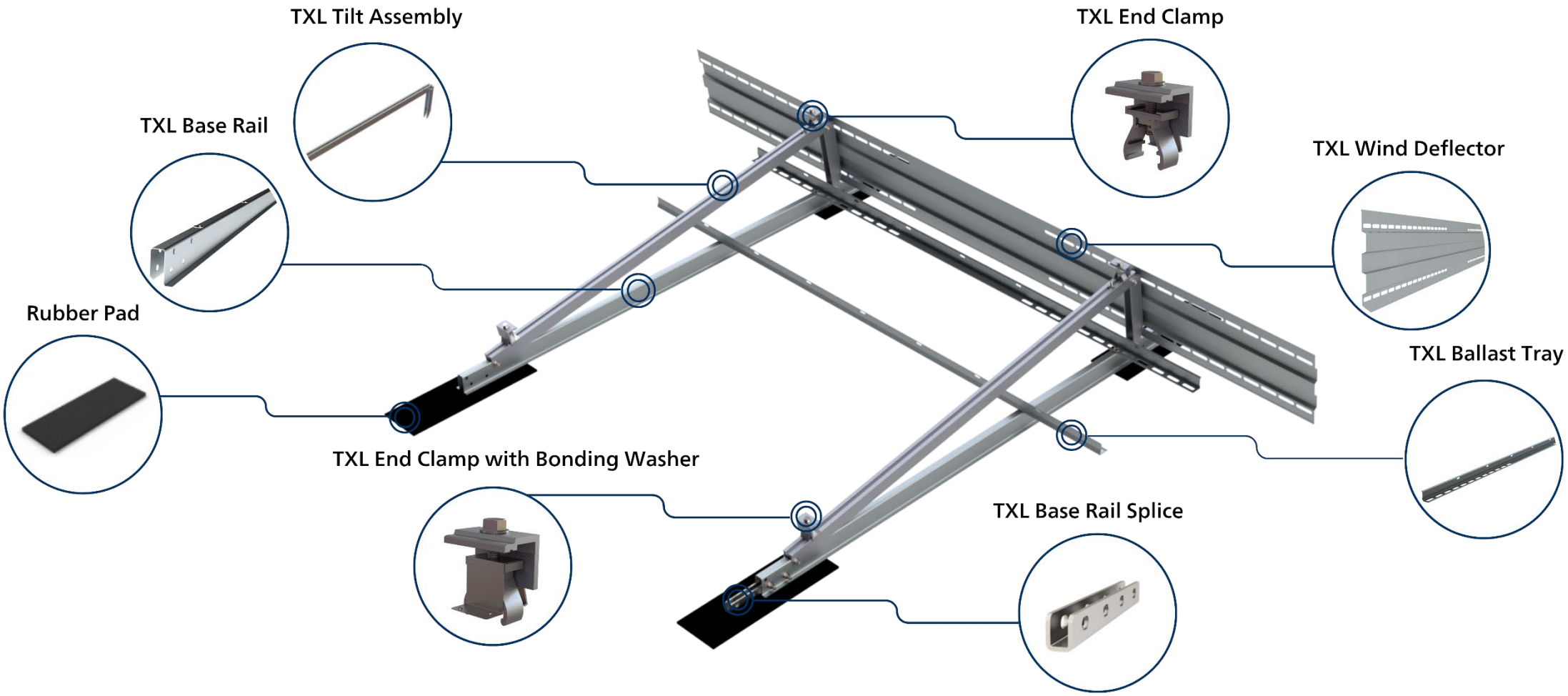
Annual Maintenance Activities

The activities described below for the maintenance of the solar racking provided by TerraGen must be performed a minimum of every 12 months from the date of installation up until the system has been decommissioned. Records with images of the inspection must be recorded and kept.

- Perform a visual inspection of the system to check all components for any signs of defect. Any components showing signs of damage that compromise safety shall be replaced immediately.
- Check for any deformation, penetrating corrosion, or other noticeable defects in the components.
- Inspect roofing condition around the contact points with the roof and that the system has not moved over time. Ensure appropriate roof protection is still secured appropriately in place.
- Ballast (when applicable) is secured as intended with no cracks or degradation.
- Modules are seated correctly and secured.

Check all hardware for specified torque or torque marks. Any loose components or fasteners shall be re-tightened in accordance with the installation instructions.

System Components



Tools & Torque

Tools

- Drill with torque limiter OR torque wrench
- 13 mm deep socket
- 13 mm combination wrench

Torque Settings Required

- 8 ft-lbs (11 N-m):
  - M8 x 40 mm bolt for tilt assembly, base rail bracket & splice
  - M8 nut for wind deflector
- 12 ft-lbs (16 N-m):
  - End clamp
  - M8 x 25 mm bolt for ballast tray
  - M8 x 70 mm bolt for anchor bracket
  - M8 nut for anchor rail

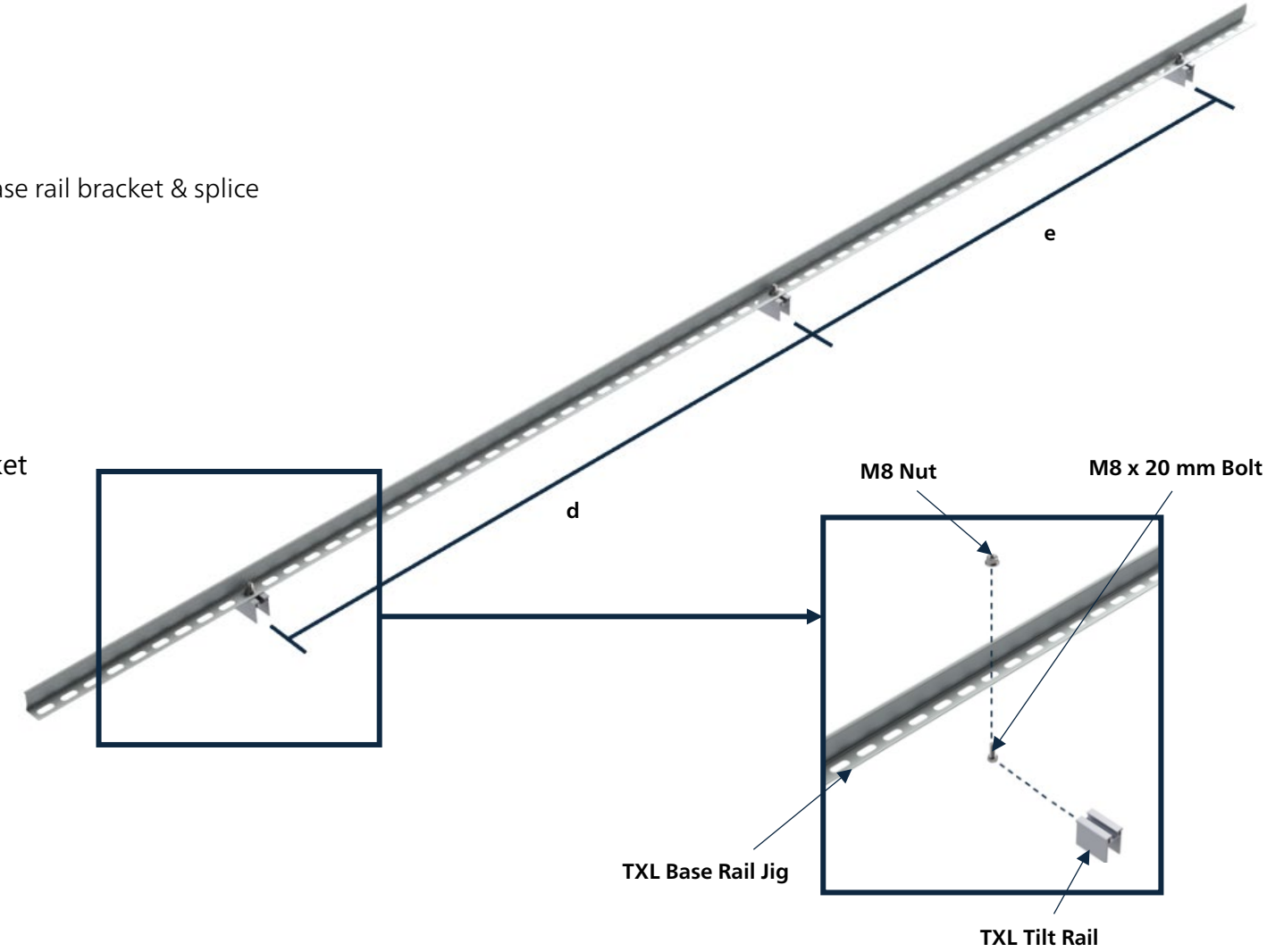
Note: Accessories may require additional tools

Construction Aids

- Base rail spacing jig
- Onsite cutting availability
- Measuring tape
- Paint marker (for torque marking)
- String and/or spray paint (for alignment)

Base Rail Spacing Jig Assembly

Assemble base rail spacing jig to dimensions “d” and “e”, from Project Construction Package



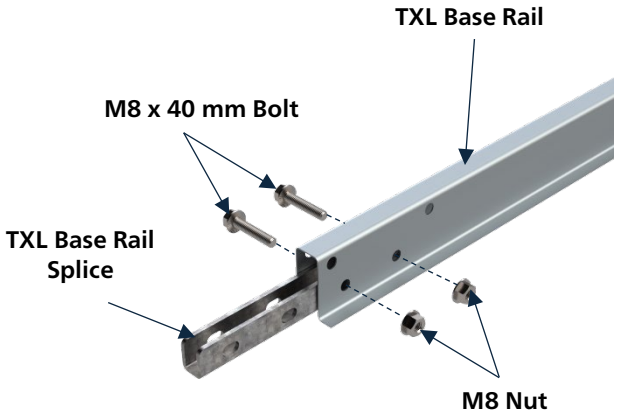
Pre-Assembly

Note: It can be advantageous to do some pre-assembly work or cutting at waist height using sawhorses and/or on the ground instead of the roof.

Base Rail Splices

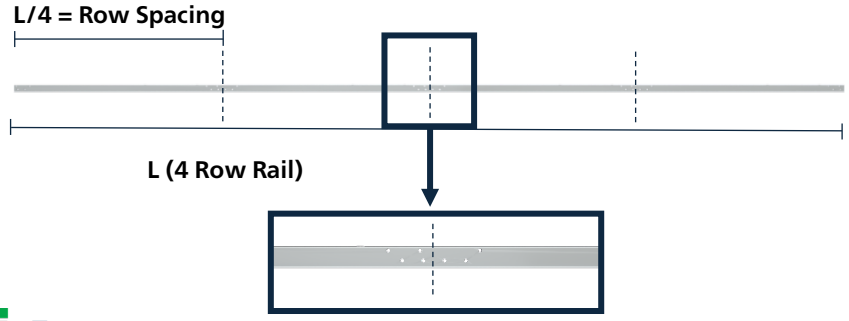
2. Pre-assemble base rail splice on 1 side.

   TORQUE: 8 ft-lb



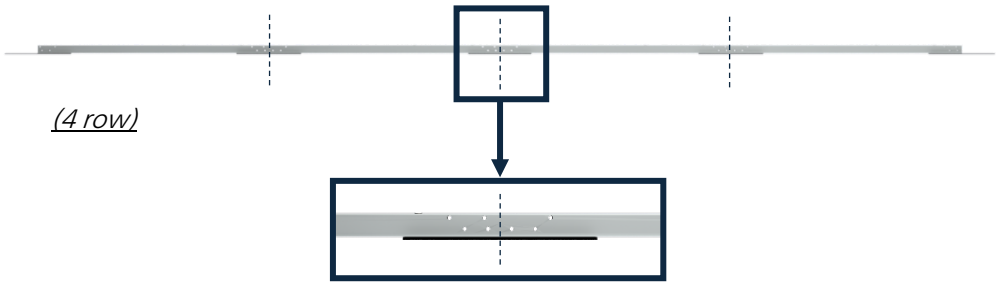
Base Rail Cutting

1. Make the appropriate cuts to the base rail, referring to the Construction Package for the cutting instructions, quantities and lengths.



Rubber Pads

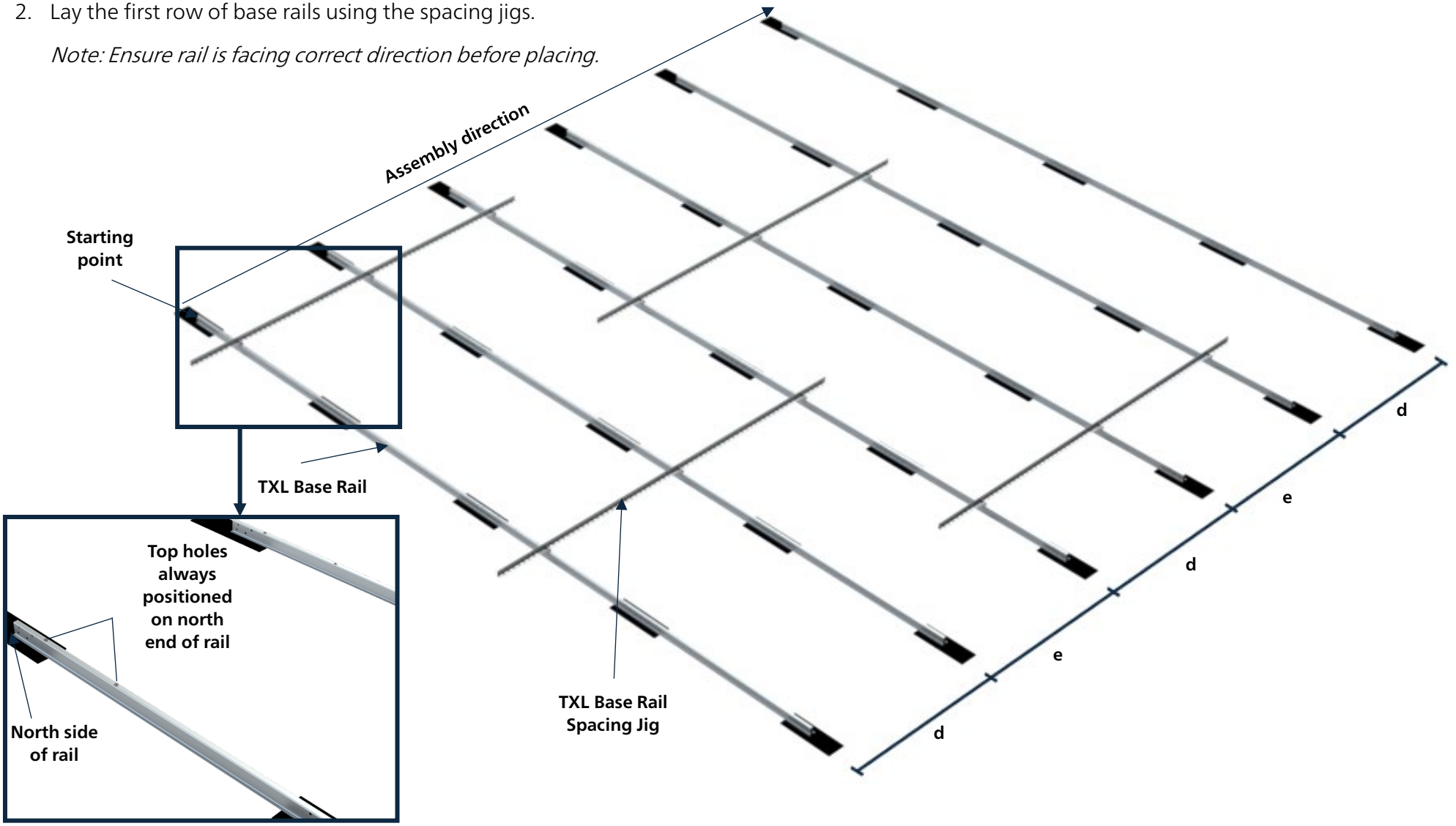
3. Peel the paper backing off and stick the pad to the base rail, as shown.



Base Rail Installation

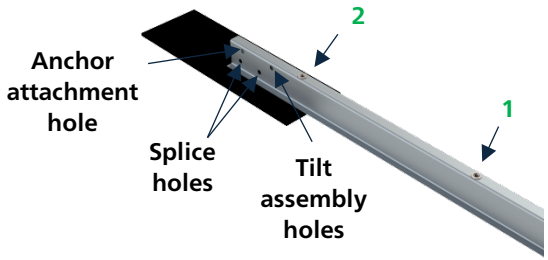
1. Locate the array's starting point for the 1st base rail according to the 'Construction Package: Base Rail Plan'.
2. Lay the first row of base rails using the spacing jigs.

   Note: Ensure rail is facing correct direction before placing.



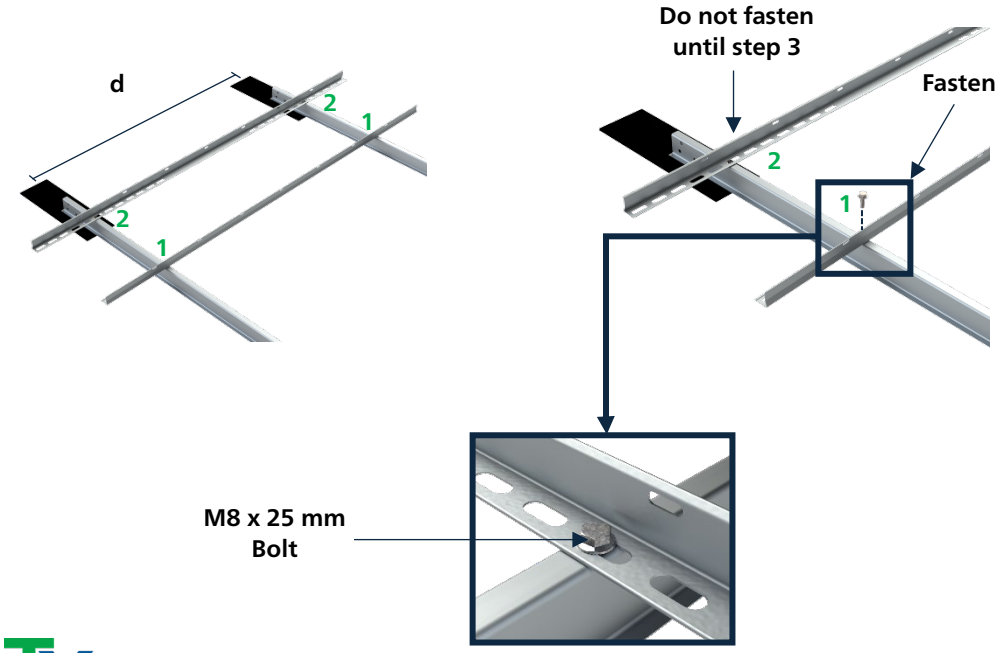
Ballast Tray & Base Rail Splice Installation

1. Utilize hole locations 1 and 2 for a portrait block orientation to accommodate all ballast configurations.



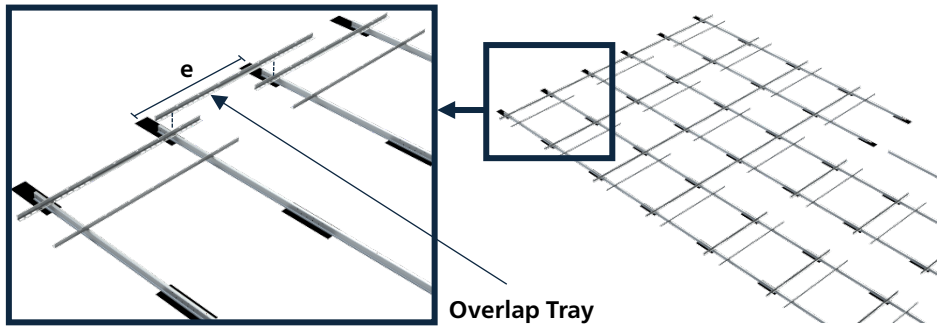
2. Center the ballast trays facing each other between the base rails with "d" spacing. Fasten only trays in location 1.

   TORQUE: 12 ft-lb



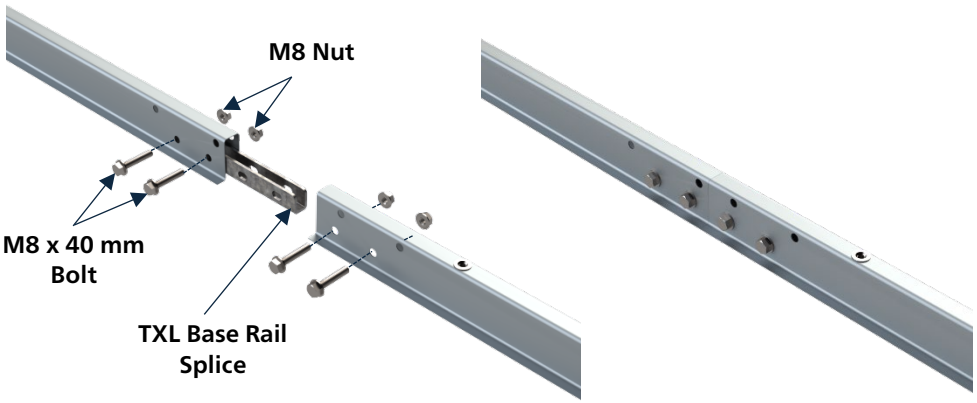
3. Center an overlap tray only between the base rails with spacing "e" fastening into location 2 with M8 x 25 mm bolt.

   Note: Ensure ballast fits securely into the tray in single and overlapped tray locations before proceeding.



4. Continue installation throughout the array using the same steps. Where a new base rail is needed, fasten together with base rail splice and M8 x 40 mm bolt.

   TORQUE: 8 ft-lb



Ballast Installation

Block Size

Note: Blocks are often advertised as 4 x 8 x 16". These are the nominal dimensions. Please verify the real dimensions. TerraGen must be informed of block weight if it differs from the proposal.

Allowable block size ***[L]*** x [W] x [H]

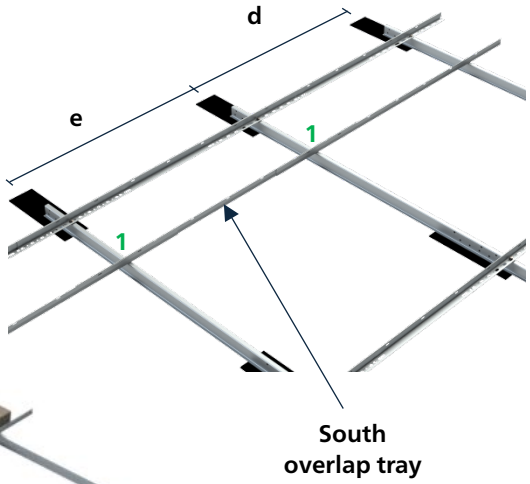
[$15\frac{3}{8}$ – $15\frac{5}{8}$"] x [$7\frac{1}{2}$ - $7\frac{5}{8}$"] x [$3\frac{1}{2}$ - $3\frac{5}{8}$"]

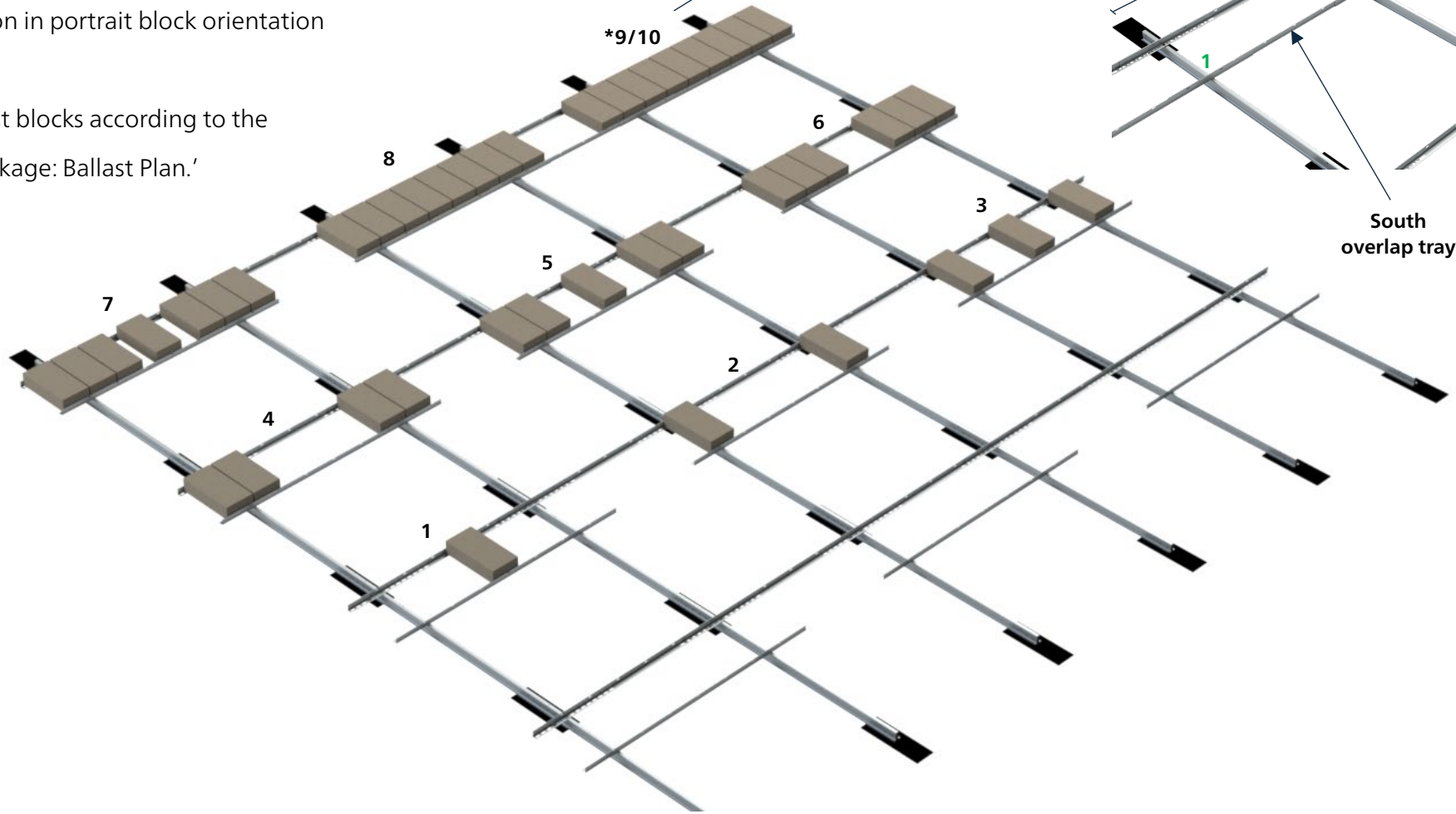
*Critical Dimension in portrait block orientation

1. Place the ballast blocks according to the

'Construction Package: Ballast Plan.'

*Special Case: In locations where 9 or more blocks are required, a south overlap tray is also required on location 1.

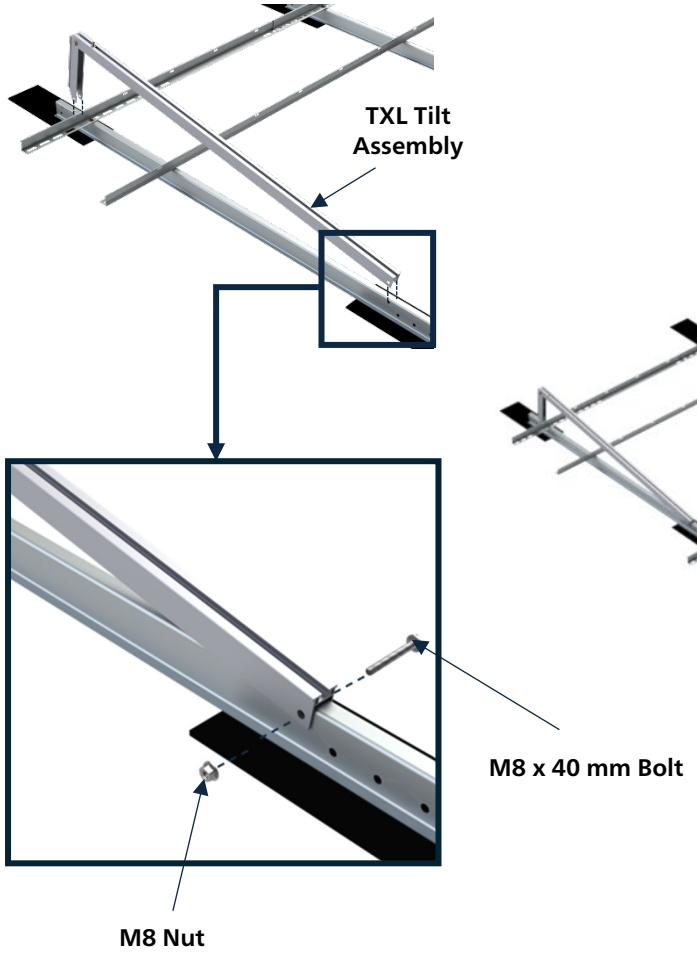


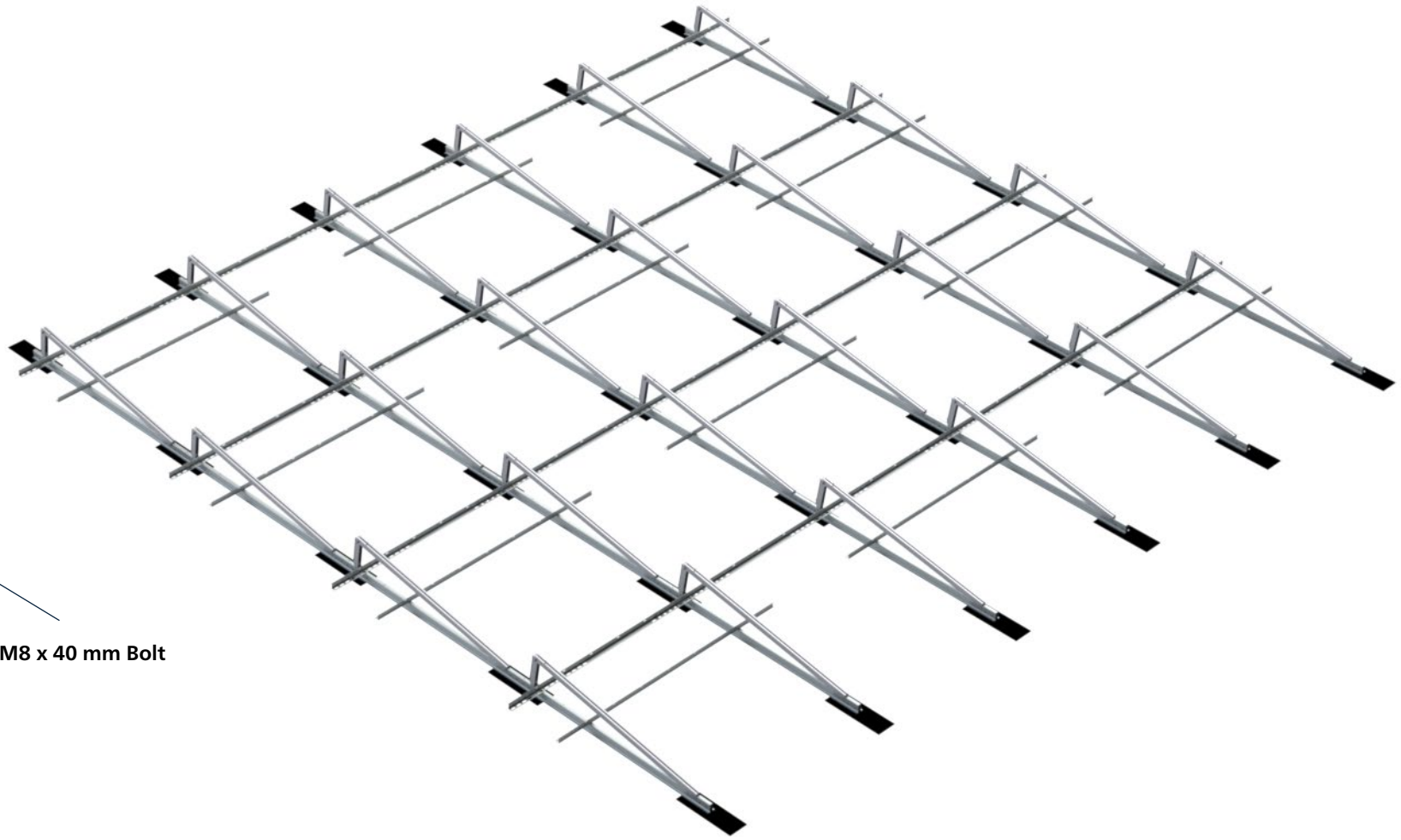


Tilt Assembly Installation

1. Unfold the pre-assembled tilt assemblies and place them on the base rail. Fasten with M8 x 40 mm bolt. Tighten all 3 bolts <u>including the pre-assembled top joint</u>.

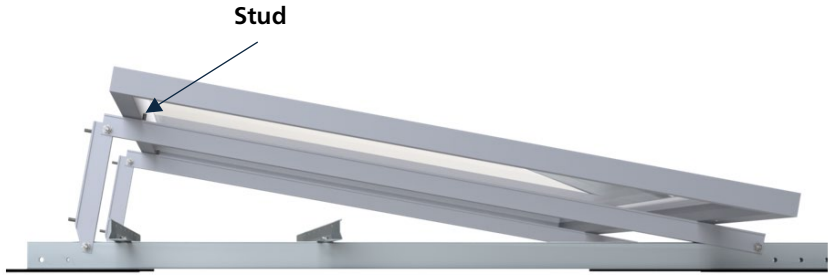
   TORQUE: 8 ft-lb





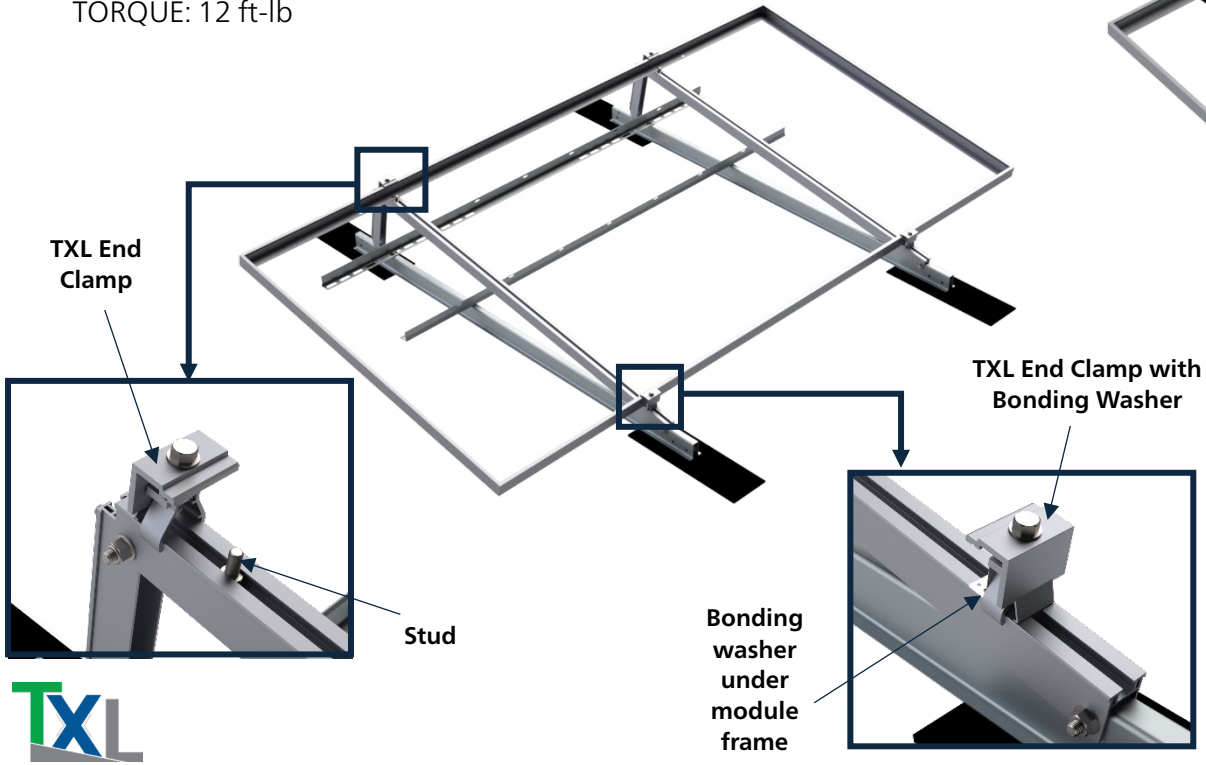
Module Installation

1. Place the high side of the module frame to "hang" on the tilt assembly stud. Adjust the module to be centered over the rails.



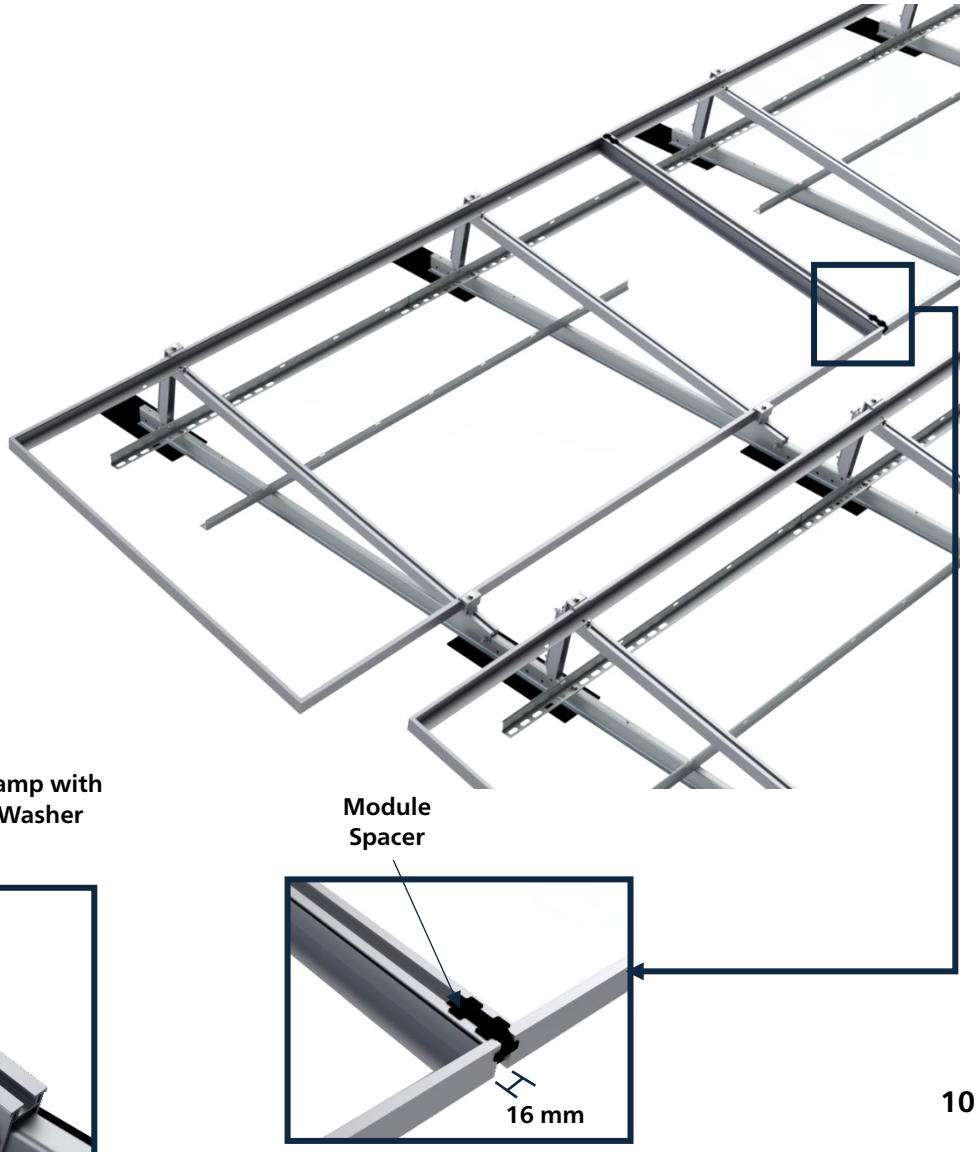
2. Install click-on end clamps onto the north end of the tilt assembly and click-on end clamps with bonding washer onto the south end of the tilt assembly. Ensure that the module sits on the bonding washer. Slide all clamps into place against the module. Tighten end clamps.

   TORQUE: 12 ft-lb



3. Continue module installation with appropriate spacing between modules.

   Note: Wire management clip can be used as module spacer.



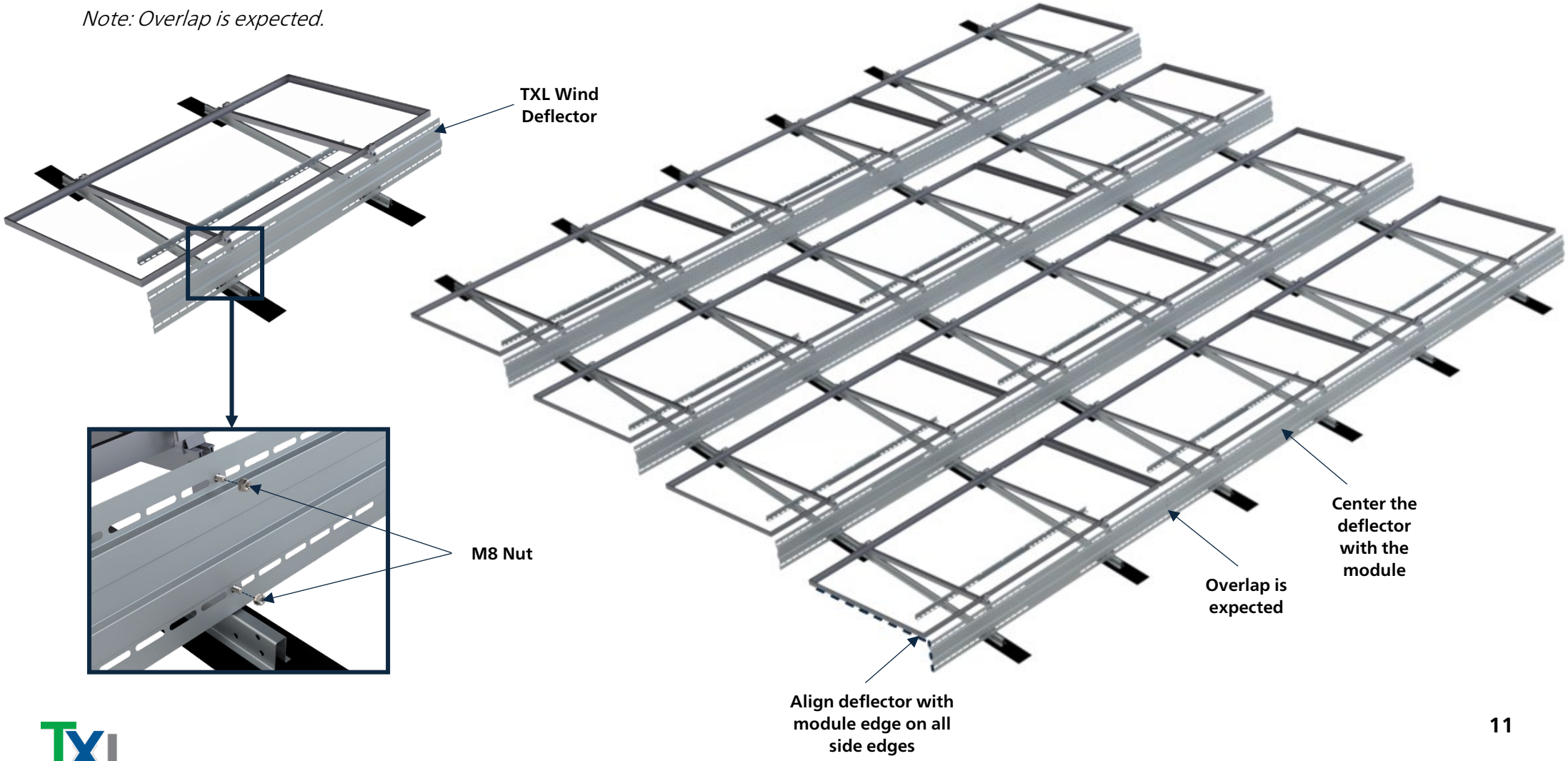
Wind Deflector Installation

1. Match the wind deflector slots with the studs on the tilt assembly. Center the wind deflector on the module. Fasten with M8 nut.

   TORQUE: 8 ft-lb

   Note: If the module is on a side edge of the row, ensure the wind deflector is flush with the module edge.

   Note: Overlap is expected.



Appendix A: Anchor Attachment Installation

Note: Anchor attachments must be installed before the modules and wind deflector. It is recommended to install the anchors after the racking is installed to ensure proper anchor locations.

- Install roof anchor according to the anchor manufacturer's instructions.

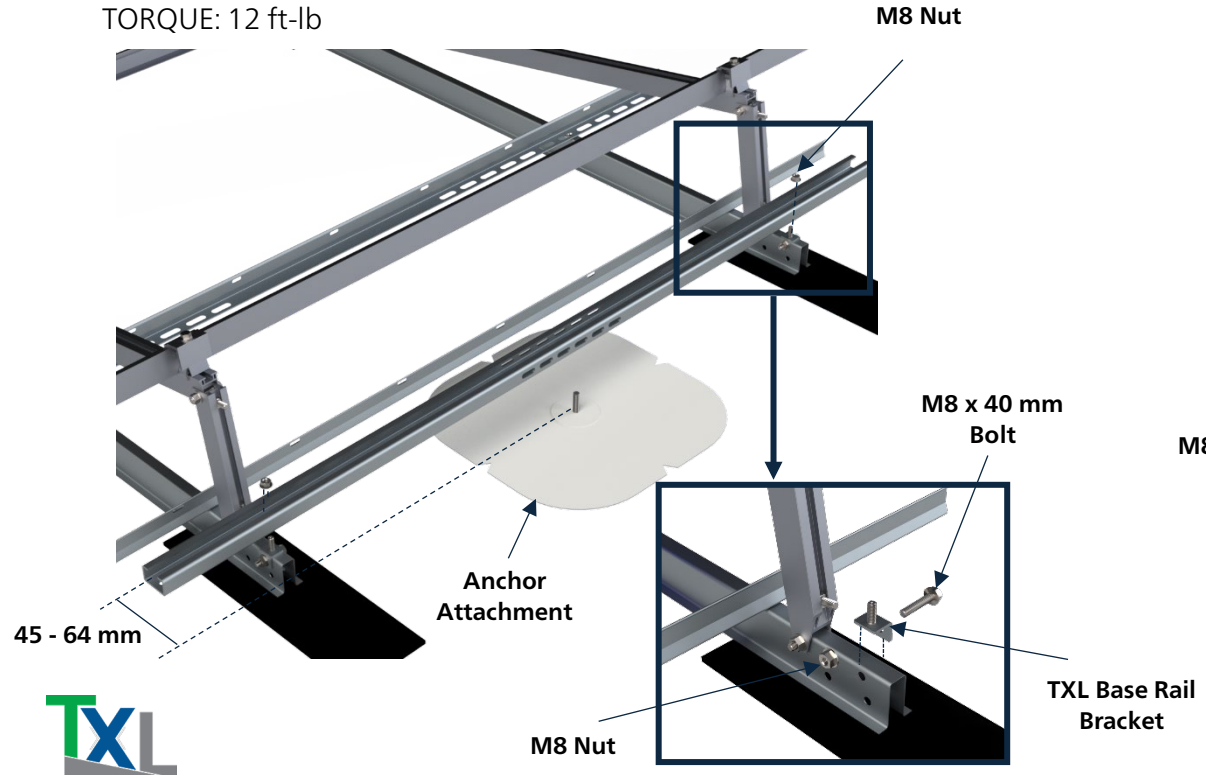
  Note: Refer to Construction Package for anchor locations. Ensure that anchor location aligns with racking location.

- Place the base rail bracket on top of the base rail over the anchor hole. Fasten with M8 x 40mm bolts.

  TORQUE: 8 ft-lb

- Place and center the anchor rail over the base rails and place on top of the base rail bracket studs. Fasten with M8 nut.

  TORQUE: 12 ft-lb

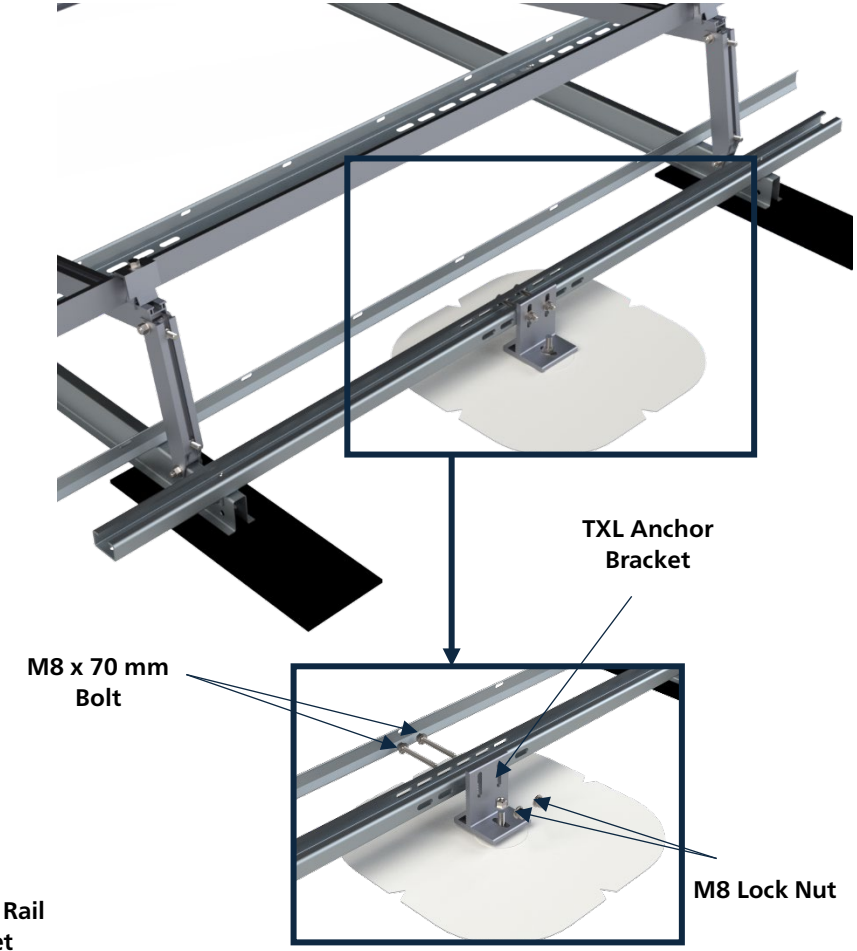


- Place anchor bracket onto the anchor stud, flush with the anchor rail. Fasten the anchor bracket to the anchor rail with 2 x M8 x 70 mm bolts.

  TORQUE: 12 ft-lb

- Fasten the anchor bracket to the anchor stud with appropriate hardware from the anchor manufacturer.

  TORQUE: According to anchor manufacturer's instructions



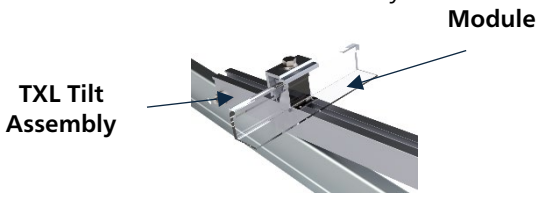
Appendix B: Bonding & Grounding

Bonding and Grounding

PV modules can be grounded using the TXL system components when in compliance with the installation instructions. Each continuous array is bonded through the connection path shown, and only needs to be grounded at one location per array.

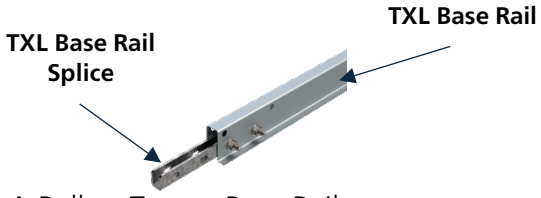
Note: Refer to the up to date 'Module Listings' document for the approved list of modules in compliance with UL 2703.

Connection 1: Module to Tilt Assembly



Connection 2: Tilt Assembly to Base Rail

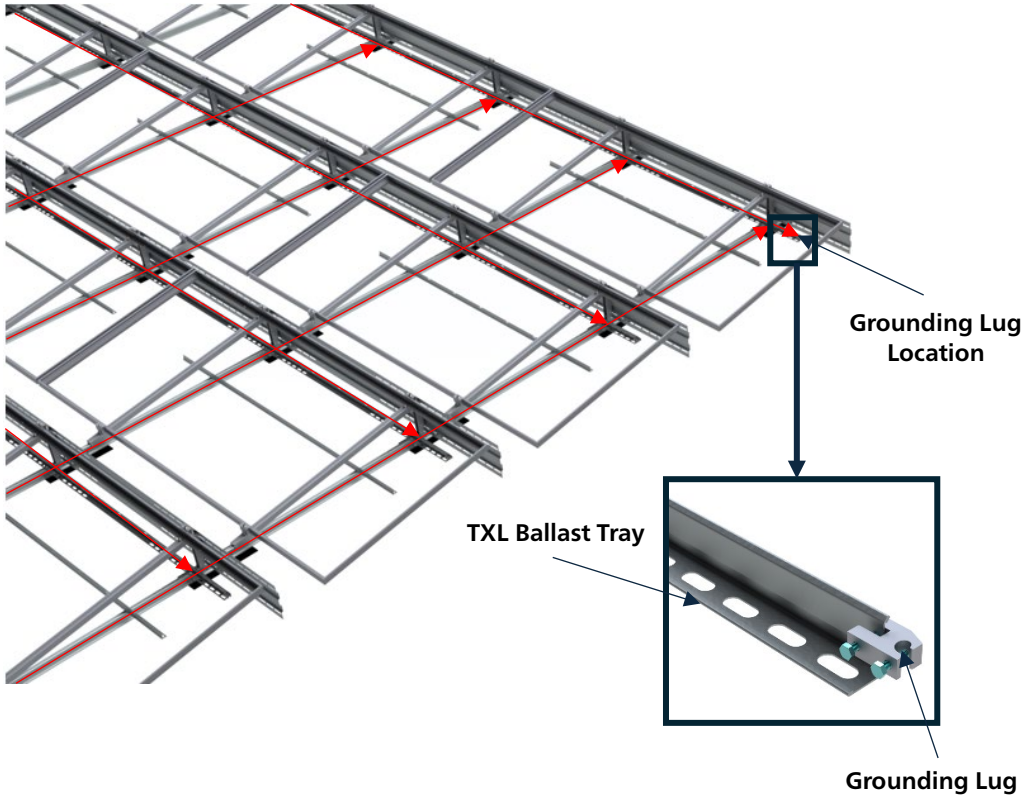
Connection 3: Base Rail to Base Rail



Connection 4: Ballast Tray to Base Rail

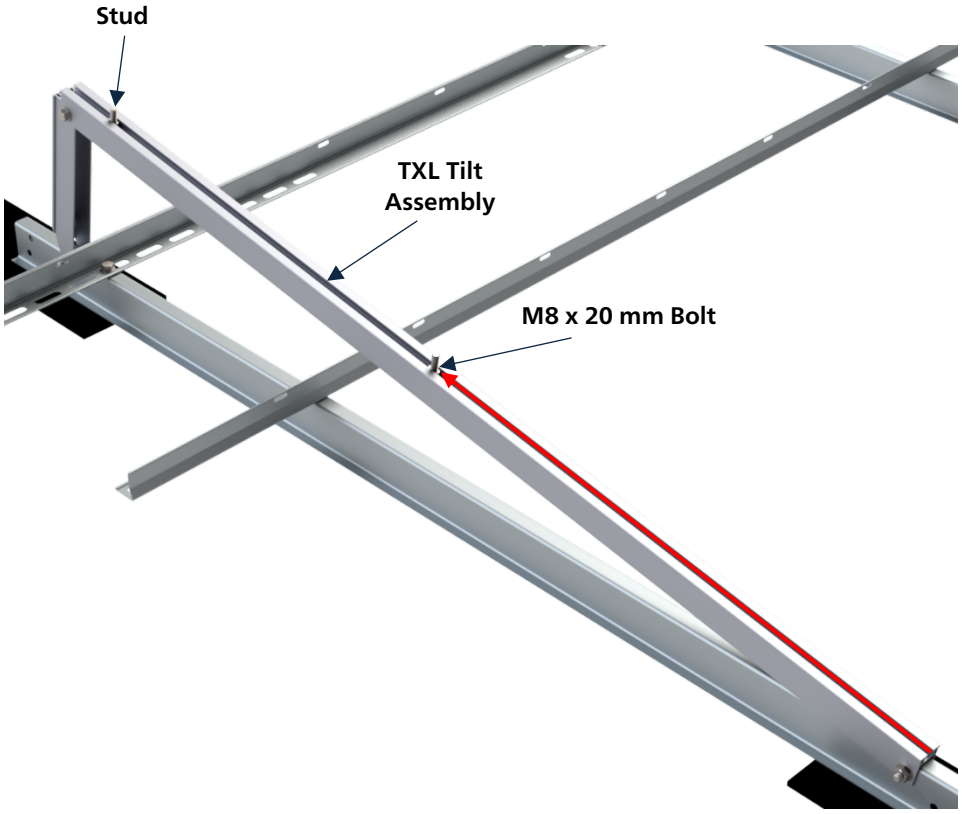
Array Grounding:

Note: Grounding Lug not supplied by TerraGen. Must be Ilsco SGB4 or other UL 467 listed grounding device.



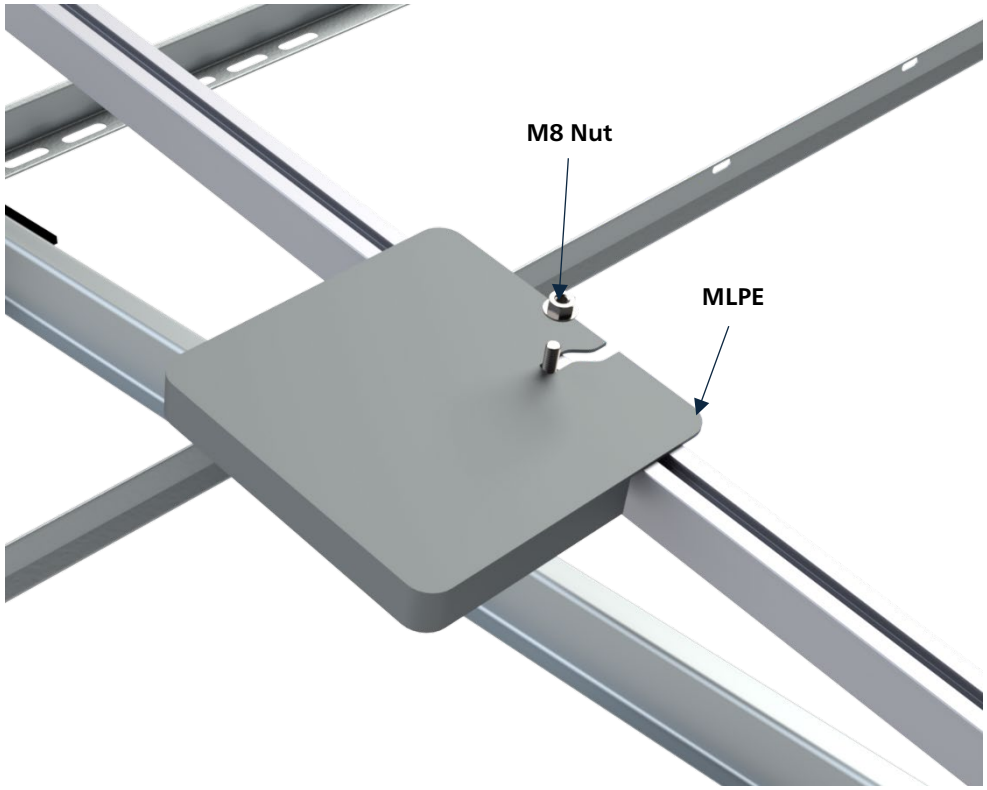
Appendix C: MLPE Mounting

1. Slide M8 x 20 mm bolt into tilt assembly channel from the bottom side.



2. Fasten MLPE with M8 nut.

   TORQUE: According to MLPE manufacturer's instructions



Appendix D: Ratings

System Ratings

- Module Orientation: Landscape
- Maximum Base Rail Spacing: 50”
- Load rating varies based on module size and system specifications and is defined with project specific engineering.

UL 2703 Listing

- The TXL system conforms to UL 2703 when installed in accordance with the instructions.

Bonding and Grounding

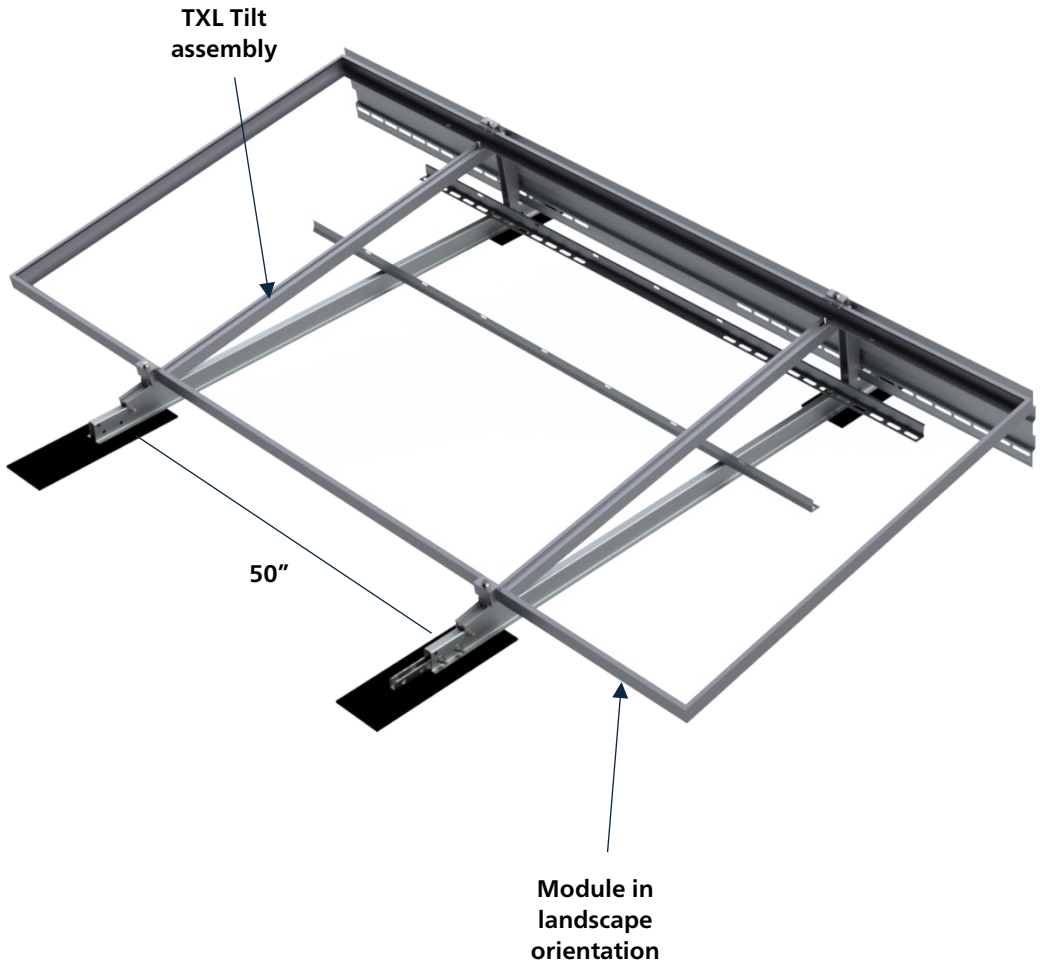
- The TXL system complies with UL 2703 for bonding & grounding when using an approved module from TerraGen’s ‘Module Listing’ document.

Mechanical Load Testing

- The TXL system has underwent mechanical load testing to determine UL 2703 load rating, covering the following base criteria: 25.2 psf downward, 25.2 psf upward, 7.5 psf downslope.
  - Test loads above are provided without the 1.5x safety factor.
  - Maximum module size to achieve UL 2703 load ratings above is 27.75 ft^2.
  - Actual system capacity to be determined with project specific engineering and sealed by licensed professional engineer.

Fire Rating

- TXL has a UL2703 class A fire rating for low slope roofs with type I, ll, 29 modules, with or without a wind deflector.



Appendix E: Site Inspection Report

Purpose

The purpose of this checklist is to provide assurances that items highlighted below have been installed in accordance with the supporting documents provided. It is expected that all details from the supporting documentation have been followed and checked in every location, though photos provided in some cases only need to provide examples of such.

TerraGen will review the information provided and offer an opinion as to whether the work is generally complete and in conformance with the drawings and specifications. Any issues or deficiencies that are addressed must be corrected with full photo evidence.

Upon completion, TerraGen will issue a letter stating that according to the information provided, it is our opinion that the work is generally complete and in conformance with the drawings and specifications.

Note: The purpose of this letter is not to imply that TerraGen has completed a full inspection of the installed system.

Info:

Date:	Company:
Project Title:	Site Location:

I, _____, the supervisor of the site inspection, confirm that the checklist below has been completed accurately.

Signature:

_____

_____

Site Inspection Checklist

Critical items to monitor, review and photo/video capture throughout installation include but are not limited to:

- ❑ Rubber Pads have been placed under the racking in appropriate locations and covering all contact areas with the roof.
- ❑ Base rails are properly spaced under the module and between modules per the construction package and align with the clamp zones of the module.
  - ❑ Provide images of the base rail spacing under the modules.
  - ❑ Provide images of the base rail spacing between modules.
- ❑ Ballast Trays and tilt assemblies have been properly installed.
  - ❑ 100% visual inspection has been performed for torque marks.
  - ❑ A 2% spot check for correct torque values has been performed.
- ❑ Ballast has been installed per the stamped drawing set provided by TerraGen Solar.
  - ❑ Provide picture/video evidence showing complete ballast layout for array(s) prior to module installation.
- ❑ Base rail splice(s) have been installed correctly.
  - ❑ Provide images/videos of correct install.
- ❑ Module clamps have been installed according to the construction package / installation manual.
  - ❑ All module clamp legs are fully engaged with tilt rail grooves.
  - ❑ 100% visual inspection has been performed for torque marks and proper engagement with tilt rail.
  - ❑ A 2% spot check for correct torque values has been performed.
  - ❑ Provide images/videos of end clamps correct install.
  - ❑ Provide images/videos of end clamps with bonding washer correct install.
- ❑ Wind deflectors (if necessary) have been installed correctly.
  - ❑ Provide images showing the completed system with all deflectors.
- ❑ Provide general images of the project that show completion.

Other Comments:

_____