SolarMount Standard Rail Design
British Columbia, Canada

Unirac is proud to present the following SolarMount designs in landscape and portrait for use in British Columbia, Canada. Steenhof Building Services Group has performed an analysis of the rails and L-feet to determine appropriate spacing based on a specific snow and wind loading condition. Their analysis is enclosed (see **Enclosure 1** and **Enclosure 2**).

> **Enclosure 1**: SOLARMOUNT (SM) Rail Profile – Solar PV Panel Mounting System Structural Evaluation – British Columbia Building Code 2012 – **East-West Rail Orientation**
>
> **Enclosure 2**: SOLARMOUNT (SM) Rail Profile – Solar PV Panel Mounting System Structural Evaluation – British Columbia Building Code 2012 – **North-South Rail Orientation**

Module connections to rails are adequate if loads are those prescribed in the span tables with one exception; a single module with four End Clamps requires engineering evaluation. Technical Data Sheets for Limit States Design (see **Enclosure 3**) are provided for the engineering use.

> **Enclosure 3**: Technical Data Sheets (Limit States Design)

Should additional engineering be required for a site-specific design, please contact Steenhof Building Service Group directly. Their contact information can be found at http://www.steenhofbuilding.com. Please contact the Orillia, Ontario, Canada office.

For more information on the SolarMount product, please contact Unirac, Inc. at info@unirac.com. Information can also be found online at http://unirac.com/.

Enclosures:

> **Enclosure 1**: SOLARMOUNT (SM) Rail Profile – Solar PV Panel Mounting System Structural Evaluation – British Columbia Building Code 2012 – **East-West Rail Orientation**
>
> **Enclosure 2**: SOLARMOUNT (SM) Rail Profile – Solar PV Panel Mounting System Structural Evaluation – British Columbia Building Code 2012 – **North-South Rail Orientation**
>
> **Enclosure 3**: Technical Data Sheets (Limit States Design)

Enclosure 1:

SOLARMOUNT (SM) Rail Profile
Solar PV Panel Mounting System Structural Evaluation
British Columbia Building Code 2012
East-West Rail Orientation

STEENHOF
BUILDING SERVICES GROUP
"DESIGN *ideas,* ENGINEER *concepts,* MANAGE *the process.*"

Date: April 28, 2017

Project No: 170077

Unirac, Inc.
1411 Broadway NE
Albuquerque, NM 87102

Attention: Jennifer Carey, Senior Structural Engineer,

Dear Ms. Carey;

Re: SOLARMOUNT(SM) Rail Profile 2 - Solar PV Panel Mounting System Structural Evaluation - British Columbia Building Code 2012 – East – West Rail Orientation

Background

At the request of Unirac, Inc., Steenhof Building Service Group (SBSG) has completed a structural review of the SolarMount Solar PV Panel Mounting System - SM- Rail Profile 2 identified in this letter for Housing and Small Building (Part 9 of the British Columbia Building Code 2012) installations in British Columbia, Canada. When installed in accordance with the design specifications described herein, the Solar Mount Rail Solar PV Panel Mounting System components identified in this letter are compliant with the design reference documents identified in this letter until the end of the 2018 calendar year. SBSG would be willing to review and update this evaluation on an annual basis if requested.

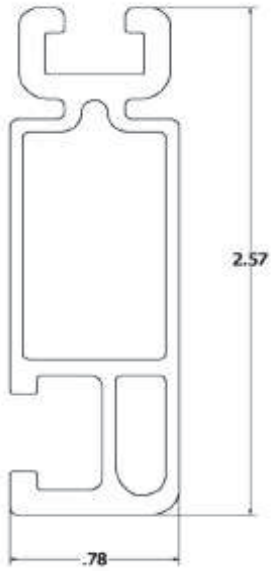


Figure 1 - SOLARMOUNT(SM) Rail Profile 2

Design Reference Documents

- British Columbia Building Code 2012 (BCBC 2012) Part 4 & Part 9.
- National Building Code of Canada 2010 Structural Commentaries (NBCC 2010).
- CAN/CSA-S157-05 Strength Design in Aluminum.
- SolarMount(SM) Rail Profile 2, section properties and material data provided by Unirac, Inc. in Appendix A.
- SolarMount Installation Guide provided in Appendix B.
- L-Foot Roof Connection Capacities provided by Unirac, Inc. in Appendix C.

Overview

The SolarMount Solar PV Panel Mounting System is a solar PV racking system designed for Housing and Small Building (Part 9 of the British Columbia Building Code 2012) roof applications. The SolarMount rails composed of extruded aluminum members are fastened to the roof structure using roof brackets and fasteners (designed and supplied by others) and the solar PV panels are attached to the rails with module clamps. The design of the roof support structure, L-foot, and fastening of the SolarMount Solar PV Panel Mounting System to the existing roof structure is to be completed by others. SBSG has utilized the capacities of the L-Foot roof connections in deriving the maximum rail spans, however final L-Foot connection spacing may be governed by the L-Foot attachment strength that will vary on a project-by-project basis. Therefore an engineer shall confirm the proposed roof connections are adequate on a project specific basis. SBSG has not reviewed, nor do we express an opinion on the design of the attachment of the SolarMount System to the existing roof structure.

Methodology and Design Limitations:

Design tables (found in Appendix D for 60 Cell Panels and in Appendix E for 72 Cell Panels) were developed for a wide range of roof loadings commonly found in British Columbia. These tables provide the maximum span length of SolarMount Rail Profile 2, the maximum factored downward force at a support location, the maximum factored uplift force at a support location, and the maximum factored shear force at a support location.

Based on SBSG's experience on residential solar projects, it is valid to assume a low importance for the wind and snow load evaluation (for part 4 loads) for the purpose of evaluating the maximum span of the solar mount rail. However the reactions of the solar mount system to the building were calculated assuming a normal importance factor (for base building design purposes).

Our design tables are developed based on the final design snow values. In our analysis, we compared both British Columbia Building Code (ABC) 2014 Part 4 snow load (utilizing reduction factors for low importance category and roof slope) with (ABC) 2014 Part 9 snow loads and considered the minimum design snow load value in our calculations. In our opinion and experience, this is a valid approach as the actual roof snow load can be much less than that based on BCBC 2012 Part 9 provisions due to the following reasons.

1. Flush mount systems have a slippery surface that will result in snow sliding off the panels and roof structure.
2. BCBC 2012 Part 9 provisions provides same design snow load regardless of the roof slope. However, practically, roofs with higher slopes will be subject to lower snow deposits due to sliding of snow off the roof.

Therefore the user of the design tables shall calculate the design snow load (S) based on following two methods and shall select the lower value but not less than 0.50 kPa.

1. Method 1 - BCBC 2012 Part 9 snow load
   $S = C_b * S_s + S_r$ where;
   S_s = 1-in-50-year ground snow load, determined in accordance with BCBC 2012, Appendix C
   S_r = 1-in-50-year associated rain load, determined in accordance with BCBC 2012, Appendix C
   C_b =0.55.

2. Method 2 - BCBC 2012 Part 4 snow load

   $S = I_s [S_s (C_b C_w C_s C_a) + S_r]$ where,

   I_s = 0.8

   S_s = 1-in-50-year ground snow load, determined in accordance with BCBC 2012, Appendix C

   C_b = basic roof snow load factor = 0.8

   C_w = wind exposure factor = 1

   C_s = slope factor (60° - α)/45° where α is the roof slope in degrees (for slippery surfaces where snow and ice can slide off the roof)

   C_a = shape factor = 1
   S_r = 1-in-50-year associated rain load, determined in accordance with BCBC 2012, Appendix C

The specified wind loads were determined in accordance with the BCBC 2012 and the NBCC 2010 Structural Commentaries (see Figures 2 and 3). For seismic design, it has been assumed that $I_E F_a S_a(0.2)$ is less than 1.06.

The attached design tables have been developed for typical Housing and Small Building (Part 9 of the British Columbia Building Code 2012) applications using the design parameters listed below. Applications not conforming to these parameters will require additional analysis:

Design Parameters:

- The $q_{1/50}$ hourly wind pressures can be obtained from Appendix C of the BCBC 2012, Climatic and Seismic Information for Building Design in British Columbia.
- The 1-in-50 year ground snow load (S_s) and the 1-in-50 year rain load (Sr) can be obtained from Appendix C, Climatic and Seismic Data Supplementary Standard for the BCBC 2012.
- $I_E F_a S_a(0.2)$ is less than 1.06.
- Maximum weight of panels including racking system, conduits and accessories is 0.24kPa (5Psf).
- Maximum Solar PV Panel Dimensions:
  1 60 Cell Panel - 1676.4 mm x 1016 mm.
  2 72 Cell Panel – 1981.2 mm x 1016 mm.
- Panel Orientation: Portrait.
- Rail Orientation: E-W direction (Rails perpendicular to the roof slope)
- Panels are supported using two independent support rails per row of panels.
- Panel Installation Angle: Flush with roof slope.
- Roof Slope: 10°-27°, 27°-45°

- Aluminum Density = 2.70 g/cm^3.
- Minimum Aluminum Ultimate Tensile Strength = 260MPa.
- Minimum Aluminum Tensile Yield Strength = 240 MPa.
- Building Roof Mean Height: 0m – 5.9m & 5.9m - 10 m
- Specified Snow Load (kPa): 1.0, 1.5, 2.0, 2.5, 3.0. for roof slopes 10°-27°
- Specified Snow Load (kPa): 0.5, 1.0, 1.5, 2.0, 2.5 for roof slopes 27°-45°
- Reference Wind Velocity Pressure $q_{1/50}$ (kPa): 0.25, 0.30, 0.35, 0.40, 0.45, 0.50, 0.55.
- Importance Factor for Snow (ULS): I_s=0.9
- Importance Factor for Snow (SLS): I_s=0.8
- Importance Factor for Wind (ULS): I_w=0.9
- Importance Factor for Wind (SLS): I_w=0.75.
- Allowable Deflection = L/60 (total load).
- Gust and External Pressure Coefficients (C_pC_g) and the different loading areas are defined on Figures 1 and 2 below.

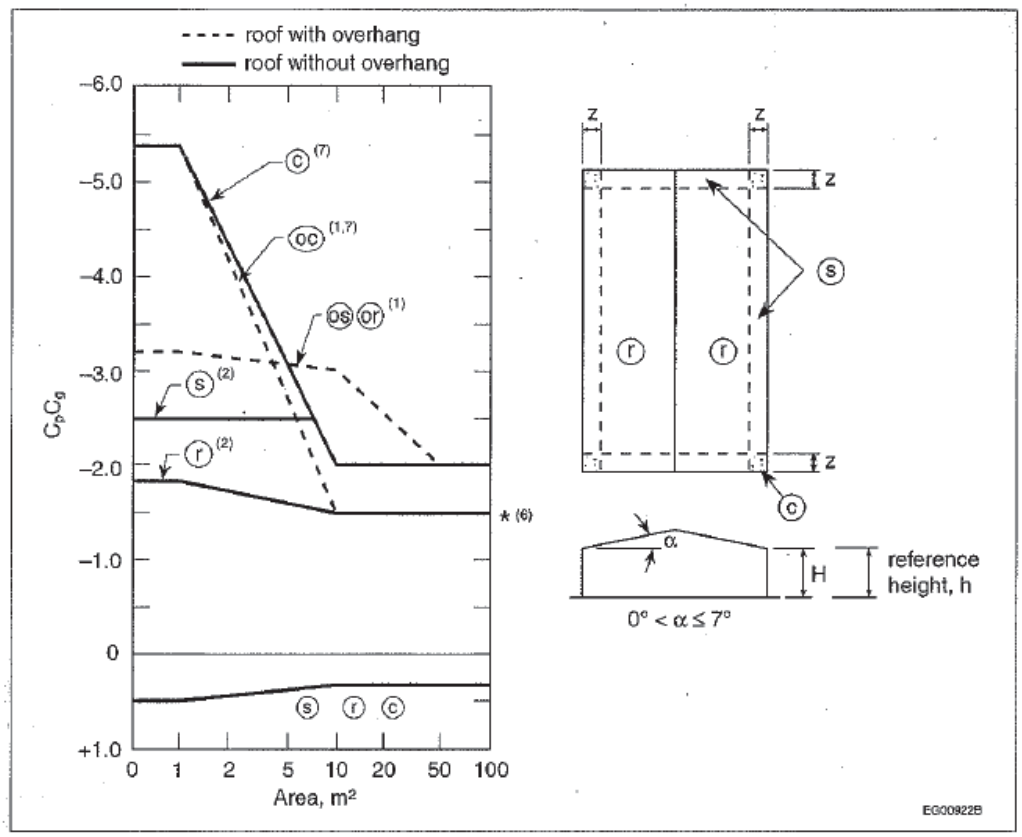


Figure I-9

External peak composite pressure-gust coefficients, C_pC_g, on roofs with a slope of 7° or less for the design of structural components and cladding

Notes to Figure I-9:

(1) Coefficients for overhung roofs have the prefix "o" and refer to the same roof areas as referred to by the corresponding symbol without a prefix. They include contributions from both upper and lower surfaces. In the case of overhangs, the walls are inboard of the roof outline.[37]

(2) s and r apply to both roofs and upper surfaces of canopies.

(3) The abscissa area in the graph is the design tributary area within the specified zone.

(4) End-zone width z is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

(5) Combinations of exterior and interior pressures must be evaluated to obtain the most severe loading.

(6) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface. Each structural element must be designed to withstand the forces of both signs.

(7) For calculating the uplift forces on tributary areas larger than 100 m² on unobstructed nearly-flat roofs with low parapets, and where the centre of the tributary area is at least two building heights from the nearest edge, the value of C_pC_g may be reduced to −1.1 at x/H = 2 and further reduced linearly to −0.6 at x/H= 5, where x is distance to the nearest edge and H is building height.[38]

(8) For roofs having a perimeter parapet that is 1 m high or greater, the corner coefficients C_pC_g for small tributary areas can be reduced from −5.4 to −4.4.[40][41]

Figure 2: Composite Pressure-Gust Coefficients for Roof Slopes 0°-7°

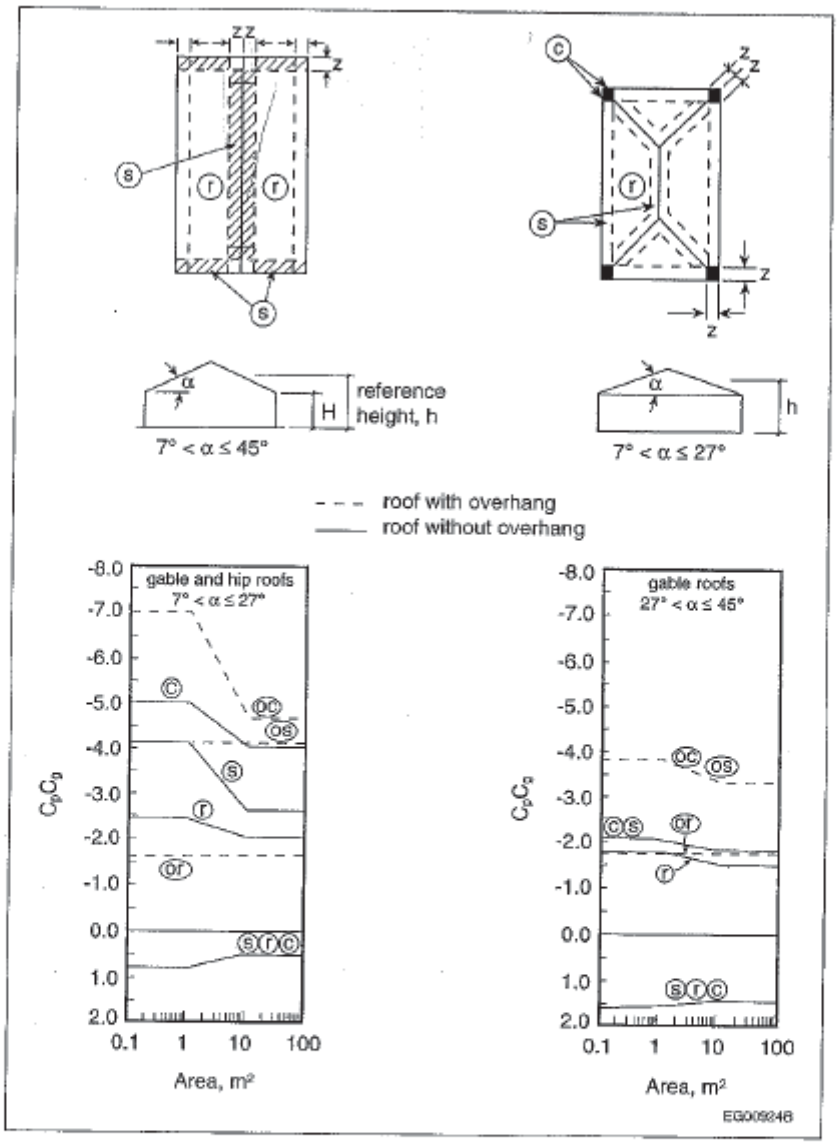


Figure I-11

External peak composite pressure-gust coefficients, C_pC_g, on single-span gabled and hipped roofs with a slope of 7° or greater for the design of structural components and cladding

Notes to Figure I-11:

(1) Coefficients for overhung roofs have the prefix "o" and refer to the same roof areas as referred to by the corresponding symbol without a prefix. They include contributions from both upper and lower surfaces.[24][44]

(2) The abscissa area in the graph is the design tributary area within the specified zone.

(3) End-zone width z is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

(4) Combinations of exterior and interior pressures must be evaluated to obtain the most severe loading.

(5) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface. Each structural element must be designed to withstand the forces of both signs.

(6) For hipped roofs with 7° < α ≤ 27°, edge/ridge strips and pressure-gust coefficients for ridges of gabled roofs apply along each hip.[45]

Figure 3: Composite Pressure-Gust Coefficients for Roof Slopes 7°-45°

Installation Notes:

- Installations shall be completed in conformance with the SolarMount Installation Guide (Appendix B) and this letter.
- Abide to all local jurisdictional requirements regarding roof setbacks and climatic data.
- Racking and PV panels shall not be installed on roof overhangs or within 250 mm (10") of roof edges.
- Panels shall be installed along the full height of roof slopes to ensure snow will slide off panels.
- All rail members shall be continuous over a minimum of two supports.
- SM Rail Profile 2 splices shall only be made at locations directly adjacent to Rail support locations.
- The maximum allowable member cantilever length shall not exceed one third (1/3) of the adjacent span length. SM Rail Profile 2 splices shall not be installed on a cantilevered span or the first adjacent span.
- The reaction loads defined in the design tables are only applicable to span lengths conforming to the associated loading conditions. These roof reactions loads can be linearly interpolated for smaller span lengths. The roof reactions were calculated assuming a normal importance factor.
- The final L-Foot connection spacing and attachment shall be designed by others on a site specific basis. The L-Foot connection capacity will depend on number of site specific factors including the excess capacity of the roof framing, roof joist or truss spacing, member size & condition of the roof structural members, etc.

Summary

The attached design tables in Appendix D for 60 Cell panels and in Appendix E for 72 Cell panels provide the maximum span lengths for the SolarMount Rail Profile 2 and associated reaction loads based on Limit States Design and serviceability deflection limits. This report does not include the design of the roof support structure, L-Foot, Clamps and fastening of the SolarMount System to the existing roof structure (to be completed by others). SBSG can undertake to provide engineering services for any configuration not specifically designed herein.

We trust the above information is clear, however, please do not hesitate to contact the undersigned if you have any questions or require additional information.

Steenhof Building Service Group
Jack Steenhof, P.Eng.
Principal Structural Engineer

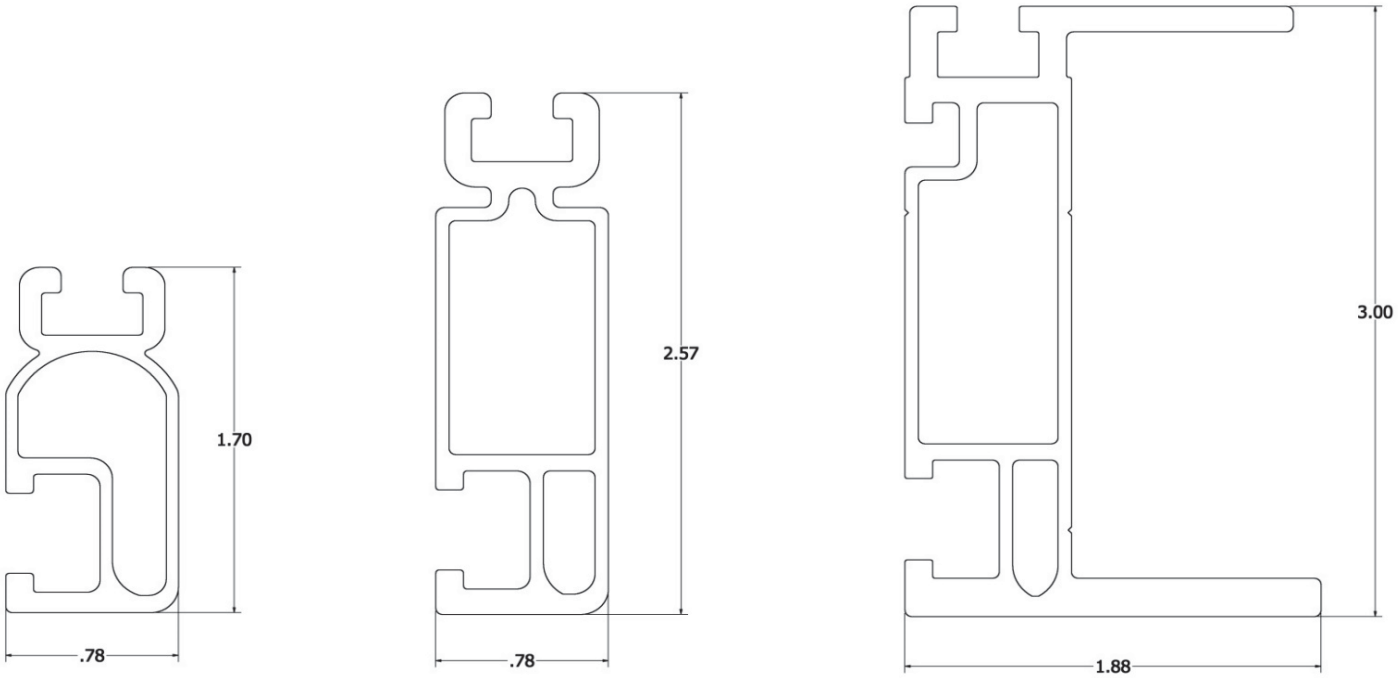
April 28, 2017

Attachments:

1. Appendix A - SolarMount(SM) Rail Profile 2, section properties and material data provided by Unirac, Inc.
2. Appendix B - SolarMount Installation Guide.
3. Appendix C - L-Foot Roof Connection Capacities provided by Unirac, Inc.
4. Appendix D - Design Tables for 60 Cell Panels.
5. Appendix E - Design Tables for 72 Cell Panels.

Appendix A

SolarMount(SM) Rail Profile 2, section properties and material data provided by Unirac, Inc.



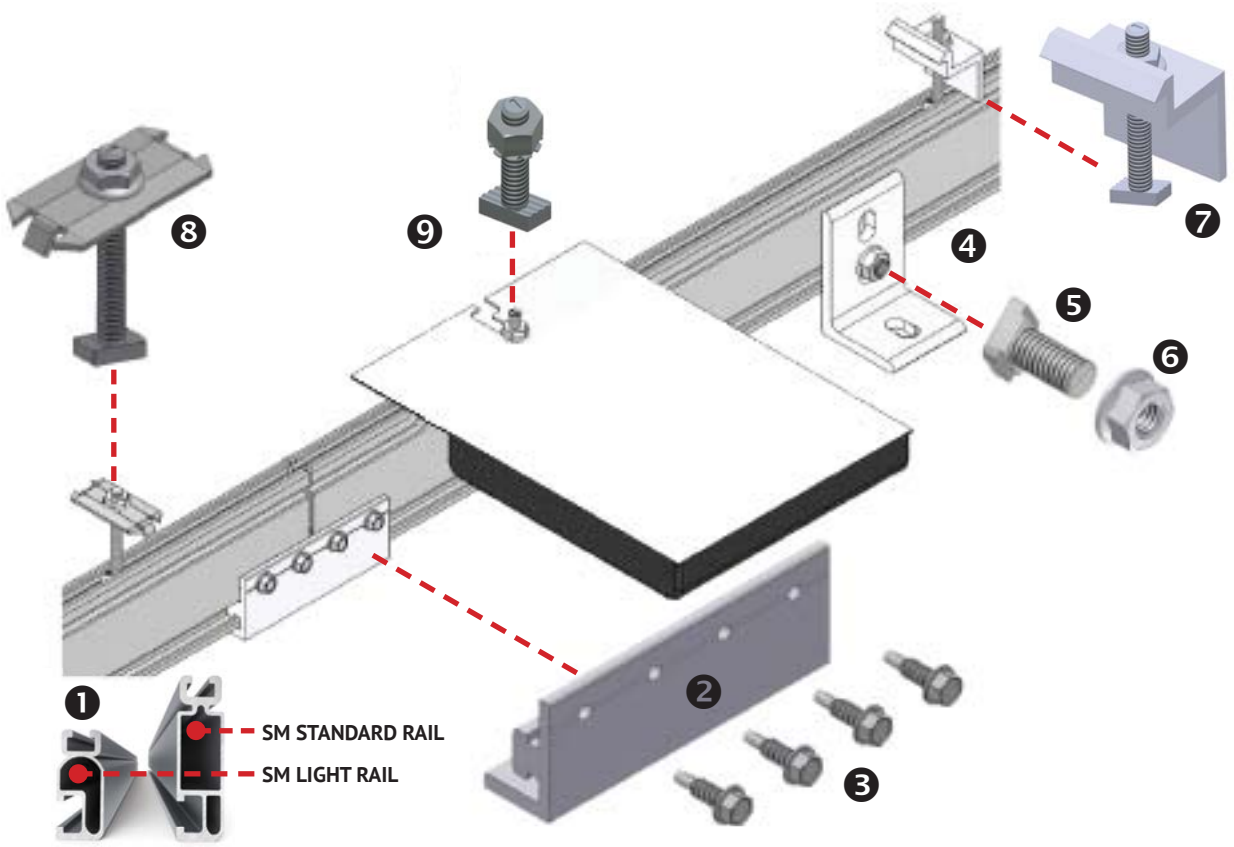
Properties	SOLARMOUNT Light	SOLARMOUNT Rail Profile 2	SOLARMOUNT HD	Units
BEAM HEIGHT	1.70	2.57	3.00	in
APPROX WEIGHT	0.491	0.728	1.271	plf
CROSS SECTION AREA	0.409	0.625	1.059	in^2
SECTION MODULUS (X-AXIS)	0.15	0.363	0.898	in^3
SECTION MODULUS (Y-AXIS)	0.067	0.113	0.221	in^3
MOMENT OF INERTIA (X-AXIS)	0.13	0.467	1.45	in^4
MOMENT OF INERTIA (Y-AXIS)	0.026	0.045	0.267	in^4
RADIUS OF GYRATION (X-AXIS)	0.564	0.865	1.17	in
RADIUS OF GYRATION (Y-AXIS)	0.254	0.269	0.502	in

Appendix B

SolarMount Installation Guide

STANDARD SYSTEM COMPONENTS

INSTALLATION GUIDE



❶RAIL: Supports PV modules. Use at least two per row of modules. Aluminum extrusion, available in mill, clear anodized, or dark anodized.

❷RAIL SPLICE: Non structural splice joins, aligns, and electrically bonds rail sections into single length of rail. Forms either a rigid or thermal expansion joint, 4 inches long, pre-drilled (see page F). Anodized aluminum extrusion available in clear or dark.

❸SELF-DRILLING SCREW: (No. 12 x ¾") – Use 4 per rigid splice or 2 per expansion joint. Stainless steel. Supplied with splice. In combination with rigid splice, provides rail to rail bond.

❹L-FOOT: Use to secure rails through roofing material to building structure. Refer to loading tables or U-Builder for spacing.

❺L-FOOT T- BOLT: (3/8" x ¾") – Use one per L-foot to secure rail to L-foot. Stainless steel. Supplied with L-foot. In combination with flange nut, provides electrical bond between rail and L-foot.

❻SERRATED FLANGE NUT (3/8"): Use one per L-foot to secure and bond rail to L-foot. Stainless steel. Supplied with L-foot.

❼MODULE ENDCLAMP: Provides bond from rail to endclamp. Pre-assembled aluminum clamp available in clear or dark finish. Supplied washer keeps clamp and bolt upright for ease of assembly.

❽MODULE MIDCLAMP: Pre-assembled clamp provides module to module and module to rail bond. Stainless steel clamp and T-bolt. Available in clear or dark finish.

❾MICROINVERTER MOUNTING BOLT: Pre-assembled bolt and nut attaches and bonds microinverter to rail. Washer at base keeps bolt upright for ease of assembly.

NOTE - POSITION INDICATOR: T-bolts have a slot in the hardware end corresponding to the direction of the T-Head.

Wrenches and Torque

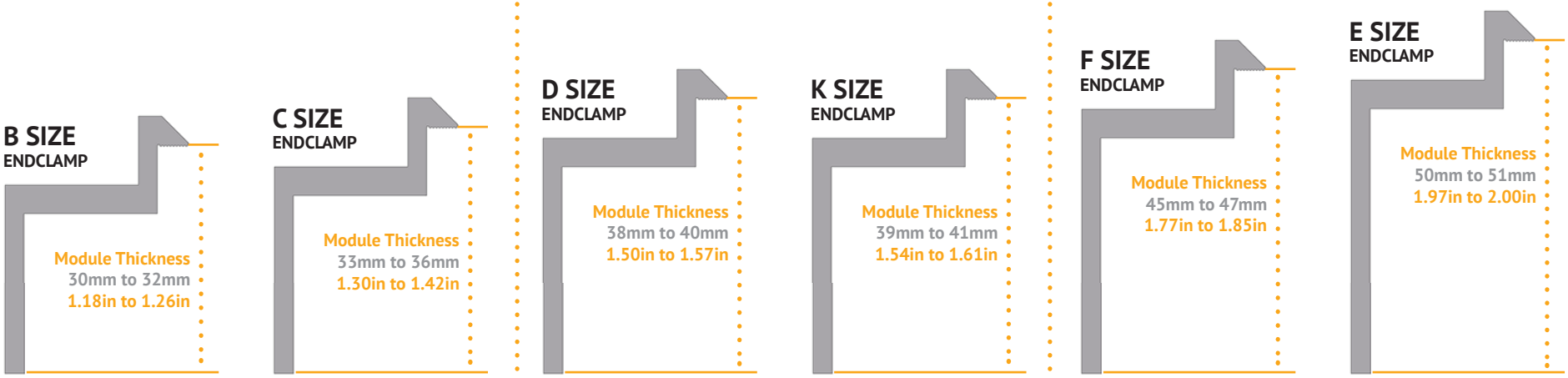
	Wrench Size	Recommended Torque (ft-lbs)
1/4" Hardware ❼❽❾	7/16"	*10
3/8" Hardware ❺	9/16"	*30
#12 Hardware ❸	5/16"	10

Torques are not designed for use with wood connectors *w/Anti-Seize.

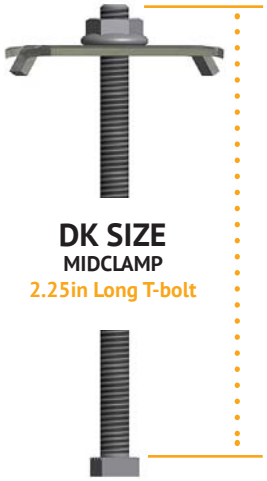
Anti-Seize*

Stainless steel hardware can seize up, a process called galling. To significantly reduce its likelihood:

1. Apply minimal lubricant to bolts, preferably Anti-Seize commonly found at auto parts stores
2. Shade hardware prior to installation, and
3. Avoid spinning stainless nuts onto bolts at high speed.



BC SIZE
MIDCLAMP
2in Long T-bolt



DK SIZE
MIDCLAMP
2.25in Long T-bolt

EF SIZE
MIDCLAMP
2.5in Long T-bolt

PLANNING YOUR SOLARMOUNT INSTALLATIONS

The installation can be laid out with rails parallel to the rafters or perpendicular to the rafters. Note that SOLARMOUNT rails make excellent straight edges for doing layouts.

Center the installation area over the structural members as much as possible.

Leave enough room to safely move around the array during installation. Some building codes and fire codes require minimum clearances around such installations, and the installer should check local building code requirements for compliance.

The length of the installation area is equal to:

- the total width of the modules,
- plus ¼" inch for each space between modules (for mid- clamp),
- plus approximately 3 inches (1½ inches for each Endclamp)

LAYING OUT L-FEET FOR TOP CLAMPS

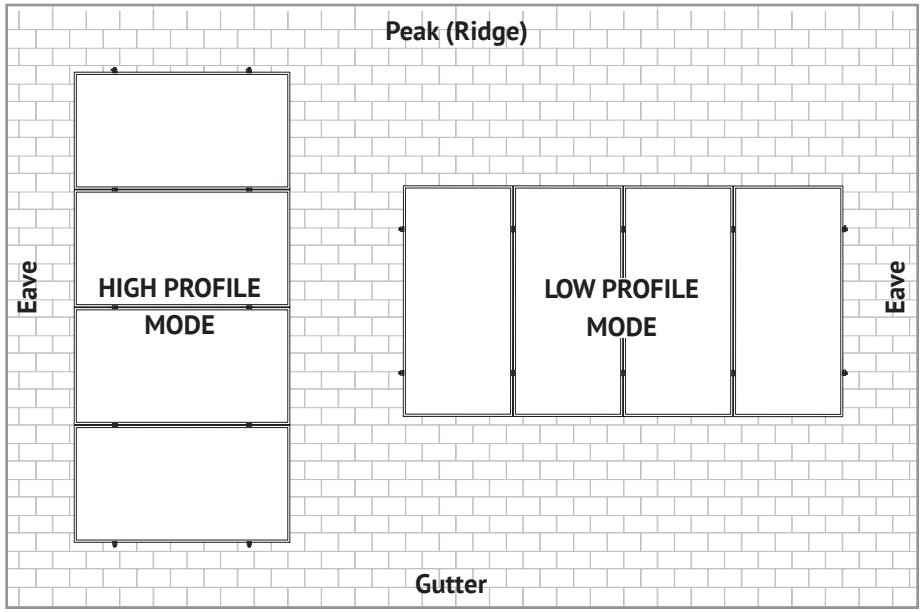
L-feet, in conjunction with proper flashing equipment and techniques, can be used for attachment through existing roofing material, such as asphalt shingles, sheathing or sheet metal to the building structure.

Locate and mark the position of the L-feet lag screw holes within the installation area as shown below. Follow manufacturer module guide for rail spacing based on appropriate mounting locations.

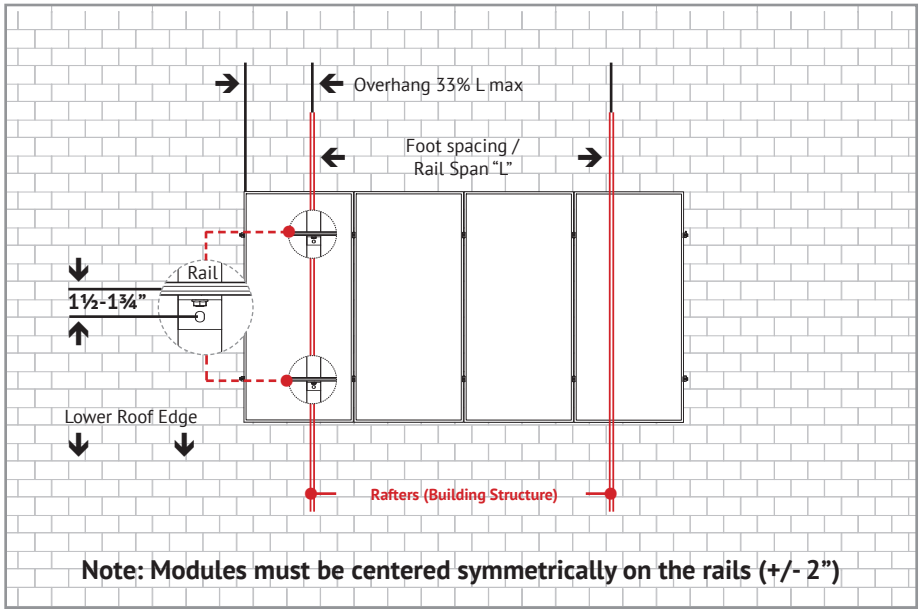
If multiple rows are to be installed adjacent to one another, it is not likely that each row will be centered above the rafters. Adjust as needed, following the guidelines below as closely as possible.

Refer to Unirac Solarmount D&E Guide & U-Builder for allowable spans and cantilevers.

RAILS MAY BE PLACED PARALLEL OR PERPENDICULAR TO RAFTERS



LAYOUT WITH RAILS PERPENDICULAR TO RAFTERS (RECOMMENDED)



Note: Modules must be centered symmetrically on the rails (+/- 2")

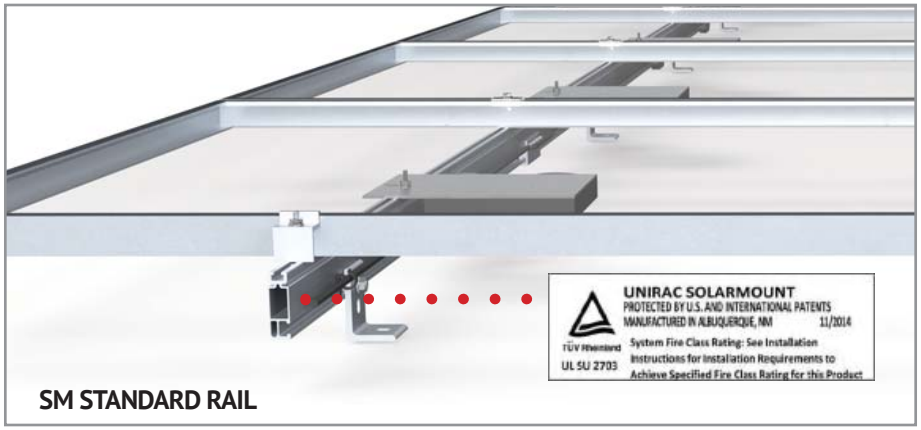
SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SOLARMOUNT Installation Guide. SOLARMOUNT 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. SOLARMOUNT has achieved system level performance for steep sloped roofs. System level fire performance is inherent in the SOLARMOUNT 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 SOLARMOUNT. Module Types & System Level Fire Ratings are listed below:

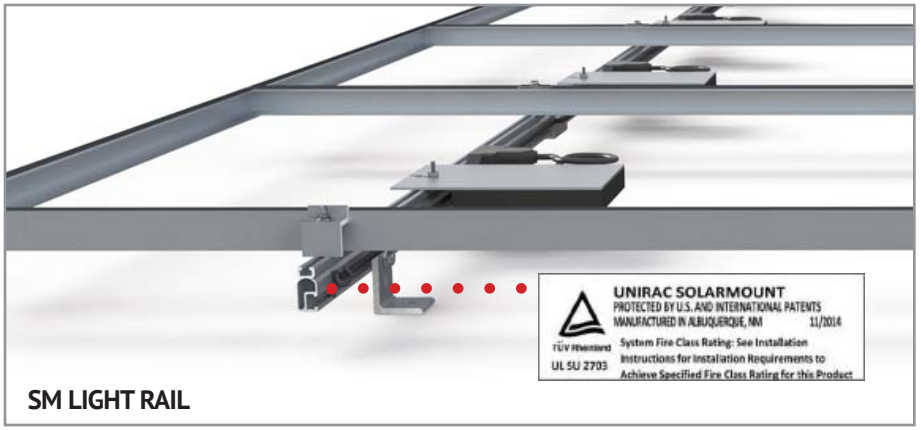
Rail Type	Module Type	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Standard Rail	Type 1, Type 2, Type 3 & Type 10	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Light Rail	Type 1 & Type 2	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required

UL2703 CERTIFICATION MARKING LABEL

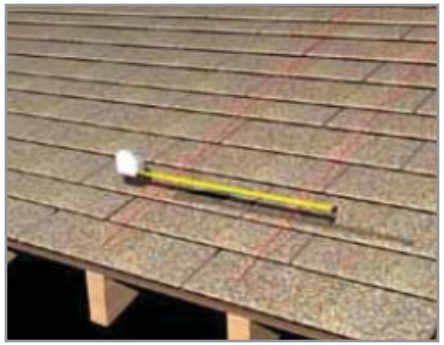
Unirac SOLARMOUNT is listed to UL 2703. Marking Labels are shipped with the Midclamps. After the racking system is fully assembled, a single Marking Label should be applied to the SOLARMOUNT rail at the edge of the array. Note: The sticker label should be placed such that it is visible, but not outward facing.



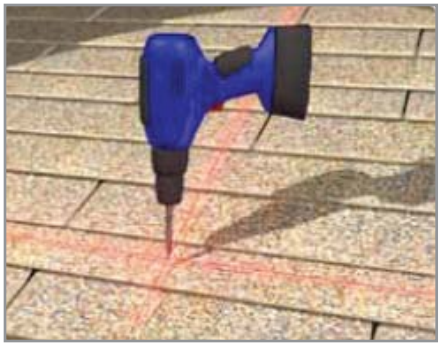
SM STANDARD RAIL



SM LIGHT RAIL



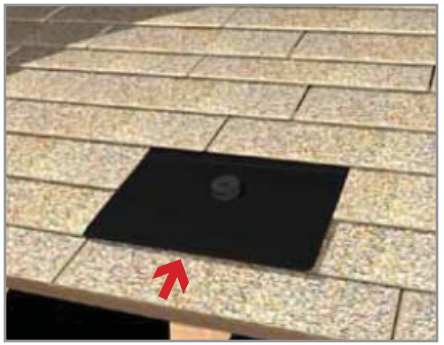
ROOF PREPARATION: Layout and install flashing at rafter locations determined per Design and Engineering Guide.



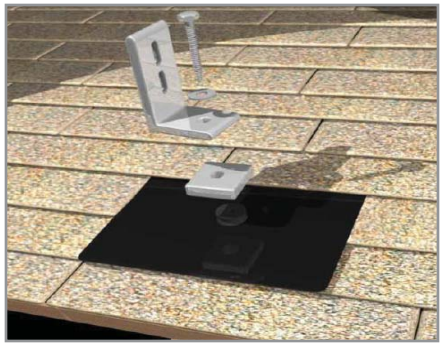
DRILL PILOT HOLES: Center the roof attachment over the rafter and drill a pilot hole(s) for the lag bolt(s).

NOTE: Determine lag bolt size and embedment depth.

Quick Tip: Pre-drill the pilot hole through the flat flashing lag bolt location for easier installation.

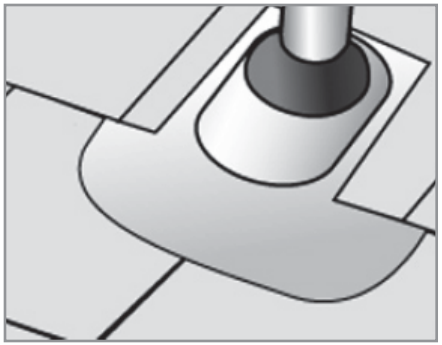


FLAT FLASHING INSTALLATION: Insert the Flat Flashing so the top part is under the next row of shingles and the hole lines up with the pilot hole.



INSTALL LAG BOLTS & L-FOOT: Insert the lag bolt through the L-Foot in the order shown in the illustration. Verify proper orientation before tightening lag bolts.

See Unirac Flat Flashing Manual for Additional Details.



2 PIECE ALUMINUM STANDOFF WITH FLASHING & L-FOOT:

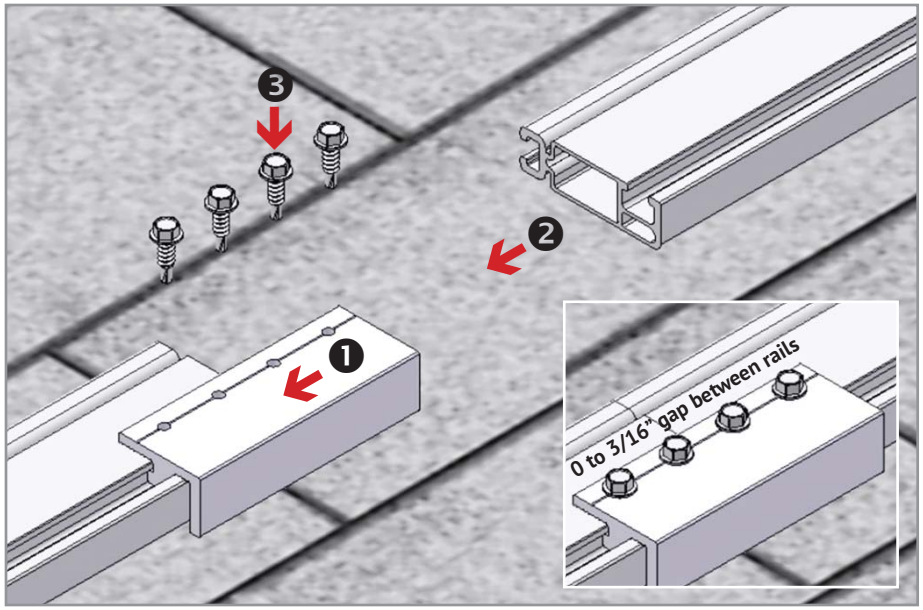
- If necessary cut an opening in the roofing material over a rafter to accommodate the flashing riser.
- Install the standoff, ensuring that both lag bolts are screwed into the rafter.
- Insert the flashing under the shingle above and over the shaft of the standoff. (No-Calk™ collar does not require sealing of the flashing and standoff shaft)
- Add L-Foot to top with bolt that secures the EPDM washer to the top of the standoff.

See Standoffs & Flashings Installation Manual 907.2 for Additional Details.

TOP MOUNT TILE HOOK & L-FOOT:

- Remove or slide up the roof tile, position the roof hook above the roof rafter
- Place Tile Hook in the middle of the underlying interlocking tile's valley. Drill 3/16 inch pilot holes through the underlayment into the center of the rafters. Securely fasten each tile hook to the rafters with two 5/16" x 3½" lag screws. Slide down or re-insert the tile.
- Attach L Foot to tile roof hook.

See Tile Hook Universal Mount Installation Manual for Additional Information.



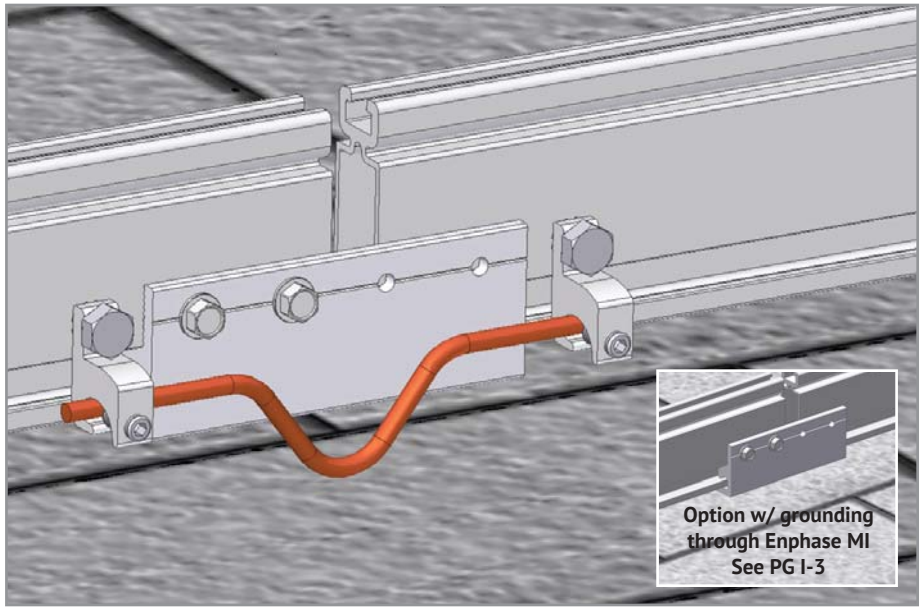
SPLICE INSTALLATION (IF REQUIRED PER SYSTEM DESIGN)

If your installation uses SOLARMOUNT splice bars, attach the rails together before mounting to the L-feet / footings. Use splice bars only with flush installations or those that use low-profile tilt legs. A rail should always be supported by more than one footing on both sides of the splice. There should be a gap between rails, up to 3/16" at the splice connections. T-bolts should not be placed less than a distance of 1" from the end of the rail regardless of a splice.

TORQUE VALUE (See Note on PG. A)

Hex head socket size 5/16" - Do not exceed 10 ft-lbs. Do not use Anti-Seize.

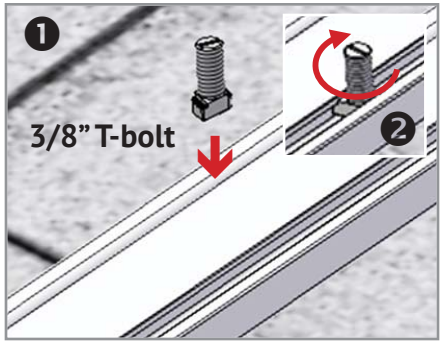
Max length of spliced rail is 40 ft. An expansion joint is required > 40 ft.



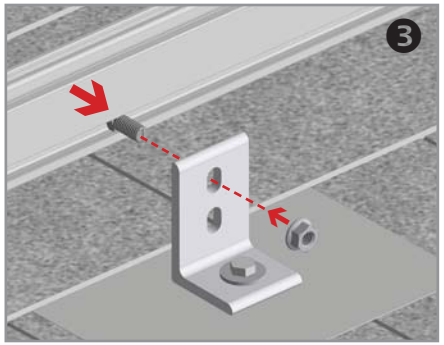
EXPANSION JOINT USED AS THERMAL BREAK

Expansion joints prevent buckling of rails due to thermal expansion. Splice bars may be used for thermal expansion joints. To create a thermal expansion joint, slide the splice bar into the footing slots of both rail lengths. Leave approximately ½" between the rail segments. Secure the splice bar with two screws on one side only. Footings (such as L-feet or standoffs) should be secured normally on both sides of the splice. No PV module or mounting hardware component should straddle the expansion joint. Modules must clearly end before the joint with mounting hardware (top mount Endclamps) terminating on that rail. T-bolts should not be placed less than a distance of 1" from the end of the rail regardless of a splice. The next set of modules would then start after the splice with mounting hardware beginning on the next rail. **A thermal break is required every 40 feet of continuously connected rail. For additional concerns on thermal breaks in your specific project, please consult a licensed structural engineer. Runs of rail less than 40 feet in length, with more than two pairs spliced together, are an acceptable installation for the SOLARMOUNT systems.**

Bonding connection for splice used as a thermal break. Option shown uses two Ilsco lugs (Model No. GBL-4DBT P/N GBL-4DBT - see product data sheet for more details) and solid copper wire.

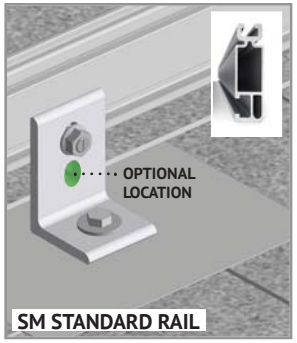


PLACE T-BOLT INTO RAIL & SECURE BOLT: Insert 3/8" T-bolt into rail at L-foot locations. Apply Anti-Seize to bolt. Rotate T-bolt into position.

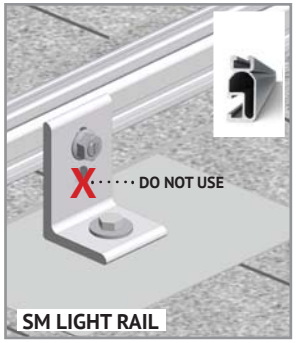


SECURE T-BOLT: Apply Anti-Seize to bolt. Rotate T-bolt into position.

Note:
Allowable L-foot slot locations for SM Standard & Light Rail.



SM STANDARD RAIL: Use either slot to connect the L-foot to the rail to obtain the desired height and alignment when using SM Standard rail.



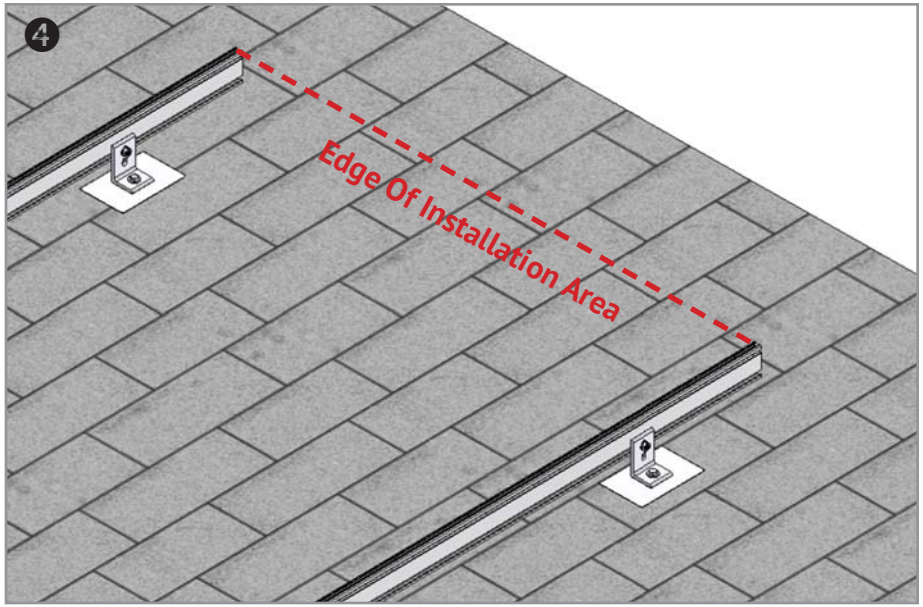
SM LIGHT RAIL: For a lower profile array when using SM Light rail, rotate the L-foot to orient the side with only one (1) slot against the rail. **Only use the slot location closet to the rail to connect the lag bolt to the flashing / roof on the side with two (2) slots.**

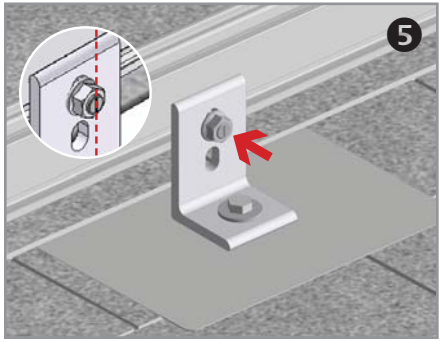
NOTE: Use only the top slot to connect the L-foot to the rail to obtain the desired height and alignment when using SM Light rail.

ALIGN RAILS: Align one pair of rail ends to the edge of the installation area. The opposite pair of rail ends will overhang installation area. Do not Trim them off until the installation is complete. If the rails are perpendicular to the rafters, either end of the rails can be aligned, but the first module must be installed at the aligned end.

If the rails are parallel to the rafters, the aligned end of the rails must face the lower edge of the roof. Securely tighten all hardware after alignment is complete.

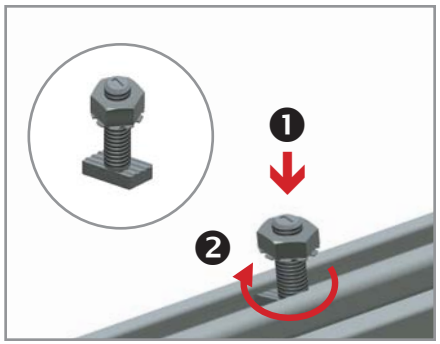
Mount modules to the rails as soon as possible. Large temperature changes may bow the rails within a few hours if module placement is delayed.



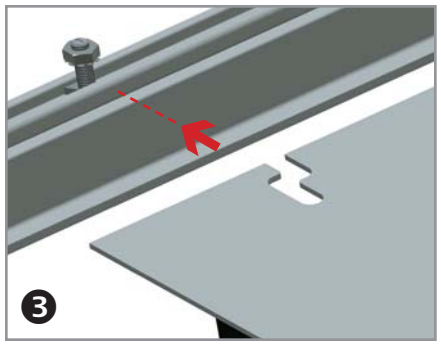


ALIGN POSITION INDICATOR: Hand tighten nut until rail alignment is complete. Verify that position indicator on bolt is vertical (perpendicular to rail)

TORQUE VALUE (See Note on PG. A)
3/8" nut to 30 ft-lbs



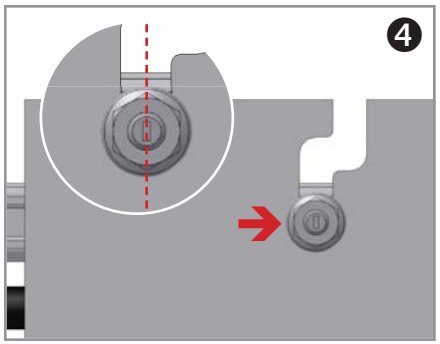
INSTALL MICROINVERTER MOUNT T-BOLT: Apply Anti-Seize and install pre-assembled ¼" dia. bonding T-bolts into top ¼" rail slot at microinverter locations. Rotate bolts into position.



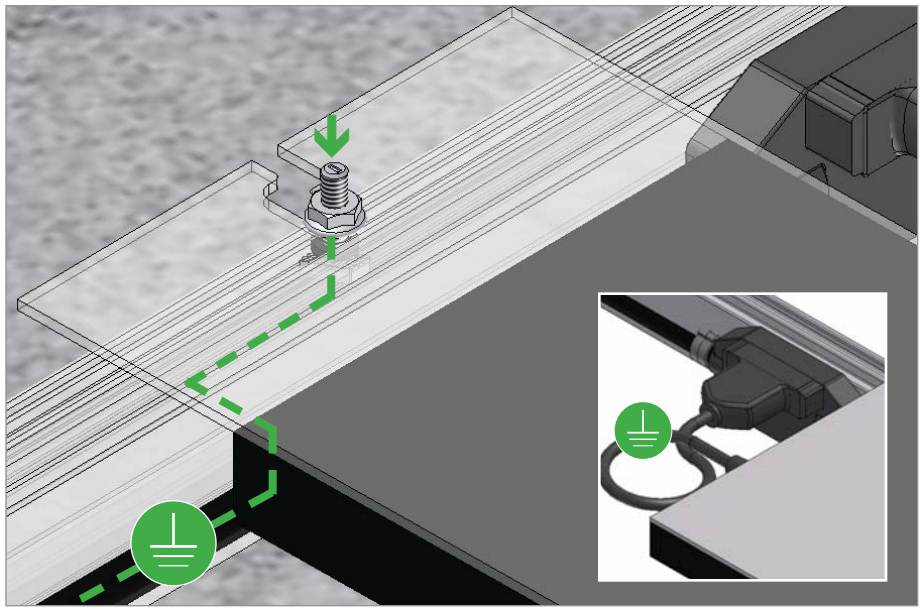
INSTALL MICROINVERTER: Install microinverter on to rail. Engage with bolt.

INSTALL MICROINVERTER:

TORQUE VALUE (See Note on PG. A)
1/4" nut to 10 ft-lbs w/Anti-Seize



ALIGN POSITION INDICATOR: Verify that position indicator on bolt is perpendicular to rail.



SM EQUIPMENT GROUNDING THROUGH ENPHASE MICROINVERTERS

The Enphase M215 and M250 microinverters have integrated grounding capabilities built in. In this case, the DC circuit is isolated from the AC circuit, and the AC equipment grounding conductor (EGC) is built into the Enphase Engage integrated grounding (IG) cabling.

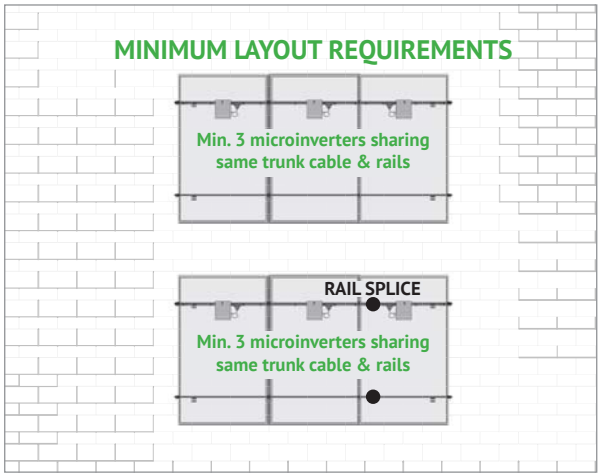
In order to ground the SOLARMOUNT racking system through the Enphase microinverter and Engage cable assembly, there must be a minimum of three PV modules connected to the same trunk cable within a continuous row. Continuous row is defined as a grouping of modules installed and bonded per the requirements of this installation guide sharing the same two rails. The microinverters are bonded to the SOLARMOUNT rail via the mounting hardware. Complete equipment grounding is achieved through the Enphase Engage cabling with integrated grounding (IG). No additional EGC grounding cables are required, as all fault current is carried to ground through the Engage cable.

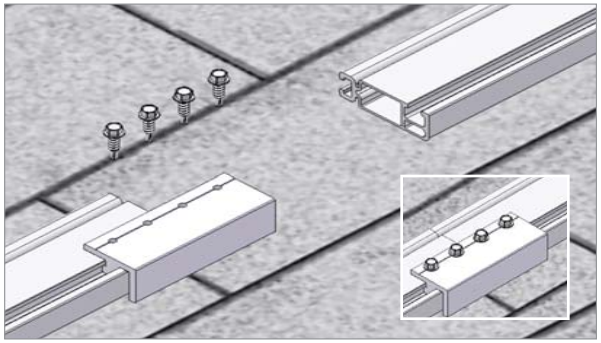
SOLARMOUNT INTEGRATED BONDING ADVANTAGE

WITH SYSTEM GROUNDING THROUGH ENPHASE MICROINVERTERS AND TRUNK CABLES

LOSE ALL THE COPPER & LUGS

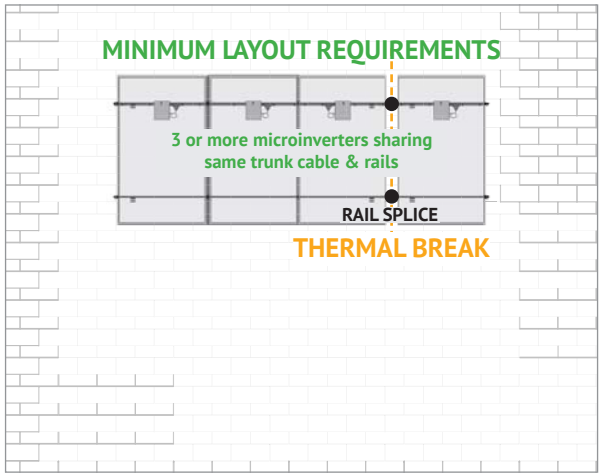
CONTINUOUS RAIL & ELECTRICAL BONDING SPLICE
Enphase Microinverter (MI) Requirements (Model No. M215 & M250)
3 Microinverters sharing same trunk cable & rails

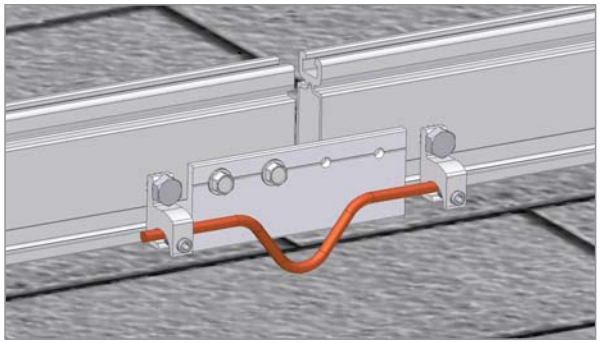




ELECTRICAL BONDING SPLICE

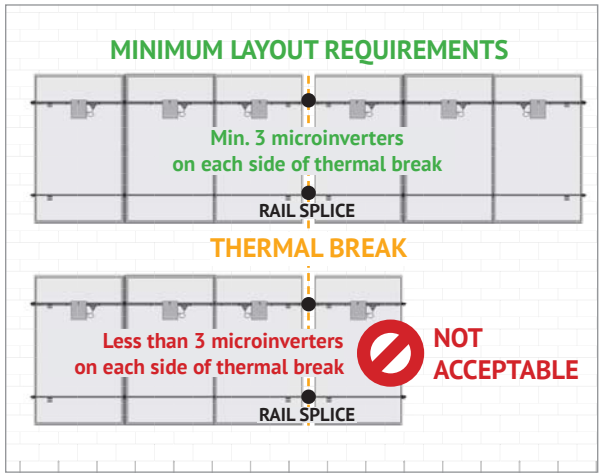
EXPANSION JOINT W/GROUNDING LUGS & COPPER JUMPER
Enphase Microinverter (MI) Requirements (Model No. M215 & M250)
3 or more Microinverters sharing same trunk cable & rails

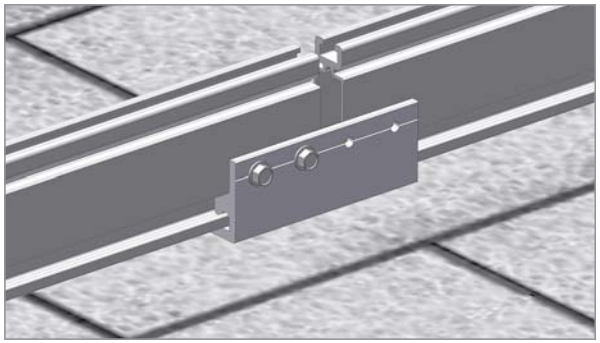




EXPANSION JOINT USED AS THERMAL BREAK W/ GROUNDING LUGS & COPPER JUMPER

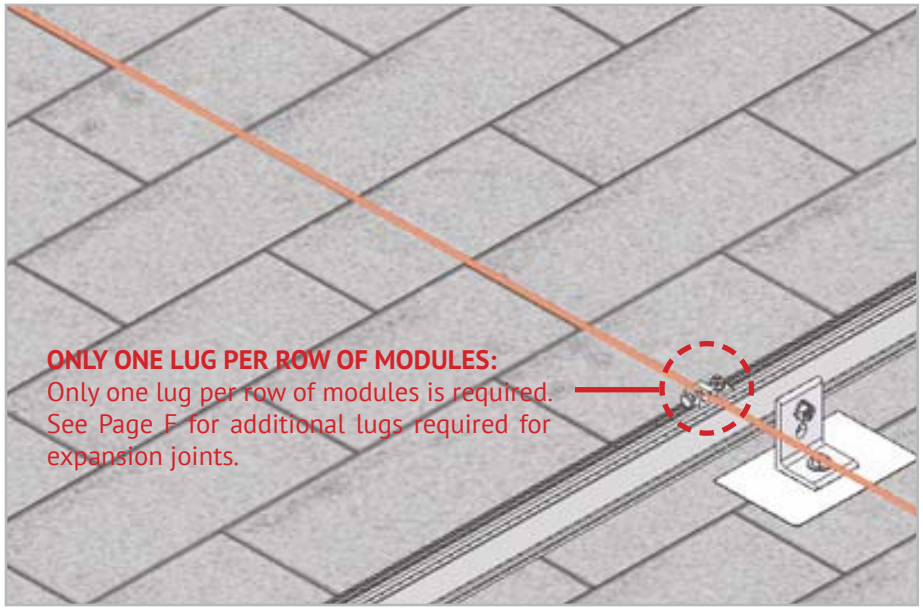
EXPANSION JOINT W/O ELECTRICAL BONDING CONNECTION
Enphase Microinverter (MI) Requirements (Model No. M215 & M250)
MIn. 3 Microinverters on each side of thermal break





EXPANSION JOINT USED AS THERMAL BREAK W/O ELECTRICAL BONDING CONNECTION

NOTE: THE ABOVE IMAGES ARE SAMPLE CONFIGURATIONS TO ILLUSTRATE THE REQUIREMENTS FOR SM SYSTEM GROUNDING THROUGH ENPHASE MICROINVERTERS DESCRIBED ON PAGE I-2

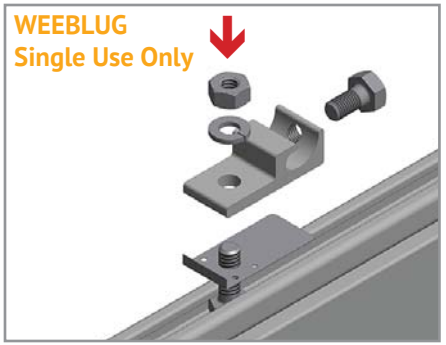


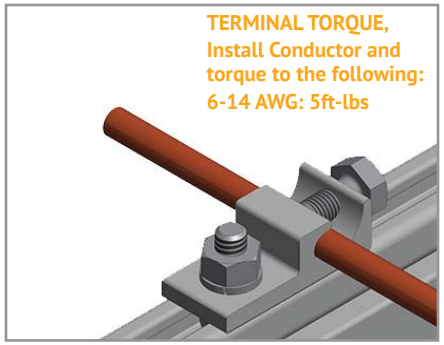
GROUNDING LUG MOUNTING DETAILS:
Details are provided for both the WEEB and Ilsco products. The WEEBLug has a grounding symbol located on the lug assembly. The Ilsco lug has a green colored set screw for grounding indication purposes. Installation must be in accordance with NFPA NEC 70, however the electrical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

Required if not using approved integrated grounding microinveters

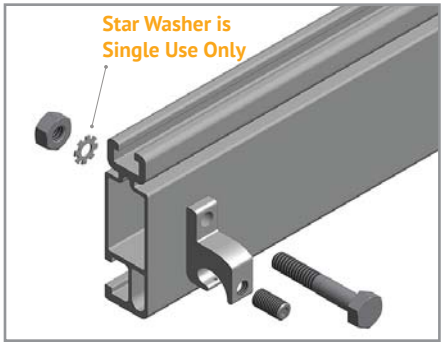
GROUNDING LUG - BOLT SIZE & DRILL SIZE		
GROUND LUG	**BOLT SIZE**	**DRILL SIZE**
WEEBLug	1/4"	N/A - Place in Top SM Rail Slot
IlSCO Lug	#10-32	7/32"

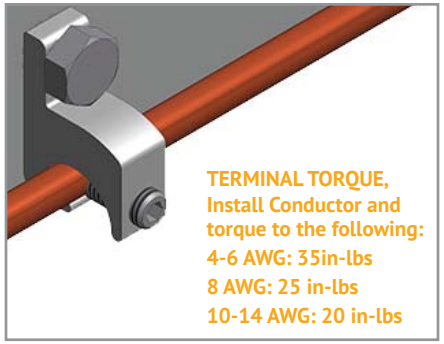
- Torque value depends on conductor size.
- See product data sheet for torque value.





WEEBLUG CONDUCTOR - UNIRAC P/N 008002S:
Apply Anti Seize and insert a bolt in the aluminum rail and through the clearance hole in the stainless steel flat washer. 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 Note on PG. A)
See product data sheet for more details, Model No. WEEB-LUG-6.7

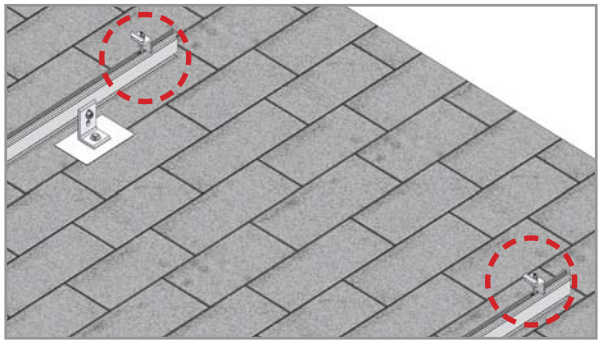




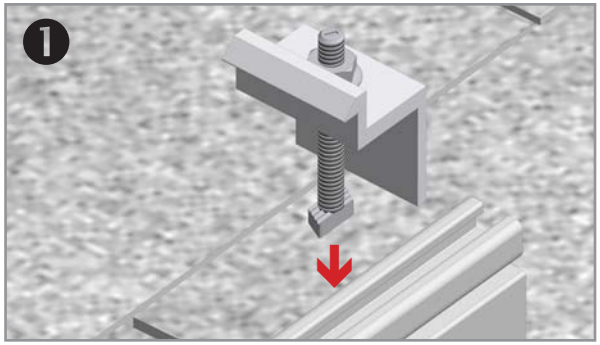
ILSCO LAY-IN LUG CONDUCTOR - UNIRAC P/N 008009P: Alternate Grounding Lug - Drill, deburr hole and bolt thru both rail walls per table.
TORQUE VALUE 5 ft lbs. (See Note on PG. A)
See ILSCO product data sheet for more details, Model No. GBL-4DBT.

NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION

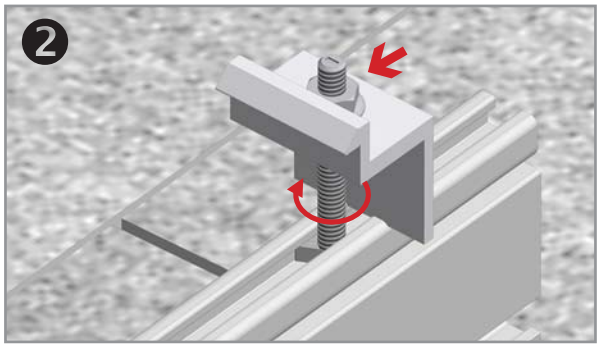
ENDCLAMP, FIRST MODULE &TRIM



INSTALL MODULE ENDCLAMPS: The Endclamp is supplied as an assembly with a T-bolt, serrated flange nut, and washer. The washer retains the clamp at the top of the assembly. This will enable the clamp to remain upright for module installation.

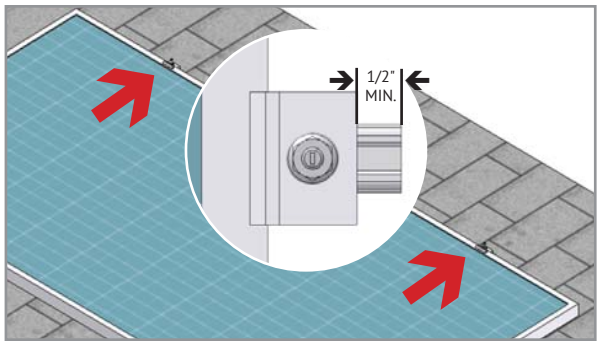


INSERT ENDCLAMP T-BOLT: Insert 1/4" T-bolt into rail.



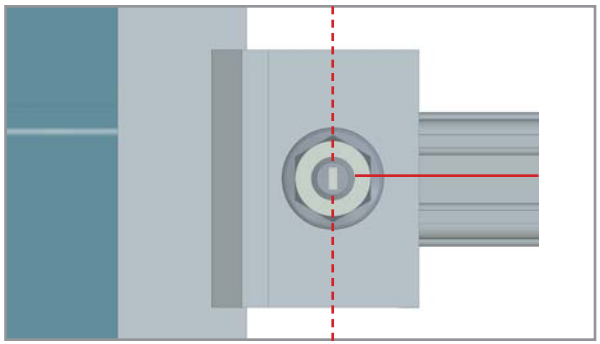
ROTATE ENDCLAMP T-BOLT: Rotate T-bolt into position. Verify that the position indicator & T-bolt shaft are angled in the correct position.

End clamps are positioned on rails prior to the first end module and installed after the last end module.



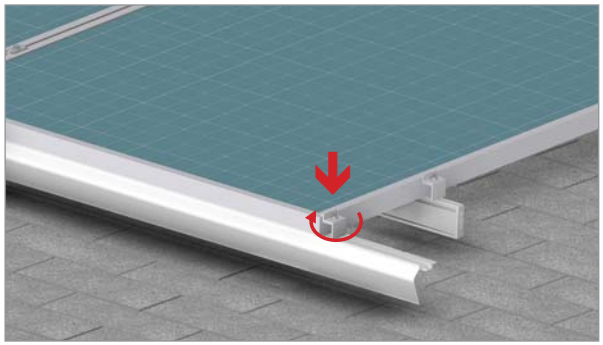
INSTALL FIRST MODULE: Install the first end module onto rails. Engage module frame with Endclamps. Verify that the position indicator & T-bolt shaft are angled in the correct position.

TORQUE VALUE (See Note on PG. A) 1/4" nuts to 10 ft-lbs. w/Anti Seize



POSITION INDICATOR - SERRATED T-BOLT: Verify the T-bolt position indicator is perpendicular to the rail.

TRIM INSTALLATION INSTRUCTIONS

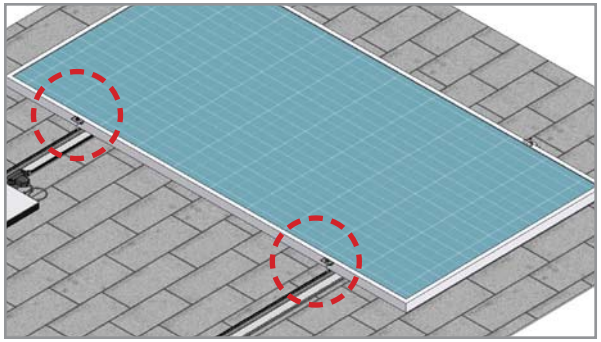


TRIM ENDCLAMPS: Install Endclamps on Trim in like manner to module endclamps per install instructions above.

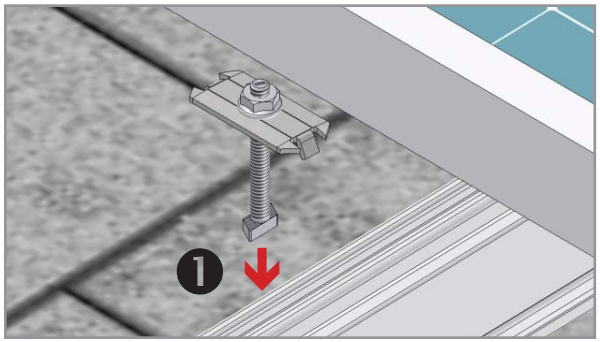
TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs w/ Anti Seize

BONDING MIDCLAMP & TRIM

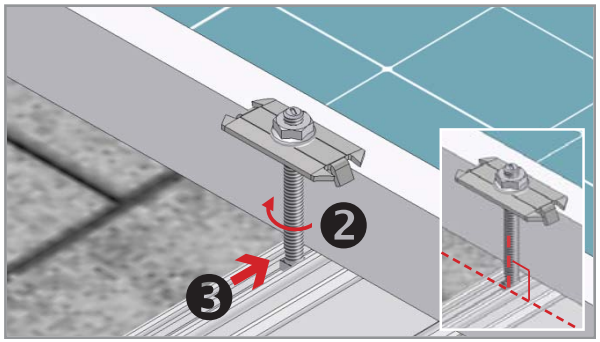
INSTALLATION GUIDE



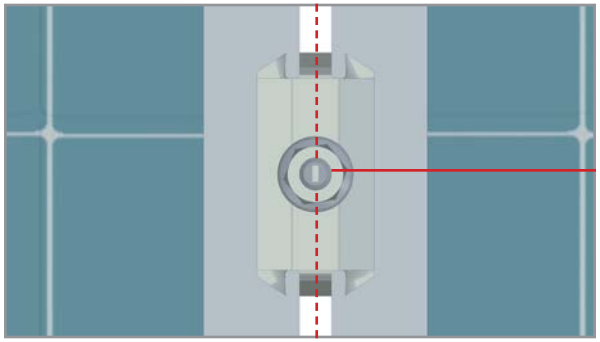
INSTALL MIDCLAMPS: Midclamp is supplied as an assembly with a T-bolt for module installation. Clamp assemblies may be positioned in rail near point of use prior to module placement.



INSERT MIDCLAMP T-BOLT: Apply Anti-Seize and insert 1/4" T-bolt into rail.

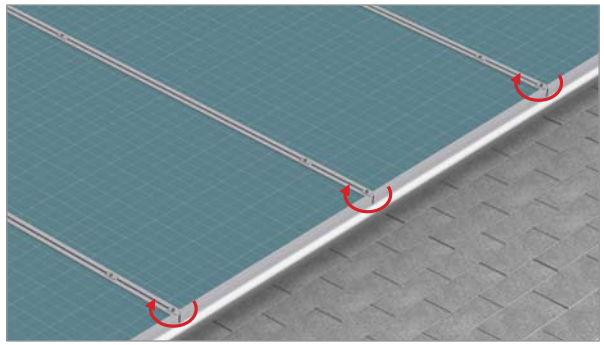


ROTATE MIDCLAMP T-BOLT: Rotate bolt into position and slide until bolt and clamp are against module frame. Do not tighten nut until next module is in position. Verify that the position indicator & T-bolt shaft are angled in the correct position.



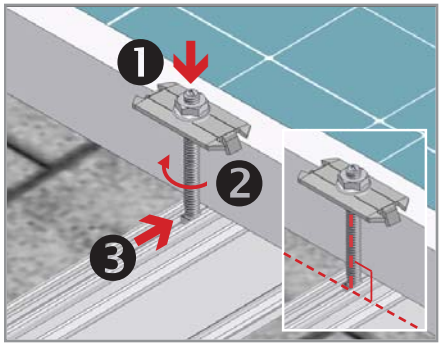
POSITION INDICATOR - SERRATED T-BOLT: Verify the T-bolt position indicator is perpendicular to the rail.

TRIM INSTALLATION INSTRUCTIONS



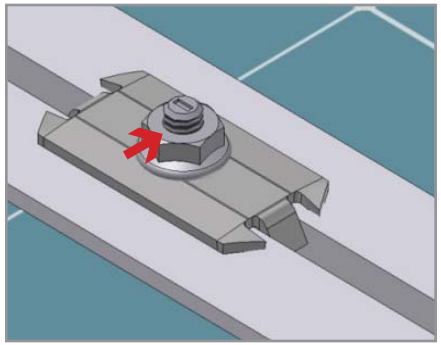
TRIM MIDCLAMPS: Ensure Trim lip is in contact with module face and verify alignment marks on T-bolts are in proper position, tighten midclamp on Trim, repeat at each gap between modules.

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs w/ Anti Seize



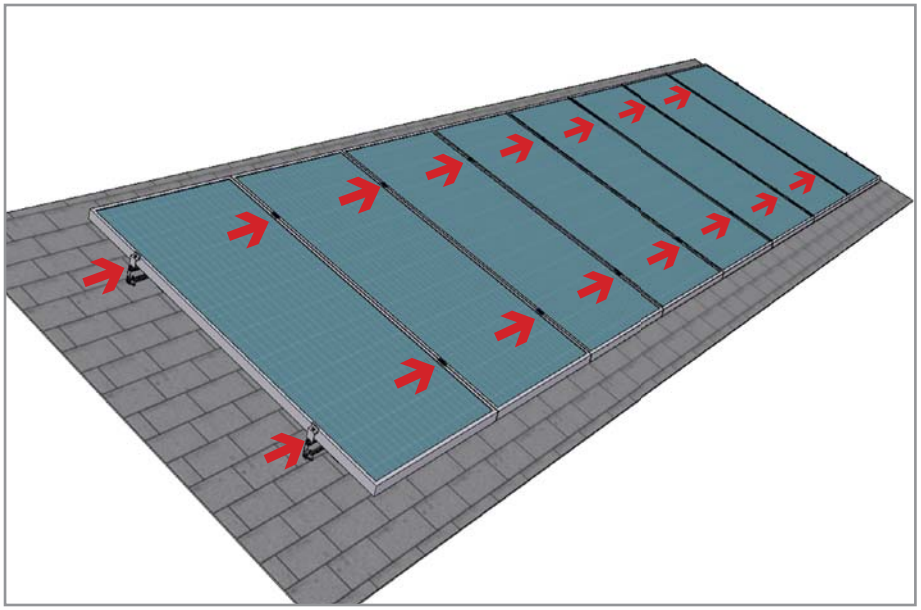
INSTALL REMAINING MID-CLAMPS: Proceed with module installation. Engage each module with previously positioned Midclamp assemblies.

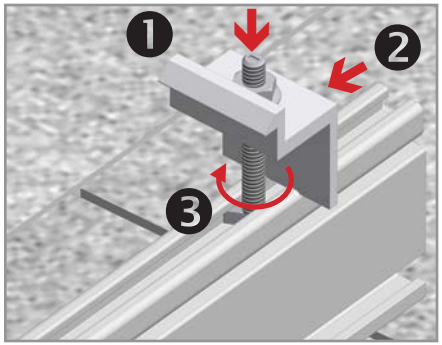
NOTE: Apply Anti-Seize to each Mid Clamp prior to installation.



POSITION T-BOLT ALIGNMENT MARKS: Verify that the position indicator(s) & T-bolt shaft(s) are angled in the correct position.

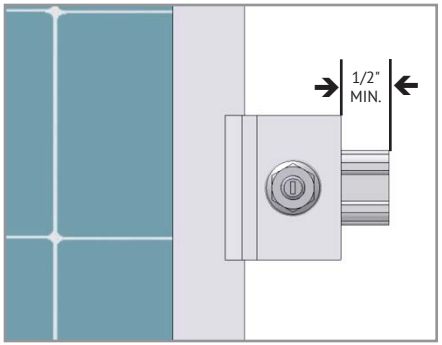
TORQUE VALUE (See Note on PG. A)
1/4" nuts to 10 ft-lbs. w/Anti Seize





INSTALL ENDCLAMPS: Apply Anti-Seize and install final Endclamps in same manner as first Endclamps. Slide clamps against module.

TORQUE VALUE (See Note on PG. A)
1/4" nuts to 10 ft-lbs. w/Anti Seize

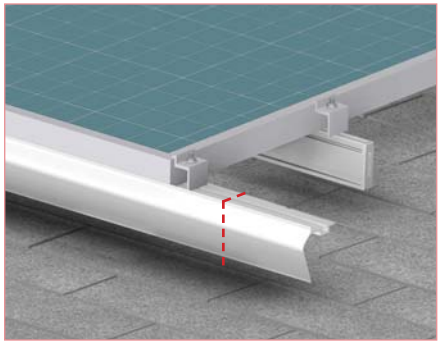


POSITION T-BOLT ALIGNMENT MARKS & CUT RAIL: Verify that the position indicator(s) & T-bolt shaft(s) are angled in the correct position. Trim off any excess rail, being careful not to cut into the roof. Allow ½" between the Endclamp and the end of the rail.

FINISH MODULE INSTALLATION: Proceed with module installation. Engage each module with the previously positioned clamp assembly:

- Install second module
- Install remaining Midclamps & modules & position alignment marks
- Install Endclamps & position alignment marks
- Cut rail to desired length

TRIM INSTALLATION INSTRUCTIONS



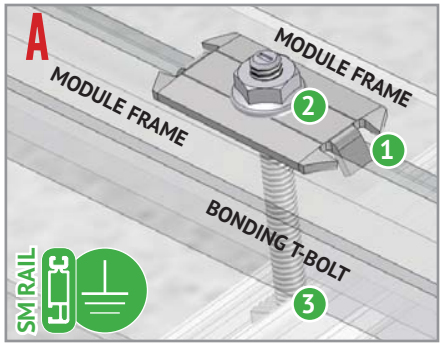
FINISH TRIM INSTALLATION, INSTALL ENDCLAMP & CUT EXCESS RAIL: Install final endclamp & Cut away excess Trim at end of array or where required for proper cantilevers. **See D&E Guide or U-Builder for allowable cantilevers.**

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs w/ Anti Seize

SM SOLAR MOUNT

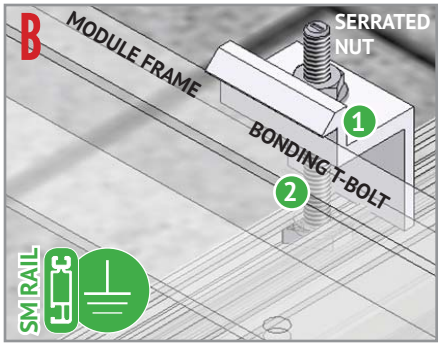
BONDING CONNECTION GROUND PATHS

INSTALLATION GUIDE | M PAGE



BONDING MIDCLAMP ASSEMBLY

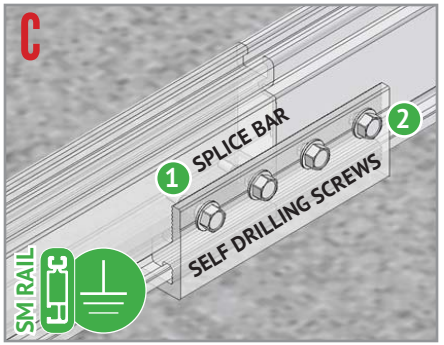
1. Stainless steel Midclamp points, 2 per module, pierce module frame anodization to bond module to module through clamp.
2. Serrated flange nut bonds stainless steel clamp to stainless steel T-bolt
3. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, clamp, and modules to grounded SM rail.



ENDCLAMP ASSEMBLY

1. Serrated flange nut bonds aluminum Endclamp to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and Endclamp to grounded SM rail

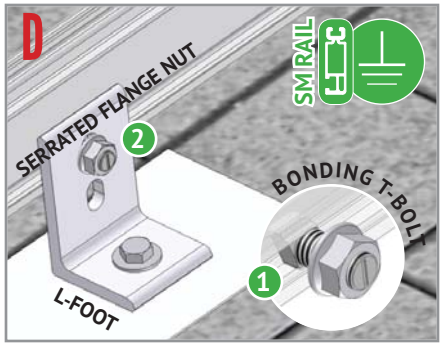
Note: End clamp does not bond to module frame.



BONDING RAIL SPLICE BAR

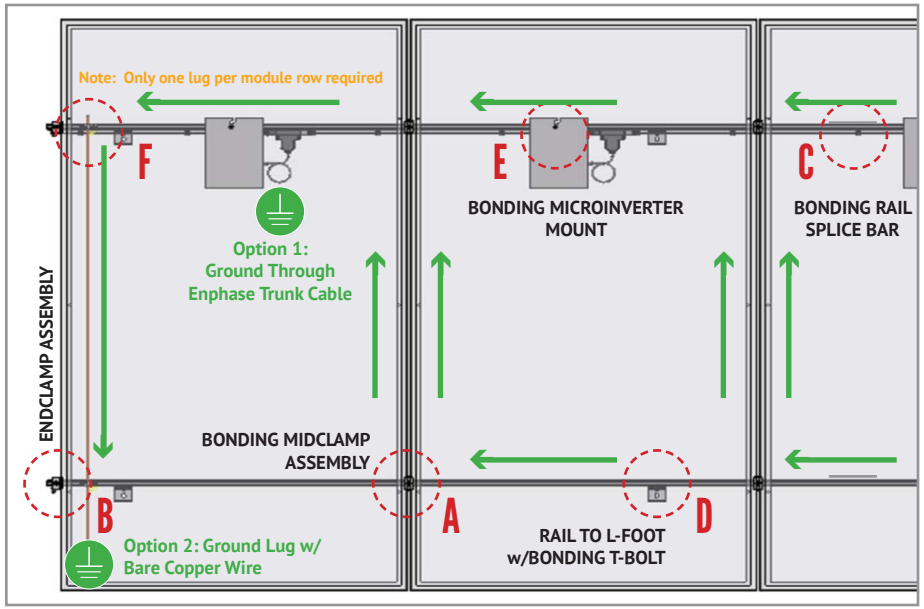
1. Stainless steel self drilling screws drill and tap into splice bar and rail creating bond between splice bar and each rail section
2. Aluminum splice bar spans across rail gap to create rail to rail bond. Rail on at least one side of splice will be grounded.

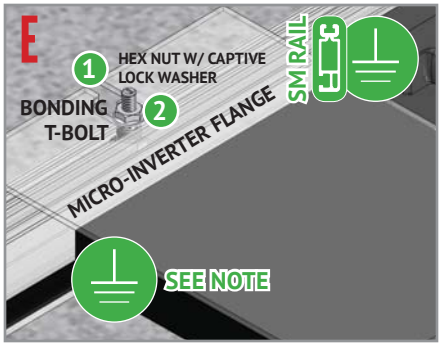
Note: Splice bar and bolted connection are non-structural. The splice bar function is rail alignment and bonding.



RAIL TO L-FOOT w/BONDING T-BOLT

1. Serrated flange nut removes L-foot anodization to bond L-Foot to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail

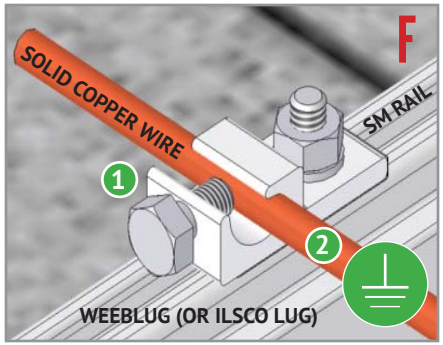




BONDING MICROINVERTER MOUNT

1. Hex nut with captive lock washer bonds metal microinverter flange to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail

System ground including racking and modules may be achieved through the trunk cable of approved microinverter systems. See page I for details

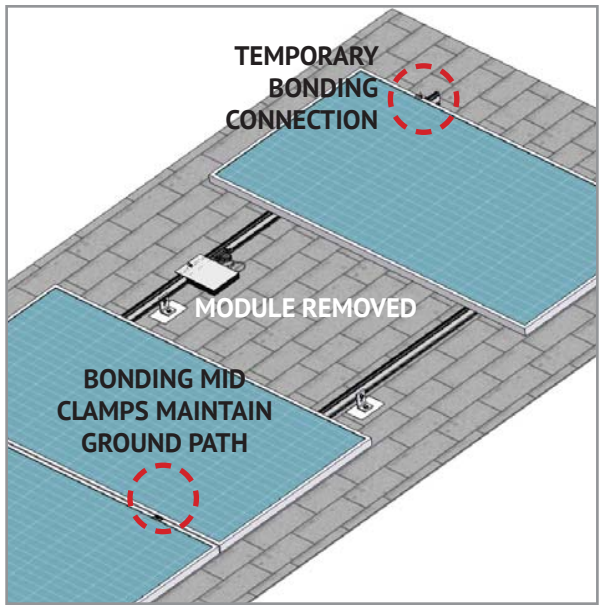


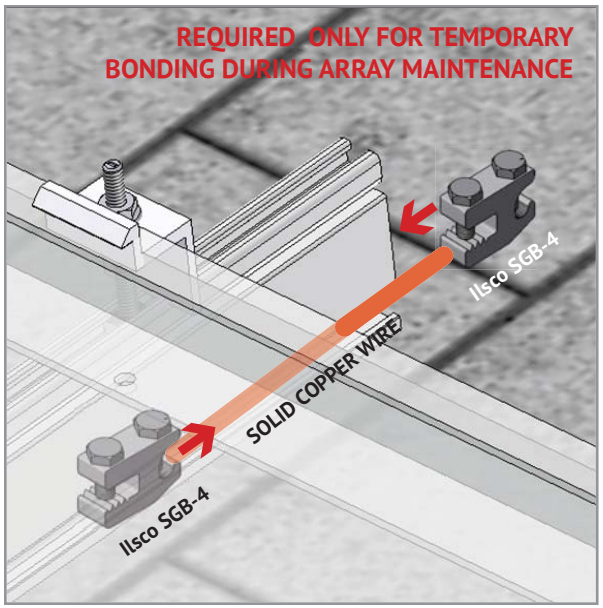
RACK SYSTEM GROUND

1. WEEB washer dimples pierce anodized rail to create bond between rail and lug
2. Solid copper wire connected to lug is routed to provide final system ground connection.

NOTE: Ilsco lug can also be used when secured to the side of the rail. See page I-3 for details

BONDING CONNECTION GROUND PATHS





TEMPORARY BONDING CONNECTION DURING ARRAY MAINTENANCE

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

- Attach Ilsco SGB4 to wall of rail
- Attach Ilsco SGB4 to module frame
- Install solid copper wire jumper to Ilsco lugs

ELECTRICAL CONSIDERATIONS

SOLARMOUNT is intended to be used with PV modules that have a system voltage less than or equal to 1000 VDC. For standard system grounding a minimum 10AWG, 105°C copper grounding conductor should be used to ground a 1000 VDC system, according to the National Electric Code (NEC). It is the installer's responsibility to check local codes, which may vary. See below for interconnection information.

INTERCONNECTION INFORMATION

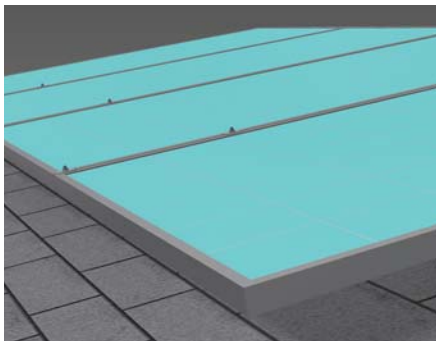
There is no size limit on how many SOLARMOUNT & PV modules can be mechanically interconnected for any given configuration, provided that the installation meets the requirements of applicable building and fire codes.

GROUNDING NOTES

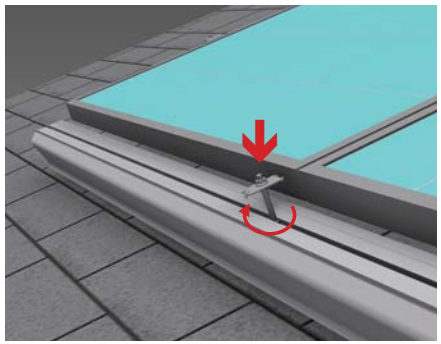
The installation must be conducted in accordance with the National Electric Code (NEC) and the authority having jurisdiction. Please refer to these resources in your location for required grounding lug quantities specific to your project.

The grounding / bonding components may overhang parts of the array so care must be made when walking around the array to avoid damage.

Conductor fastener torque values depend on conductor size. See product data sheets for correct torque values.

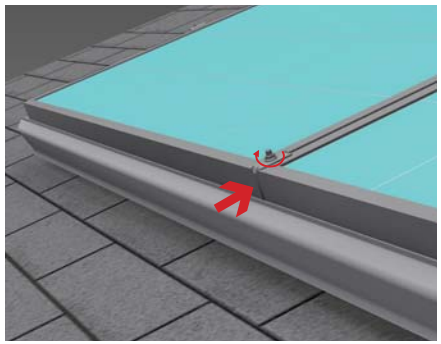


PREPARATION: At front edge of array, ensure at least 3.25 inches of space between modules and roof surface and that modules are aligned to within 3/8". Plan for Trim length so that Endclamps can be properly installed.



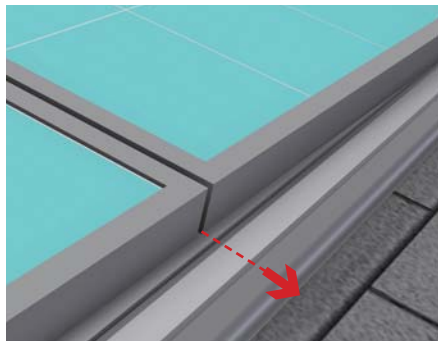
1ST MIDCLAMP: Position Trim in front of array. Insert Midclamp into the Trim slot, aligned with the gap between the 1st two modules at either end of array.

NOTE: Apply Anti-Seize to Each Mid-Clamp prior to installation

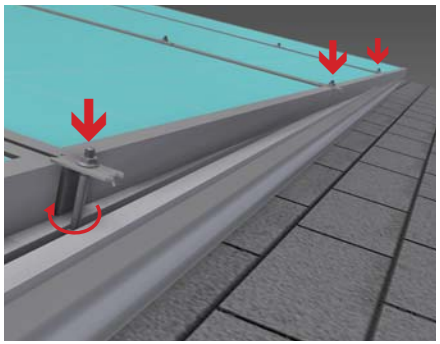


MOUNT TRIM: Position Trim beneath modules by sliding T-bolt into gap between modules and tighten. Midclamp should stay in position and support Trim. Tighten snugly enough so that Trim is held firmly in place.

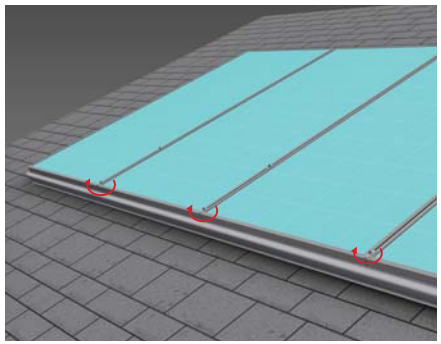
TORQUE VALUE: Do not exceed specified torque value (10 ft-lbs)



CLEAR T-BOLT SLOT: Rotate unattached end of Trim out and away from array so T-bolt slot (at next T-bolt insertion point) is clear of modules. This may require force to deflect the Trim slightly. Deflect only enough to insert T-bolt.

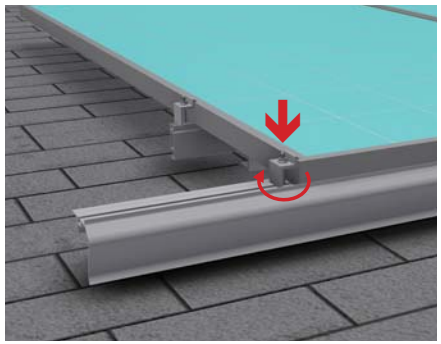


INSERT MIDCLAMPS: Insert T-bolt into slot and slide clamp (rotating Trim) into position between modules and leave loose. Continue to work down array, inserting Midclamps and positioning in gaps between modules.



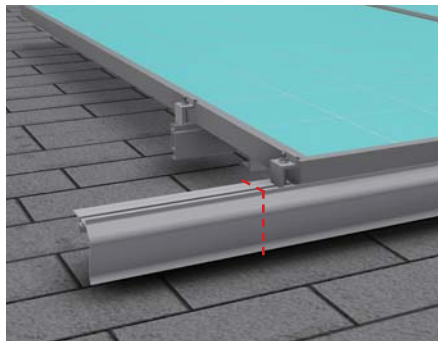
FASTEN MIDCLAMPS: Return to each inserted Midclamp. Ensuring Trim lip is in contact with module face and verifying alignment marks on T-bolts are in proper position, tighten clamp.

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs w/ Anti Seize



ENDCLAMPS: Install Endclamps per previous Endclamp install instructions

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs w/ Anti Seize

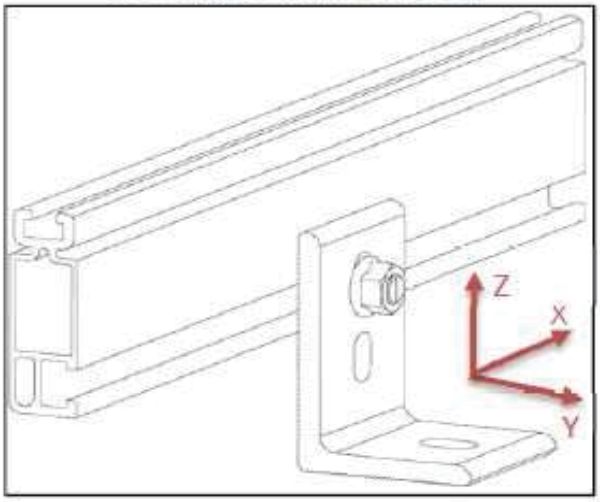


CUT EXCESS TRIM: Mark excess Trim and cut at end of array or where required for proper cantilevers.

Appendix C

L-Foot Roof Connection Capacities provided by Unirac, Inc.

SOLARMOUNT L-FOOT



L-Foot with 3/8" T-Bolt	
Direction	**Limit States Design Values (lbs)**
	SM Rail
X ±, Sliding	1413
Y ±, Transverse	330
Z +, Tension	1896
Z -, Compression	3074

Appendix D

Design Tables for 60 Cell Panels (East – West Rail Orientation)

Table 1: Maximum Span Length (m) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.6	*1.4	*1.1	*0.9	*0.7
	0.30	1.6	*1.4	*1.1	*0.9	*0.7
	0.35	1.6	*1.4	*1.1	*0.9	*0.7
	0.40	1.6	*1.4	*1.1	*0.9	*0.7
	0.45	1.6	*1.4	*1.1	*0.9	*0.7
	0.50	1.6	*1.4	*1.1	*0.9	*0.7
	0.55	1.6	1.4	*1.1	*0.9	*0.7

* Maximum span limited by the L-Foot shear capacity

Table 2: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-0.9	-0.7	-0.6	-0.5	-0.4
	0.30	-1.1	-0.9	-0.7	-0.6	-0.5
	0.35	-1.3	-1.1	-0.9	-0.7	-0.6
	0.40	-1.5	-1.3	-1.0	-0.8	-0.7
	0.45	-1.7	-1.5	-1.1	-0.9	-0.8
	0.50	-1.9	-1.6	-1.3	-1.0	-0.9
	0.55	-2.1	-1.8	-1.4	-1.2	-1.0

Table 3: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.6	-1.4	-1.1	-0.9	-0.7
	0.30	-2.0	-1.7	-1.3	-1.1	-0.9
	0.35	-2.3	-2.0	-1.5	-1.2	-1.1
	0.40	-2.7	-2.3	-1.8	-1.4	-1.2
	0.45	-3.0	-2.6	-2.0	-1.6	-1.4
	0.50	-3.4	-2.9	-2.2	-1.8	-1.5
	0.55	-3.7	-3.2	-2.5	-2.0	-1.7

Table 4: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.9	-1.6	-1.3	-1.0	-0.9
	0.30	-2.4	-2.0	-1.6	-1.3	-1.1
	0.35	-2.8	-2.4	-1.8	-1.5	-1.3
	0.40	-3.2	-2.7	-2.1	-1.7	-1.5
	0.45	-3.6	-3.1	-2.4	-2.0	-1.7
	0.50	-4.1	-3.5	-2.7	-2.2	-1.9
	0.55	-4.5	-3.8	-3.0	-2.4	-2.0

Table 5: Maximum Applied Downforce (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	3.0	3.6	3.6	3.6	3.6
	0.30	3.1	3.6	3.6	3.6	3.6
	0.35	3.1	3.6	3.6	3.6	3.6
	0.40	3.1	3.7	3.6	3.6	3.6
	0.45	3.1	3.7	3.6	3.6	3.6
	0.50	3.1	3.7	3.7	3.6	3.6
	0.55	3.1	3.7	3.7	3.7	3.6

Table 6: Maximum Applied Shear Force (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.23	1.47	1.47	1.47	1.47
	0.30	1.22	1.47	1.47	1.47	1.47
	0.35	1.22	1.47	1.47	1.47	1.47
	0.40	1.22	1.47	1.47	1.47	1.47
	0.45	1.22	1.47	1.47	1.47	1.47
	0.50	1.22	1.47	1.47	1.47	1.47
	0.55	1.21	1.46	1.47	1.47	1.47

Table 7: Maximum Span Length (m) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Low Importance Category						
Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.0	*1.5	*1.1	*0.8	*0.7
	0.30	2.0	*1.5	*1.1	*0.8	*0.7
	0.35	2.0	*1.5	*1.1	*0.8	*0.7
	0.40	2.0	*1.5	*1.1	*0.8	*0.7
	0.45	2.0	*1.5	*1.1	*0.8	*0.7
	0.50	2.0	*1.5	*1.1	*0.8	*0.7
	0.55	2.0	*1.5	*1.1	*0.8	*0.7

* Maximum span limited by the L-Foot shear capacity

Table 8: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.8	-0.6	-0.4	-0.3	-0.3
	0.30	-0.9	-0.7	-0.5	-0.4	-0.4
	0.35	-1.1	-0.9	-0.6	-0.5	-0.4
	0.40	-1.3	-1.0	-0.7	-0.6	-0.5
	0.45	-1.5	-1.2	-0.8	-0.7	-0.5
	0.50	-1.7	-1.3	-0.9	-0.7	-0.6
	0.55	-1.9	-1.4	-1.0	-0.8	-0.7

Table 9: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.9	-0.7	-0.5	-0.4	-0.3
	0.30	-1.1	-0.9	-0.6	-0.5	-0.4
	0.35	-1.3	-1.0	-0.8	-0.6	-0.5
	0.40	-1.6	-1.2	-0.9	-0.7	-0.6
	0.45	-1.8	-1.4	-1.0	-0.8	-0.6
	0.50	-2.0	-1.5	-1.1	-0.9	-0.7
	0.55	-2.2	-1.7	-1.2	-1.0	-0.8

Table 10: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.9	-0.7	-0.5	-0.4	-0.3
	0.30	-1.1	-0.9	-0.6	-0.5	-0.4
	0.35	-1.3	-1.0	-0.8	-0.6	-0.5
	0.40	-1.6	-1.2	-0.9	-0.7	-0.6
	0.45	-1.8	-1.4	-1.0	-0.8	-0.6
	0.50	-2.0	-1.5	-1.1	-0.9	-0.7
	0.55	-2.2	-1.7	-1.2	-1.0	-0.8

Table 11: Maximum Applied Downforce (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.0	2.5	2.4	2.4	2.4
	0.30	2.0	2.5	2.5	2.5	2.4
	0.35	2.1	2.5	2.5	2.5	2.5
	0.40	2.3	2.6	2.5	2.5	2.5
	0.45	2.4	2.6	2.6	2.5	2.5
	0.50	2.6	2.7	2.6	2.5	2.5
	0.55	2.7	2.7	2.6	2.6	2.5

Table 12: Maximum Applied Shear Force (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.16	1.47	1.47	1.47	1.47
	0.30	1.15	1.47	1.47	1.47	1.47
	0.35	1.14	1.47	1.47	1.47	1.47
	0.40	1.14	1.47	1.47	1.47	1.47
	0.45	1.13	1.47	1.47	1.47	1.47
	0.50	1.13	1.47	1.47	1.47	1.47
	0.55	1.12	1.47	1.47	1.47	1.47

Table 13: Maximum Span Length (m) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Low Importance Category						
Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.6	*1.4	*1.1	*0.9	*0.7
	0.30	1.6	*1.4	*1.1	*0.9	*0.7
	0.35	1.6	*1.4	*1.1	*0.9	*0.7
	0.40	1.6	*1.4	*1.1	*0.9	*0.7
	0.45	1.6	*1.4	*1.1	*0.9	*0.7
	0.50	1.6	*1.4	*1.1	*0.9	*0.7
	0.55	1.6	*1.4	*1.1	*0.9	*0.7

* Maximum span limited by the L-Foot shear capacity

Table 14: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-0.6	-0.5	-0.4	-0.4	-0.3
	0.30	-0.8	-0.7	-0.5	-0.4	-0.4
	0.35	-1.0	-0.8	-0.6	-0.5	-0.5
	0.40	-1.1	-1.0	-0.7	-0.6	-0.5
	0.45	-1.3	-1.1	-0.9	-0.7	-0.6
	0.50	-1.5	-1.2	-1.0	-0.8	-0.7
	0.55	-1.6	-1.4	-1.1	-0.9	-0.8

Table 15: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.2	-1.0	-0.8	-0.7	-0.6
	0.30	-1.5	-1.3	-1.0	-0.8	-0.7
	0.35	-1.8	-1.5	-1.2	-1.0	-0.8
	0.40	-2.0	-1.7	-1.3	-1.1	-0.9
	0.45	-2.3	-2.0	-1.5	-1.2	-1.1
	0.50	-2.6	-2.2	-1.7	-1.4	-1.2
	0.55	-2.9	-2.4	-1.9	-1.5	-1.3

Table 16: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.5	-1.2	-1.0	-0.8	-0.7
	0.30	-1.8	-1.5	-1.2	-1.0	-0.8
	0.35	-2.1	-1.8	-1.4	-1.1	-1.0
	0.40	-2.5	-2.1	-1.6	-1.3	-1.1
	0.45	-2.8	-2.4	-1.8	-1.5	-1.3
	0.50	-3.1	-2.7	-2.1	-1.7	-1.4
	0.55	-3.5	-2.9	-2.3	-1.9	-1.6

Table 17: Maximum Applied Downforce (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	3.0	3.6	3.6	3.6	3.6
	0.30	3.0	3.6	3.6	3.6	3.6
	0.35	3.0	3.6	3.6	3.6	3.6
	0.40	3.1	3.6	3.6	3.6	3.6
	0.45	3.1	3.6	3.6	3.6	3.6
	0.50	3.1	3.7	3.6	3.6	3.6
	0.55	3.1	3.7	3.6	3.6	3.6

Table 18: Maximum Applied Shear Force (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.23	1.47	1.47	1.47	1.47
	0.30	1.23	1.47	1.47	1.47	1.47
	0.35	1.22	1.47	1.47	1.47	1.47
	0.40	1.22	1.47	1.47	1.47	1.47
	0.45	1.22	1.47	1.47	1.47	1.47
	0.50	1.22	1.47	1.47	1.47	1.47
	0.55	1.22	1.47	1.47	1.47	1.47

Table 19: Maximum Span Length (m) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.0	*1.5	*1.1	*0.8	*0.7
	0.30	2.0	*1.5	*1.1	*0.8	*0.7
	0.35	2.0	*1.5	*1.1	*0.8	*0.7
	0.40	2.0	*1.5	*1.1	*0.8	*0.7
	0.45	2.0	*1.5	*1.1	*0.8	*0.7
	0.50	2.0	*1.5	*1.1	*0.8	*0.7
	0.55	2.0	*1.5	*1.1	*0.8	*0.7

* Maximum span limited by the L-Foot shear capacity

Table 20: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.5	-0.4	-0.3	-0.3	-0.2
	0.30	-0.7	-0.5	-0.4	-0.3	-0.3
	0.35	-0.8	-0.6	-0.5	-0.4	-0.3
	0.40	-1.0	-0.8	-0.6	-0.4	-0.4
	0.45	-1.1	-0.9	-0.6	-0.5	-0.4
	0.50	-1.3	-1.0	-0.7	-0.6	-0.5
	0.55	-1.4	-1.1	-0.8	-0.6	-0.5

Table 21: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.7	-0.5	-0.4	-0.3	-0.3
	0.30	-0.8	-0.6	-0.5	-0.4	-0.3
	0.35	-1.0	-0.8	-0.6	-0.4	-0.4
	0.40	-1.2	-0.9	-0.7	-0.5	-0.4
	0.45	-1.3	-1.0	-0.8	-0.6	-0.5
	0.50	-1.5	-1.2	-0.8	-0.7	-0.6
	0.55	-1.7	-1.3	-0.9	-0.7	-0.6

Table 22: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.7	-0.5	-0.4	-0.3	-0.3
	0.30	-0.8	-0.6	-0.5	-0.4	-0.3
	0.35	-1.0	-0.8	-0.6	-0.4	-0.4
	0.40	-1.2	-0.9	-0.7	-0.5	-0.4
	0.45	-1.3	-1.0	-0.8	-0.6	-0.5
	0.50	-1.5	-1.2	-0.8	-0.7	-0.6
	0.55	-1.7	-1.3	-0.9	-0.7	-0.6

Table 23: Maximum Applied Downforce (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.0	2.4	2.4	2.4	2.4
	0.30	2.0	2.5	2.4	2.4	2.4
	0.35	2.0	2.5	2.5	2.4	2.4
	0.40	2.1	2.5	2.5	2.5	2.4
	0.45	2.1	2.5	2.5	2.5	2.5
	0.50	2.2	2.6	2.5	2.5	2.5
	0.55	2.3	2.6	2.5	2.5	2.5

Table 24: Maximum Applied Shear Force (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.16	1.47	1.47	1.47	1.47
	0.30	1.16	1.47	1.47	1.47	1.47
	0.35	1.15	1.47	1.47	1.47	1.47
	0.40	1.15	1.47	1.47	1.47	1.47
	0.45	1.14	1.47	1.47	1.47	1.47
	0.50	1.14	1.47	1.47	1.47	1.47
	0.55	1.14	1.47	1.47	1.47	1.47

Table 25: Maximum Span Length (m) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.6	*1.4	*1.1	*0.9	*0.7
	0.30	1.6	*1.4	*1.1	*0.9	*0.7
	0.35	1.6	*1.4	*1.1	*0.9	*0.7
	0.40	1.6	*1.4	*1.1	*0.9	*0.7
	0.45	1.6	*1.4	*1.1	*0.9	*0.7
	0.50	1.6	1.4	*1.1	*0.9	*0.7
	0.55	1.6	1.4	*1.1	*0.9	*0.7

* Maximum span limited by the L-Foot shear capacity

Table 26: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.0	-0.8	-0.7	-0.5	-0.5
	0.30	-1.2	-1.0	-0.8	-0.7	-0.6
	0.35	-1.5	-1.2	-1.0	-0.8	-0.7
	0.40	-1.7	-1.4	-1.1	-0.9	-0.8
	0.45	-1.9	-1.6	-1.3	-1.0	-0.9
	0.50	-2.2	-1.8	-1.4	-1.2	-1.0
	0.55	-2.4	-2.0	-1.6	-1.3	-1.1

Table 27: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.8	-1.5	-1.2	-1.0	-0.8
	0.30	-2.2	-1.9	-1.4	-1.2	-1.0
	0.35	-2.6	-2.2	-1.7	-1.4	-1.2
	0.40	-3.0	-2.5	-2.0	-1.6	-1.4
	0.45	-3.4	-2.9	-2.2	-1.8	-1.5
	0.50	-3.8	-3.2	-2.5	-2.0	-1.7
	0.55	-4.2	-3.5	-2.8	-2.2	-1.9

Table 28: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.2	-1.8	-1.4	-1.2	-1.0
	0.30	-2.7	-2.2	-1.7	-1.4	-1.2
	0.35	-3.1	-2.7	-2.1	-1.7	-1.4
	0.40	-3.6	-3.1	-2.4	-1.9	-1.6
	0.45	-4.1	-3.5	-2.7	-2.2	-1.9
	0.50	-4.5	-3.8	-3.0	-2.4	-2.1
	0.55	-5.0	-4.2	-3.3	-2.7	-2.3

Table 29: Maximum Applied Downforce (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	3.0	3.6	3.6	3.6	3.6
	0.30	3.1	3.6	3.6	3.6	3.6
	0.35	3.1	3.7	3.6	3.6	3.6
	0.40	3.1	3.7	3.6	3.6	3.6
	0.45	3.1	3.7	3.7	3.6	3.6
	0.50	3.1	3.7	3.7	3.7	3.6
	0.55	3.1	3.7	3.7	3.7	3.7

Table 30: Maximum Applied Shear Force (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.22	1.47	1.47	1.47	1.47
	0.30	1.22	1.47	1.47	1.47	1.47
	0.35	1.22	1.47	1.47	1.47	1.47
	0.40	1.22	1.47	1.47	1.47	1.47
	0.45	1.22	1.47	1.47	1.47	1.47
	0.50	1.21	1.46	1.47	1.47	1.47
	0.55	1.21	1.46	1.47	1.47	1.47

Table 31: Maximum Span Length (m) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.0	*1.5	*1.1	*0.8	*0.7
	0.30	2.0	*1.5	*1.1	*0.8	*0.7
	0.35	2.0	*1.5	*1.1	*0.8	*0.7
	0.40	2.0	*1.5	*1.1	*0.8	*0.7
	0.45	2.0	*1.5	*1.1	*0.8	*0.7
	0.50	2.0	*1.5	*1.1	*0.8	*0.7
	0.55	2.0	*1.5	*1.1	*0.8	*0.7

* Maximum span limited by the L-Foot shear capacity

Table 32: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.9	-0.7	-0.5	-0.4	-0.3
	0.30	-1.1	-0.8	-0.6	-0.5	-0.4
	0.35	-1.3	-1.0	-0.7	-0.6	-0.5
	0.40	-1.5	-1.1	-0.8	-0.7	-0.5
	0.45	-1.7	-1.3	-0.9	-0.7	-0.6
	0.50	-1.9	-1.5	-1.1	-0.8	-0.7
	0.55	-2.1	-1.6	-1.2	-0.9	-0.8

Table 33: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.0	-0.8	-0.6	-0.5	-0.4
	0.30	-1.3	-1.0	-0.7	-0.6	-0.5
	0.35	-1.5	-1.2	-0.8	-0.7	-0.6
	0.40	-1.8	-1.4	-1.0	-0.8	-0.6
	0.45	-2.0	-1.5	-1.1	-0.9	-0.7
	0.50	-2.2	-1.7	-1.2	-1.0	-0.8
	0.55	-2.4	-1.9	-1.4	-1.1	-0.9

Table 34: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.0	-0.8	-0.6	-0.5	-0.4
	0.30	-1.3	-1.0	-0.7	-0.6	-0.5
	0.35	-1.5	-1.2	-0.8	-0.7	-0.6
	0.40	-1.8	-1.4	-1.0	-0.8	-0.6
	0.45	-2.0	-1.5	-1.1	-0.9	-0.7
	0.50	-2.2	-1.7	-1.2	-1.0	-0.8
	0.55	-2.4	-1.9	-1.4	-1.1	-0.9

Table 35: Maximum Applied Downforce (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.0	2.5	2.5	2.4	2.4
	0.30	2.1	2.5	2.5	2.5	2.5
	0.35	2.2	2.6	2.5	2.5	2.5
	0.40	2.4	2.6	2.6	2.5	2.5
	0.45	2.6	2.7	2.6	2.5	2.5
	0.50	2.7	2.7	2.6	2.6	2.5
	0.55	2.9	2.7	2.6	2.6	2.5

Table 36: Maximum Applied Shear Force (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.15	1.47	1.47	1.47	1.47
	0.30	1.15	1.47	1.47	1.47	1.47
	0.35	1.14	1.47	1.47	1.47	1.47
	0.40	1.13	1.47	1.47	1.47	1.47
	0.45	1.13	1.47	1.47	1.47	1.47
	0.50	1.12	1.47	1.47	1.47	1.47
	0.55	1.12	1.47	1.47	1.47	1.47

Appendix E

Design Tables for 72 Cell Panels (East – West Rail Orientation)

Table 1: Maximum Span Length (m) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Low Importance Category						
Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.5	*1.2	*0.9	*0.7	*0.6
	0.30	1.5	*1.2	*0.9	*0.7	*0.6
	0.35	1.5	*1.2	*0.9	*0.7	*0.6
	0.40	1.5	*1.2	*0.9	*0.7	*0.6
	0.45	1.5	*1.2	*0.9	*0.7	*0.6
	0.50	1.5	*1.2	*0.9	*0.7	*0.6
	0.55	1.5	*1.2	*0.9	*0.7	*0.6

* Maximum span govern by the L-Foot shear capacity.

Table 2: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-0.9	-0.7	-0.6	-0.5	-0.4
	0.30	-1.2	-0.9	-0.7	-0.6	-0.5
	0.35	-1.4	-1.1	-0.9	-0.7	-0.6
	0.40	-1.6	-1.3	-1.0	-0.8	-0.7
	0.45	-1.9	-1.5	-1.1	-0.9	-0.8
	0.50	-2.1	-1.6	-1.3	-1.0	-0.9
	0.55	-2.3	-1.8	-1.4	-1.2	-1.0

Table 3: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.7	-1.4	-1.1	-0.9	-0.7
	0.30	-2.1	-1.7	-1.3	-1.1	-0.9
	0.35	-2.5	-2.0	-1.5	-1.2	-1.1
	0.40	-2.9	-2.3	-1.8	-1.4	-1.2
	0.45	-3.3	-2.6	-2.0	-1.6	-1.4
	0.50	-3.7	-2.9	-2.2	-1.8	-1.5
	0.55	-4.1	-3.2	-2.5	-2.0	-1.7

Table 4: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.1	-1.6	-1.3	-1.0	-0.9
	0.30	-2.6	-2.0	-1.6	-1.3	-1.1
	0.35	-3.0	-2.4	-1.8	-1.5	-1.3
	0.40	-3.5	-2.7	-2.1	-1.7	-1.5
	0.45	-4.0	-3.1	-2.4	-2.0	-1.7
	0.50	-4.4	-3.5	-2.7	-2.2	-1.9
	0.55	-4.9	-3.8	-3.0	-2.4	-2.0

Table 5: Maximum Applied Downforce (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	3.3	3.6	3.6	3.6	3.6
	0.30	3.3	3.6	3.6	3.6	3.6
	0.35	3.3	3.6	3.6	3.6	3.6
	0.40	3.3	3.7	3.6	3.6	3.6
	0.45	3.4	3.7	3.6	3.6	3.6
	0.50	3.4	3.7	3.7	3.6	3.6
	0.55	3.4	3.7	3.7	3.7	3.6

Table 6: Maximum Applied Shear Force (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.33	1.47	1.47	1.47	1.47
	0.30	1.33	1.47	1.47	1.47	1.47
	0.35	1.33	1.47	1.47	1.47	1.47
	0.40	1.32	1.47	1.47	1.47	1.47
	0.45	1.32	1.47	1.47	1.47	1.47
	0.50	1.32	1.47	1.47	1.47	1.47
	0.55	1.32	1.47	1.47	1.47	1.47

Table 7: Maximum Span Length (m) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Low Importance Category						
Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.9	*1.3	*0.9	*0.7	*0.6
	0.30	1.9	*1.3	*0.9	*0.7	*0.6
	0.35	1.8	*1.3	*0.9	*0.7	*0.6
	0.40	1.8	*1.3	*0.9	*0.7	*0.6
	0.45	1.8	*1.3	*0.9	*0.7	*0.6
	0.50	1.8	*1.3	*0.9	*0.7	*0.6
	0.55	1.8	*1.3	*0.9	*0.7	*0.6

* Maximum span govern by the L-Foot shear capacity.

Table 8: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.8	-0.6	-0.4	-0.3	-0.3
	0.30	-1.0	-0.7	-0.5	-0.4	-0.4
	0.35	-1.2	-0.9	-0.6	-0.5	-0.4
	0.40	-1.4	-1.0	-0.7	-0.6	-0.5
	0.45	-1.6	-1.2	-0.8	-0.7	-0.5
	0.50	-1.8	-1.3	-0.9	-0.7	-0.6
	0.55	-2.0	-1.4	-1.0	-0.8	-0.7

Table 9: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.0	-0.7	-0.5	-0.4	-0.3
	0.30	-1.2	-0.9	-0.6	-0.5	-0.4
	0.35	-1.5	-1.0	-0.8	-0.6	-0.5
	0.40	-1.7	-1.2	-0.9	-0.7	-0.6
	0.45	-1.9	-1.4	-1.0	-0.8	-0.6
	0.50	-2.2	-1.5	-1.1	-0.9	-0.7
	0.55	-2.4	-1.7	-1.2	-1.0	-0.8

Table 10: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.0	-0.7	-0.5	-0.4	-0.3
	0.30	-1.2	-0.9	-0.6	-0.5	-0.4
	0.35	-1.5	-1.0	-0.8	-0.6	-0.5
	0.40	-1.7	-1.2	-0.9	-0.7	-0.6
	0.45	-1.9	-1.4	-1.0	-0.8	-0.6
	0.50	-2.2	-1.5	-1.1	-0.9	-0.7
	0.55	-2.4	-1.7	-1.2	-1.0	-0.8

Table 11: Maximum Applied Downforce (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.2	2.5	2.4	2.4	2.4
	0.30	2.2	2.5	2.5	2.5	2.4
	0.35	2.3	2.5	2.5	2.5	2.5
	0.40	2.4	2.6	2.5	2.5	2.5
	0.45	2.6	2.6	2.6	2.5	2.5
	0.50	2.8	2.7	2.6	2.5	2.5
	0.55	3.0	2.7	2.6	2.6	2.5

Table 12: Maximum Applied Shear Force (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.26	1.47	1.47	1.47	1.47
	0.30	1.25	1.47	1.47	1.47	1.47
	0.35	1.24	1.47	1.47	1.47	1.47
	0.40	1.24	1.47	1.47	1.47	1.47
	0.45	1.23	1.47	1.47	1.47	1.47
	0.50	1.22	1.47	1.47	1.47	1.47
	0.55	1.22	1.47	1.47	1.47	1.47

Table 13: Maximum Span Length (m) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Low Importance Category						
Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.5	*1.2	*0.9	*0.7	*0.6
	0.30	1.5	*1.2	*0.9	*0.7	*0.6
	0.35	1.5	*1.2	*0.9	*0.7	*0.6
	0.40	1.5	*1.2	*0.9	*0.7	*0.6
	0.45	1.5	*1.2	*0.9	*0.7	*0.6
	0.50	1.5	*1.2	*0.9	*0.7	*0.6
	0.55	1.5	*1.2	*0.9	*0.7	*0.6

* Maximum span govern by the L-Foot shear capacity.

Table 14: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-0.7	-0.5	-0.4	-0.4	-0.3
	0.30	-0.9	-0.7	-0.5	-0.4	-0.4
	0.35	-1.0	-0.8	-0.6	-0.5	-0.5
	0.40	-1.2	-1.0	-0.7	-0.6	-0.5
	0.45	-1.4	-1.1	-0.9	-0.7	-0.6
	0.50	-1.6	-1.2	-1.0	-0.8	-0.7
	0.55	-1.8	-1.4	-1.1	-0.9	-0.8

Table 15: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.3	-1.0	-0.8	-0.7	-0.6
	0.30	-1.6	-1.3	-1.0	-0.8	-0.7
	0.35	-1.9	-1.5	-1.2	-1.0	-0.8
	0.40	-2.2	-1.7	-1.3	-1.1	-0.9
	0.45	-2.5	-2.0	-1.5	-1.2	-1.1
	0.50	-2.8	-2.2	-1.7	-1.4	-1.2
	0.55	-3.1	-2.4	-1.9	-1.5	-1.3

Table 16: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.6	-1.2	-1.0	-0.8	-0.7
	0.30	-2.0	-1.5	-1.2	-1.0	-0.8
	0.35	-2.3	-1.8	-1.4	-1.1	-1.0
	0.40	-2.7	-2.1	-1.6	-1.3	-1.1
	0.45	-3.0	-2.4	-1.8	-1.5	-1.3
	0.50	-3.4	-2.7	-2.1	-1.7	-1.4
	0.55	-3.8	-2.9	-2.3	-1.9	-1.6

Table 17: Maximum Applied Downforce (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	3.3	3.6	3.6	3.6	3.6
	0.30	3.3	3.6	3.6	3.6	3.6
	0.35	3.3	3.6	3.6	3.6	3.6
	0.40	3.3	3.6	3.6	3.6	3.6
	0.45	3.3	3.6	3.6	3.6	3.6
	0.50	3.3	3.7	3.6	3.6	3.6
	0.55	3.3	3.7	3.6	3.6	3.6

Table 18: Maximum Applied Shear Force (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.33	1.47	1.47	1.47	1.47
	0.30	1.33	1.47	1.47	1.47	1.47
	0.35	1.33	1.47	1.47	1.47	1.47
	0.40	1.33	1.47	1.47	1.47	1.47
	0.45	1.33	1.47	1.47	1.47	1.47
	0.50	1.33	1.47	1.47	1.47	1.47
	0.55	1.32	1.47	1.47	1.47	1.47

Table 19: Maximum Span Length (m) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Low Importance Category						
Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.9	*1.3	*0.9	*0.7	*0.6
	0.30	1.9	*1.3	*0.9	*0.7	*0.6
	0.35	1.9	*1.3	*0.9	*0.7	*0.6
	0.40	1.8	*1.3	*0.9	*0.7	*0.6
	0.45	1.8	*1.3	*0.9	*0.7	*0.6
	0.50	1.8	*1.3	*0.9	*0.7	*0.6
	0.55	1.8	*1.3	*0.9	*0.7	*0.6

* Maximum span govern by the L-Foot shear capacity.

Table 20: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.6	-0.4	-0.3	-0.3	-0.2
	0.30	-0.7	-0.5	-0.4	-0.3	-0.3
	0.35	-0.9	-0.6	-0.5	-0.4	-0.3
	0.40	-1.1	-0.8	-0.6	-0.4	-0.4
	0.45	-1.2	-0.9	-0.6	-0.5	-0.4
	0.50	-1.4	-1.0	-0.7	-0.6	-0.5
	0.55	-1.5	-1.1	-0.8	-0.6	-0.5

Table 21: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category						
Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.7	-0.5	-0.4	-0.3	-0.3
	0.30	-0.9	-0.6	-0.5	-0.4	-0.3
	0.35	-1.1	-0.8	-0.6	-0.4	-0.4
	0.40	-1.3	-0.9	-0.7	-0.5	-0.4
	0.45	-1.5	-1.0	-0.8	-0.6	-0.5
	0.50	-1.6	-1.2	-0.8	-0.7	-0.6
	0.55	-1.8	-1.3	-0.9	-0.7	-0.6

Table 22: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.7	-0.5	-0.4	-0.3	-0.3
	0.30	-0.9	-0.6	-0.5	-0.4	-0.3
	0.35	-1.1	-0.8	-0.6	-0.4	-0.4
	0.40	-1.3	-0.9	-0.7	-0.5	-0.4
	0.45	-1.5	-1.0	-0.8	-0.6	-0.5
	0.50	-1.6	-1.2	-0.8	-0.7	-0.6
	0.55	-1.8	-1.3	-0.9	-0.7	-0.6

Table 23: Maximum Applied Downforce (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.1	2.4	2.4	2.4	2.4
	0.30	2.2	2.5	2.4	2.4	2.4
	0.35	2.2	2.5	2.5	2.4	2.4
	0.40	2.2	2.5	2.5	2.5	2.4
	0.45	2.3	2.5	2.5	2.5	2.5
	0.50	2.4	2.6	2.5	2.5	2.5
	0.55	2.5	2.6	2.5	2.5	2.5

Table 24: Maximum Applied Shear Force (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.26	1.47	1.47	1.47	1.47
	0.30	1.26	1.47	1.47	1.47	1.47
	0.35	1.25	1.47	1.47	1.47	1.47
	0.40	1.25	1.47	1.47	1.47	1.47
	0.45	1.24	1.47	1.47	1.47	1.47
	0.50	1.24	1.47	1.47	1.47	1.47
	0.55	1.23	1.47	1.47	1.47	1.47

Table 25: Maximum Span Length (m) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.5	*1.2	*0.9	*0.7	*0.6
	0.30	1.5	*1.2	*0.9	*0.7	*0.6
	0.35	1.5	*1.2	*0.9	*0.7	*0.6
	0.40	1.5	*1.2	*0.9	*0.7	*0.6
	0.45	1.5	*1.2	*0.9	*0.7	*0.6
	0.50	1.5	*1.2	*0.9	*0.7	*0.6
	0.55	1.5	*1.2	*0.9	*0.7	*0.6

* Maximum span govern by the L-Foot shear capacity.

Table 26: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.1	-0.8	-0.7	-0.5	-0.5
	0.30	-1.3	-1.0	-0.8	-0.7	-0.6
	0.35	-1.6	-1.2	-1.0	-0.8	-0.7
	0.40	-1.8	-1.4	-1.1	-0.9	-0.8
	0.45	-2.1	-1.6	-1.3	-1.0	-0.9
	0.50	-2.3	-1.8	-1.4	-1.2	-1.0
	0.55	-2.6	-2.0	-1.6	-1.3	-1.1

Table 27: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.9	-1.5	-1.2	-1.0	-0.8
	0.30	-2.4	-1.9	-1.4	-1.2	-1.0
	0.35	-2.8	-2.2	-1.7	-1.4	-1.2
	0.40	-3.2	-2.5	-2.0	-1.6	-1.4
	0.45	-3.7	-2.9	-2.2	-1.8	-1.5
	0.50	-4.1	-3.2	-2.5	-2.0	-1.7
	0.55	-4.5	-3.6	-2.8	-2.2	-1.9

Table 28: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.4	-1.8	-1.4	-1.2	-1.0
	0.30	-2.9	-2.2	-1.7	-1.4	-1.2
	0.35	-3.4	-2.7	-2.1	-1.7	-1.4
	0.40	-3.9	-3.1	-2.4	-1.9	-1.6
	0.45	-4.4	-3.5	-2.7	-2.2	-1.9
	0.50	-4.9	-3.9	-3.0	-2.4	-2.1
	0.55	-5.4	-4.3	-3.3	-2.7	-2.3

Table 29: Maximum Applied Downforce (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	3.3	3.6	3.6	3.6	3.6
	0.30	3.3	3.6	3.6	3.6	3.6
	0.35	3.3	3.7	3.6	3.6	3.6
	0.40	3.4	3.7	3.6	3.6	3.6
	0.45	3.4	3.7	3.7	3.6	3.6
	0.50	3.4	3.7	3.7	3.7	3.6
	0.55	3.4	3.7	3.7	3.7	3.7

Table 30: Maximum Applied Shear Force (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.33	1.47	1.47	1.47	1.47
	0.30	1.33	1.47	1.47	1.47	1.47
	0.35	1.33	1.47	1.47	1.47	1.47
	0.40	1.32	1.47	1.47	1.47	1.47
	0.45	1.32	1.47	1.47	1.47	1.47
	0.50	1.32	1.47	1.47	1.47	1.47
	0.55	1.32	1.47	1.47	1.47	1.47

Table 31: Maximum Span Length (m) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.9	*1.3	*0.9	*0.7	*0.6
	0.30	1.8	*1.3	*0.9	*0.7	*0.6
	0.35	1.8	*1.3	*0.9	*0.7	*0.6
	0.40	1.8	*1.3	*0.9	*0.7	*0.6
	0.45	1.8	*1.3	*0.9	*0.7	*0.6
	0.50	1.8	*1.3	*0.9	*0.7	*0.6
	0.55	1.8	*1.3	*0.9	*0.7	*0.6

* Maximum span govern by the L-Foot shear capacity.

Table 32: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.9	-0.7	-0.5	-0.4	-0.3
	0.30	-1.2	-0.8	-0.6	-0.5	-0.4
	0.35	-1.4	-1.0	-0.7	-0.6	-0.5
	0.40	-1.6	-1.1	-0.8	-0.7	-0.5
	0.45	-1.8	-1.3	-0.9	-0.7	-0.6
	0.50	-2.0	-1.5	-1.1	-0.8	-0.7
	0.55	-2.2	-1.6	-1.2	-0.9	-0.8

Table 33: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.1	-0.8	-0.6	-0.5	-0.4
	0.30	-1.4	-1.0	-0.7	-0.6	-0.5
	0.35	-1.6	-1.2	-0.8	-0.7	-0.6
	0.40	-1.9	-1.4	-1.0	-0.8	-0.6
	0.45	-2.2	-1.5	-1.1	-0.9	-0.7
	0.50	-2.4	-1.7	-1.2	-1.0	-0.8
	0.55	-2.7	-1.9	-1.4	-1.1	-0.9

Table 34: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.1	-0.8	-0.6	-0.5	-0.4
	0.30	-1.4	-1.0	-0.7	-0.6	-0.5
	0.35	-1.6	-1.2	-0.8	-0.7	-0.6
	0.40	-1.9	-1.4	-1.0	-0.8	-0.6
	0.45	-2.2	-1.5	-1.1	-0.9	-0.7
	0.50	-2.4	-1.7	-1.2	-1.0	-0.8
	0.55	-2.7	-1.9	-1.4	-1.1	-0.9

Table 35: Maximum Applied Downforce (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.2	2.5	2.5	2.4	2.4
	0.30	2.2	2.5	2.5	2.5	2.5
	0.35	2.4	2.6	2.5	2.5	2.5
	0.40	2.6	2.6	2.6	2.5	2.5
	0.45	2.8	2.7	2.6	2.5	2.5
	0.50	3.0	2.7	2.6	2.6	2.5
	0.55	3.2	2.7	2.6	2.6	2.5

Table 36: Maximum Applied Shear Force (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, East - West Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.25	1.47	1.47	1.47	1.47
	0.30	1.24	1.47	1.47	1.47	1.47
	0.35	1.24	1.47	1.47	1.47	1.47
	0.40	1.23	1.47	1.47	1.47	1.47
	0.45	1.22	1.47	1.47	1.47	1.47
	0.50	1.22	1.47	1.47	1.47	1.47
	0.55	1.21	1.47	1.47	1.47	1.47

Enclosure 2:

SOLARMOUNT (SM) Rail Profile
Solar PV Panel Mounting System Structural Evaluation
British Columbia Building Code 2012
North-South Rail Orientation

STEENHOF
BUILDING SERVICES GROUP
"DESIGN *ideas,* ENGINEER *concepts,* MANAGE *the process.*"

Date: April 28, 2017

Project No: 170077

Unirac, Inc.
1411 Broadway NE
Albuquerque, NM 87102

Attention: Jennifer Carey, Senior Structural Engineer,

Dear Ms. Carey;

Re: SOLARMOUNT(SM) Rail Profile 2 - Solar PV Panel Mounting System Structural Evaluation - British Columbia Building Code 2012 – N-S Rail Orientation

Background

At the request of Unirac, Inc., Steenhof Building Service Group (SBSG) has completed a structural review of the SolarMount Solar PV Panel Mounting System - SM- Rail Profile 2 identified in this letter for Housing and Small Building (Part 9 of the British Columbia Building Code 2012) installations in British Columbia, Canada. When installed in accordance with the design specifications described herein, the Solar Mount Rail Solar PV Panel Mounting System components identified in this letter are compliant with the design reference documents identified in this letter until the end of the 2018 calendar year. SBSG would be willing to review and update this evaluation on an annual basis if requested.

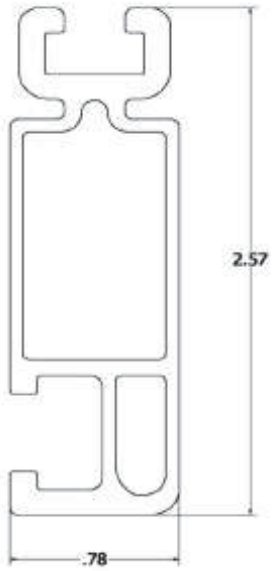


Figure 1 - SOLARMOUNT(SM) Rail Profile 2

Design Reference Documents

- British Columbia Building Code 2012 (BCBC 2012) Part 4 & Part 9.
- National Building Code of Canada 2010 Structural Commentaries (NBCC 2010).
- CAN/CSA-S157-05 Strength Design in Aluminum.
- SolarMount(SM) Rail Profile 2, section properties and material data provided by Unirac, Inc. in Appendix A.
- SolarMount Installation Guide provided in Appendix B.
- L-Foot Roof Connection Capacities provided by Unirac, Inc. in Appendix C.

Overview

The SolarMount Solar PV Panel Mounting System is a solar PV racking system designed for Housing and Small Building (Part 9 of the British Columbia Building Code 2012) roof applications. The SolarMount rails composed of extruded aluminum members are fastened to the roof structure using roof brackets and fasteners (designed and supplied by others) and the solar PV panels are attached to the rails with module clamps. The design of the roof support structure, L-foot, and fastening of the SolarMount Solar PV Panel Mounting System to the existing roof structure is to be completed by others. SBSG has utilized the capacities of the L-Foot roof connections in deriving the maximum rail spans, however final L-Foot connection spacing may be governed by the L-Foot attachment strength that will vary on a project-by-project basis. Therefore an engineer shall confirm the proposed roof connections are adequate on a project specific basis. SBSG has not reviewed, nor do we express an opinion on the design of the attachment of the SolarMount System to the existing roof structure.

Methodology and Design Limitations:

Design tables (found in Appendix D for 60 Cell Panels and in Appendix E for 72 Cell Panels) were developed for a wide range of roof loadings commonly found in British Columbia. These tables provide the maximum span length of SolarMount Rail Profile 2, the maximum factored downward force at a support location, the maximum factored uplift force at a support location, and the maximum factored shear force at a support location.

Based on SBSG's experience on residential solar projects, it is valid to assume a low importance for the wind and snow load evaluation (for part 4 loads) for the purpose of evaluating the maximum span of the solar mount rail. However the reactions of the solar mount system to the building were calculated assuming a normal importance factor (for base building design purposes).

Our design tables are developed based on the final design snow values. In our analysis, we compared both British Columbia Building Code (ABC) 2014 Part 4 snow load (utilizing reduction factors for low importance category and roof slope) with (ABC) 2014 Part 9 snow loads and considered the minimum design snow load value in our calculations. In our opinion and experience, this is a valid approach as the actual roof snow load can be much less than that based on BCBC 2012 Part 9 provisions due to the following reasons.

1. Flush mount systems have a slippery surface that will result in snow sliding off the panels and roof structure.
2. BCBC 2012 Part 9 provisions provides same design snow load regardless of the roof slope. However, practically, roofs with higher slopes will be subject to lower snow deposits due to sliding of snow off the roof.

Therefore the user of the design tables shall calculate the design snow load (S) based on following two methods and shall select the lower value but not less than 0.50 kPa.

1. Method 1 - BCBC 2012 Part 9 snow load
   $S = C_b * S_s + S_r$ where;
   S_s = 1-in-50-year ground snow load, determined in accordance with BCBC 2012, Appendix C
   S_r = 1-in-50-year associated rain load, determined in accordance with BCBC 2012, Appendix C
   C_b =0.55.

2. Method 2 - BCBC 2012 Part 4 snow load

   $S = I_s [S_s (C_b C_w C_s C_a) + S_r]$ where,

   I_s = 0.8

   S_s = 1-in-50-year ground snow load, determined in accordance with BCBC 2012, Appendix C

   C_b = basic roof snow load factor = 0.8

   C_w = wind exposure factor = 1

   C_s = slope factor (60° - α)/45° where α is the roof slope in degrees (for slippery surfaces where snow and ice can slide off the roof)

   C_a = shape factor = 1
   S_r = 1-in-50-year associated rain load, determined in accordance with BCBC 2012, Appendix C

The specified wind loads were determined in accordance with the BCBC 2012 and the NBCC 2010 Structural Commentaries (see Figures 2 and 3). For seismic design, it has been assumed that $I_E F_a S_a(0.2)$ is less than 1.06.

The attached design tables have been developed for typical Housing and Small Building (Part 9 of the British Columbia Building Code 2012) applications using the design parameters listed below. Applications not conforming to these parameters will require additional analysis:

Design Parameters:

- The $q_{1/50}$ hourly wind pressures can be obtained from Appendix C of the BCBC 2012, Climatic and Seismic Information for Building Design in British Columbia.
- The 1-in-50 year ground snow load (S_s) and the 1-in-50 year rain load (Sr) can be obtained from Appendix C, Climatic and Seismic Data Supplementary Standard for the BCBC 2012.
- $I_E F_a S_a(0.2)$ is less than 1.06.
- Maximum weight of panels including racking system, conduits and accessories is 0.24kPa (5Psf).
- Maximum Solar PV Panel Dimensions:
  1 60 Cell Panel - 1676.4 mm x 1016 mm.
  2 72 Cell Panel – 1981.2 mm x 1016 mm.
- Panel Orientation: Portrait.
- Rail Orientation: N-S direction (Rails along the roof slope)
- Panels are supported using two independent support rails per row of panels.
- Panel Installation Angle: Flush with roof slope.
- Roof Slope: 10°-27°, 27°-45°

- Aluminum Density = 2.70 g/cm^3.
- Minimum Aluminum Ultimate Tensile Strength = 260MPa.
- Minimum Aluminum Tensile Yield Strength = 240 MPa.
- Building Roof Mean Height: 0m – 5.9m & 5.9m - 10 m
- Specified Snow Load (kPa): 1.0, 1.5, 2.0, 2.5, 3.0. for roof slopes 10°-27°
- Specified Snow Load (kPa): 0.5, 1.0, 1.5, 2.0, 2.5 for roof slopes 27°-45°
- Reference Wind Velocity Pressure $q_{1/50}$ (kPa): 0.25, 0.30, 0.35, 0.40, 0.45, 0.50, 0.55.
- Importance Factor for Snow (ULS): I_s=0.9
- Importance Factor for Snow (SLS): I_s=0.8
- Importance Factor for Wind (ULS): I_w=0.9
- Importance Factor for Wind (SLS): I_w=0.75.
- Allowable Deflection = L/60 (total load).
- Gust and External Pressure Coefficients (C_pC_g) and the different loading areas are defined on Figures 1 and 2 below.

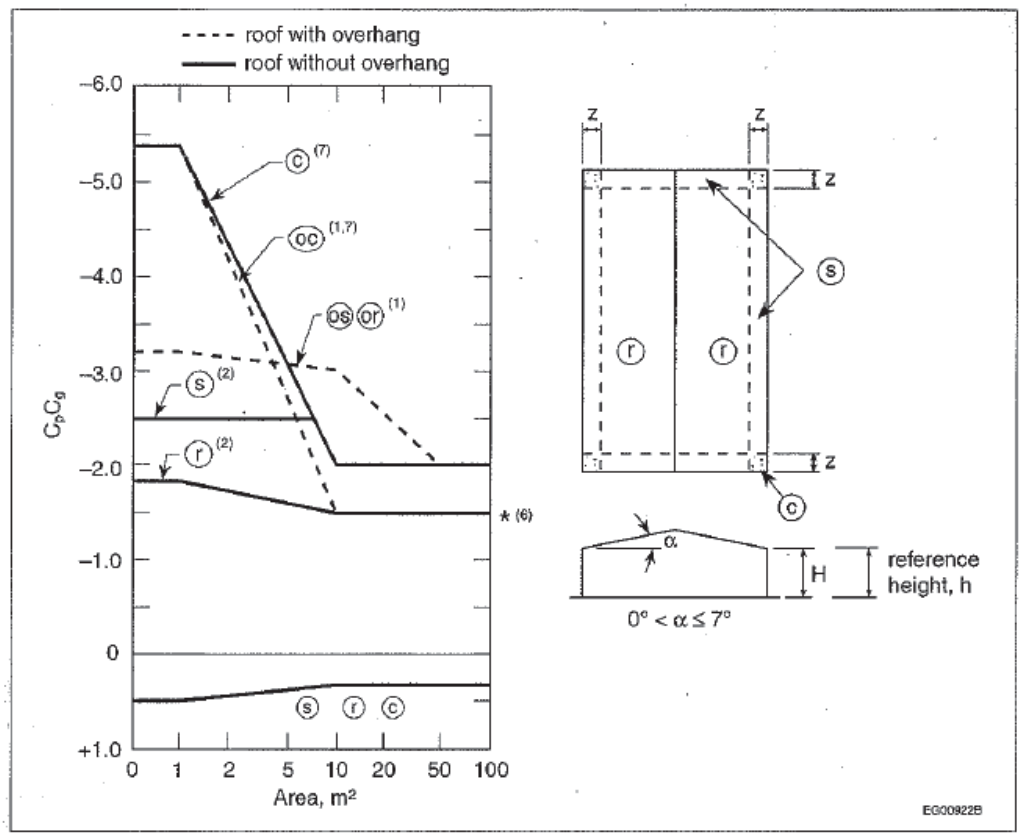


Figure I-9

External peak composite pressure-gust coefficients, C_pC_g, on roofs with a slope of 7° or less for the design of structural components and cladding

Notes to Figure I-9:

(1) Coefficients for overhung roofs have the prefix "o" and refer to the same roof areas as referred to by the corresponding symbol without a prefix. They include contributions from both upper and lower surfaces. In the case of overhangs, the walls are inboard of the roof outline.[37]

(2) s and r apply to both roofs and upper surfaces of canopies.

(3) The abscissa area in the graph is the design tributary area within the specified zone.

(4) End-zone width z is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

(5) Combinations of exterior and interior pressures must be evaluated to obtain the most severe loading.

(6) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface. Each structural element must be designed to withstand the forces of both signs.

(7) For calculating the uplift forces on tributary areas larger than 100 m² on unobstructed nearly-flat roofs with low parapets, and where the centre of the tributary area is at least two building heights from the nearest edge, the value of C_pC_g may be reduced to −1.1 at x/H = 2 and further reduced linearly to −0.6 at x/H= 5, where x is distance to the nearest edge and H is building height.[38]

(8) For roofs having a perimeter parapet that is 1 m high or greater, the corner coefficients C_pC_g for small tributary areas can be reduced from −5.4 to −4.4.[40][41]

Figure 2: Composite Pressure-Gust Coefficients for Roof Slopes 0°-7°

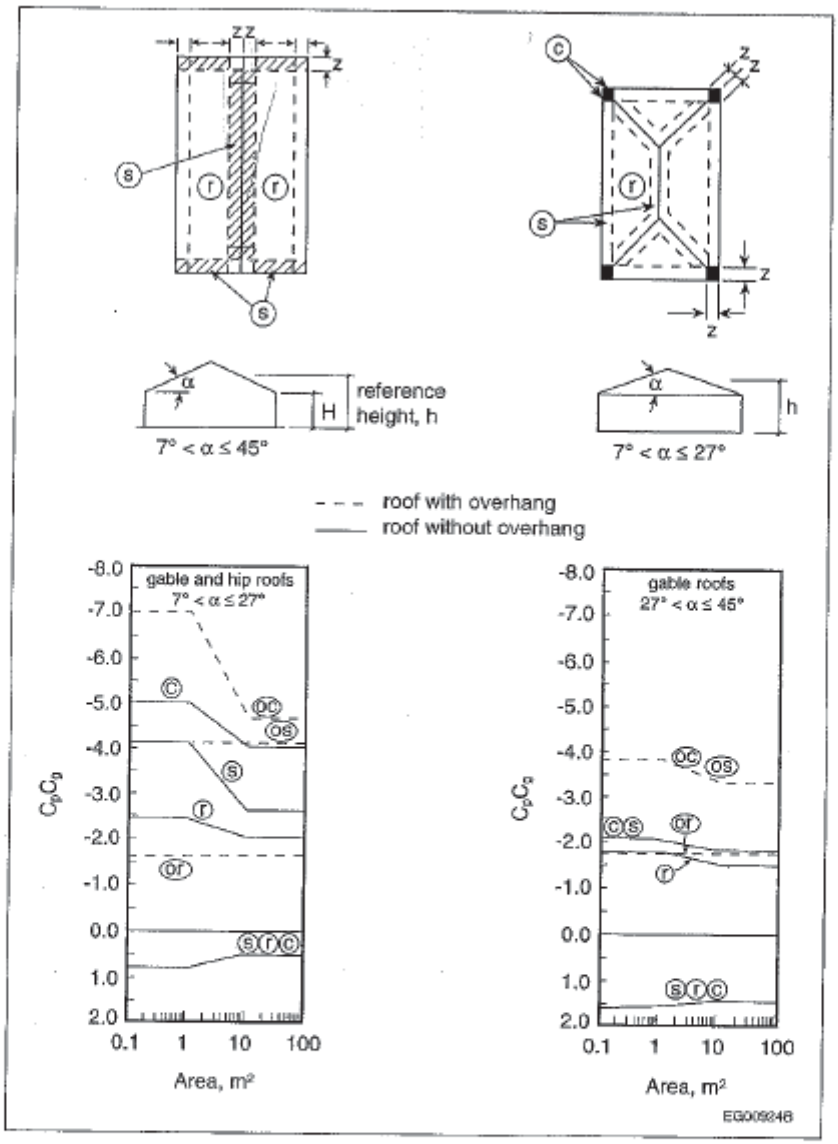


Figure I-11

External peak composite pressure-gust coefficients, C_pC_g, on single-span gabled and hipped roofs with a slope of 7° or greater for the design of structural components and cladding

Notes to Figure I-11:

(1) Coefficients for overhung roofs have the prefix "o" and refer to the same roof areas as referred to by the corresponding symbol without a prefix. They include contributions from both upper and lower surfaces.[24][44]

(2) The abscissa area in the graph is the design tributary area within the specified zone.

(3) End-zone width z is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

(4) Combinations of exterior and interior pressures must be evaluated to obtain the most severe loading.

(5) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface. Each structural element must be designed to withstand the forces of both signs.

(6) For hipped roofs with 7° < α ≤ 27°, edge/ridge strips and pressure-gust coefficients for ridges of gabled roofs apply along each hip.[45]

Figure 3: Composite Pressure-Gust Coefficients for Roof Slopes 7°-45°

Installation Notes:

- Installations shall be completed in conformance with the SolarMount Installation Guide (Appendix B) and this letter.
- Abide to all local jurisdictional requirements regarding roof setbacks and climatic data.
- Racking and PV panels shall not be installed on roof overhangs or within 250 mm (10") of roof edges.
- Panels shall be installed along the full height of roof slopes to ensure snow will slide off panels.
- All rail members shall be continuous over a minimum of two supports.
- SM Rail Profile 2 splices shall only be made at locations directly adjacent to Rail support locations.
- The maximum allowable member cantilever length shall not exceed one third (1/3) of the adjacent span length. SM Rail Profile 2 splices shall not be installed on a cantilevered span or the first adjacent span.
- The reaction loads defined in the design tables are only applicable to span lengths conforming to the associated loading conditions. These roof reactions loads can be linearly interpolated for smaller span lengths. The roof reactions were calculated assuming a normal importance factor.
- The final L-Foot connection spacing and attachment shall be designed by others on a site specific basis. The L-Foot connection capacity will depend on number of site specific factors including the excess capacity of the roof framing, roof joist or truss spacing, member size & condition of the roof structural members, etc.

Summary

The attached design tables in Appendix D for 60 Cell panels and in Appendix E for 72 Cell panels provide the maximum span lengths for the SolarMount Rail Profile 2 and associated reaction loads based on Limit States Design and serviceability deflection limits. This report does not include the design of the roof support structure, L-Foot, Clamps and fastening of the SolarMount System to the existing roof structure (to be completed by others). SBSG can undertake to provide engineering services for any configuration not specifically designed herein.

We trust the above information is clear, however, please do not hesitate to contact the undersigned if you have any questions or require additional information.

Steenhof Building Service Group
Jack Steenhof, P.Eng.
Principal Structural Engineer

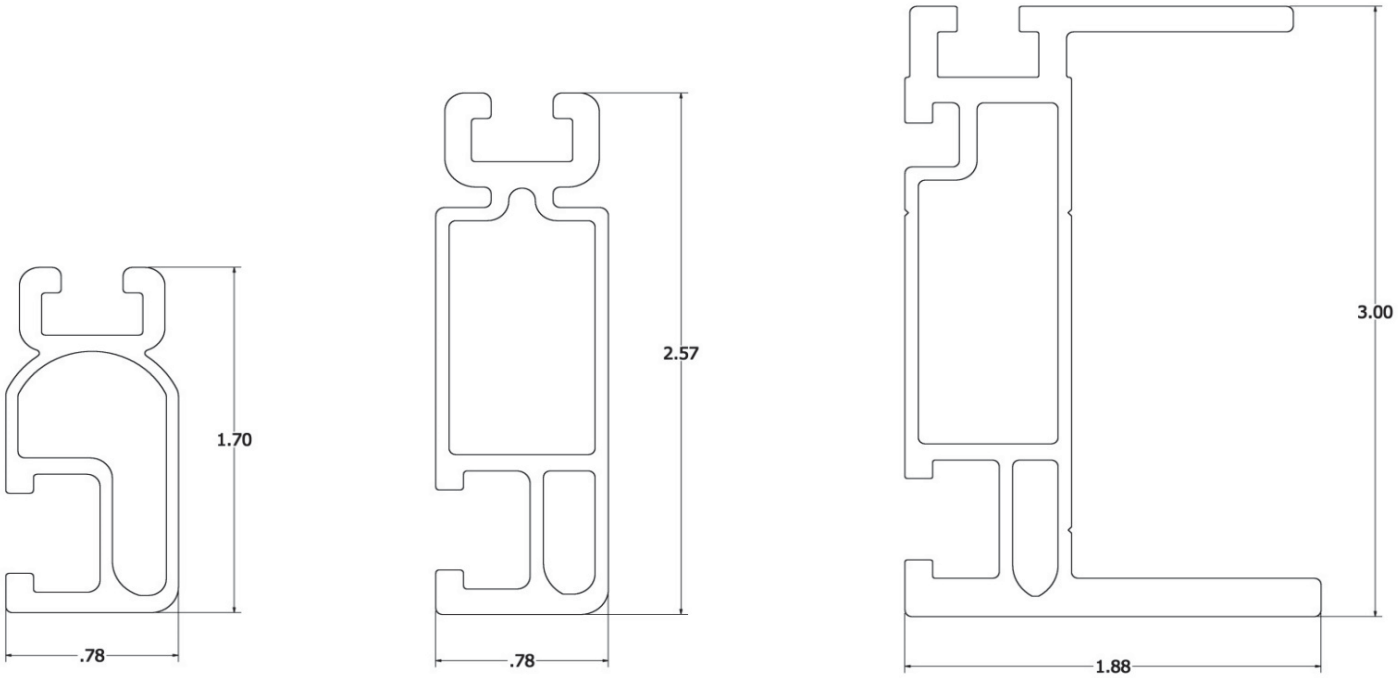
April 28, 2017

Attachments:

1. Appendix A - SolarMount(SM) Rail Profile 2, section properties and material data provided by Unirac, Inc.
2. Appendix B - SolarMount Installation Guide.
3. Appendix C - L-Foot Roof Connection Capacities provided by Unirac, Inc.
4. Appendix D - Design Tables for 60 Cell Panels.
5. Appendix E - Design Tables for 72 Cell Panels.

Appendix A

SolarMount(SM) Rail Profile 2, section properties and material data provided by Unirac, Inc.



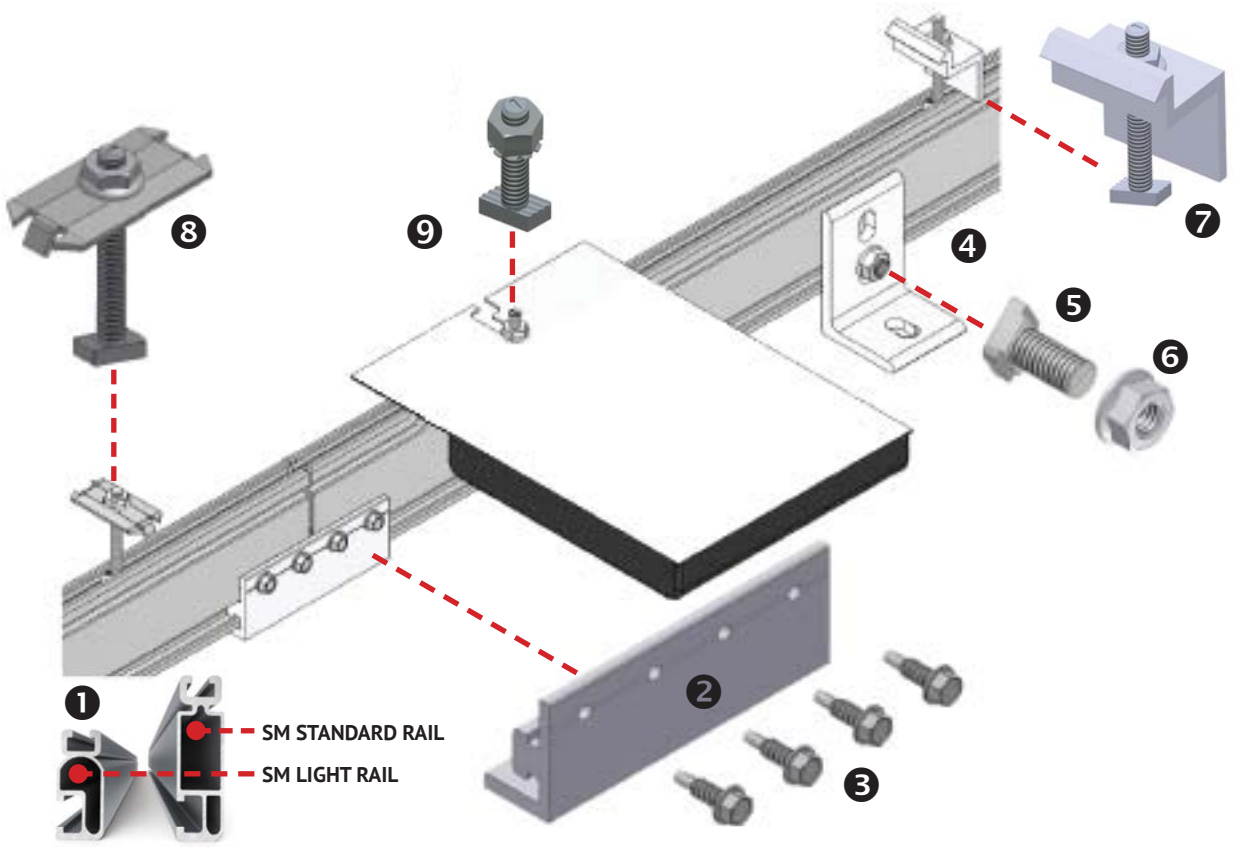
Properties	SOLARMOUNT Light	SOLARMOUNT Rail Profile 2	SOLARMOUNT HD	Units
BEAM HEIGHT	1.70	2.57	3.00	in
APPROX WEIGHT	0.491	0.728	1.271	plf
CROSS SECTION AREA	0.409	0.625	1.059	in^2
SECTION MODULUS (X-AXIS)	0.15	0.363	0.898	in^3
SECTION MODULUS (Y-AXIS)	0.067	0.113	0.221	in^3
MOMENT OF INERTIA (X-AXIS)	0.13	0.467	1.45	in^4
MOMENT OF INERTIA (Y-AXIS)	0.026	0.045	0.267	in^4
RADIUS OF GYRATION (X-AXIS)	0.564	0.865	1.17	in
RADIUS OF GYRATION (Y-AXIS)	0.254	0.269	0.502	in

Appendix B

SolarMount Installation Guide

STANDARD SYSTEM COMPONENTS

INSTALLATION GUIDE



❶RAIL: Supports PV modules. Use at least two per row of modules. Aluminum extrusion, available in mill, clear anodized, or dark anodized.

❷RAIL SPLICE: Non structural splice joins, aligns, and electrically bonds rail sections into single length of rail. Forms either a rigid or thermal expansion joint, 4 inches long, pre-drilled (see page F). Anodized aluminum extrusion available in clear or dark.

❸SELF-DRILLING SCREW: (No. 12 x ¾") – Use 4 per rigid splice or 2 per expansion joint. Stainless steel. Supplied with splice. In combination with rigid splice, provides rail to rail bond.

❹L-FOOT: Use to secure rails through roofing material to building structure. Refer to loading tables or U-Builder for spacing.

❺L-FOOT T- BOLT: (3/8" x ¾") – Use one per L-foot to secure rail to L-foot. Stainless steel. Supplied with L-foot. In combination with flange nut, provides electrical bond between rail and L-foot.

❻SERRATED FLANGE NUT (3/8"): Use one per L-foot to secure and bond rail to L-foot. Stainless steel. Supplied with L-foot.

❼MODULE ENDCLAMP: Provides bond from rail to endclamp. Pre-assembled aluminum clamp available in clear or dark finish. Supplied washer keeps clamp and bolt upright for ease of assembly.

❽MODULE MIDCLAMP: Pre-assembled clamp provides module to module and module to rail bond. Stainless steel clamp and T-bolt. Available in clear or dark finish.

❾MICROINVERTER MOUNTING BOLT: Pre-assembled bolt and nut attaches and bonds microinverter to rail. Washer at base keeps bolt upright for ease of assembly.

NOTE - POSITION INDICATOR: T-bolts have a slot in the hardware end corresponding to the direction of the T-Head.

Wrenches and Torque

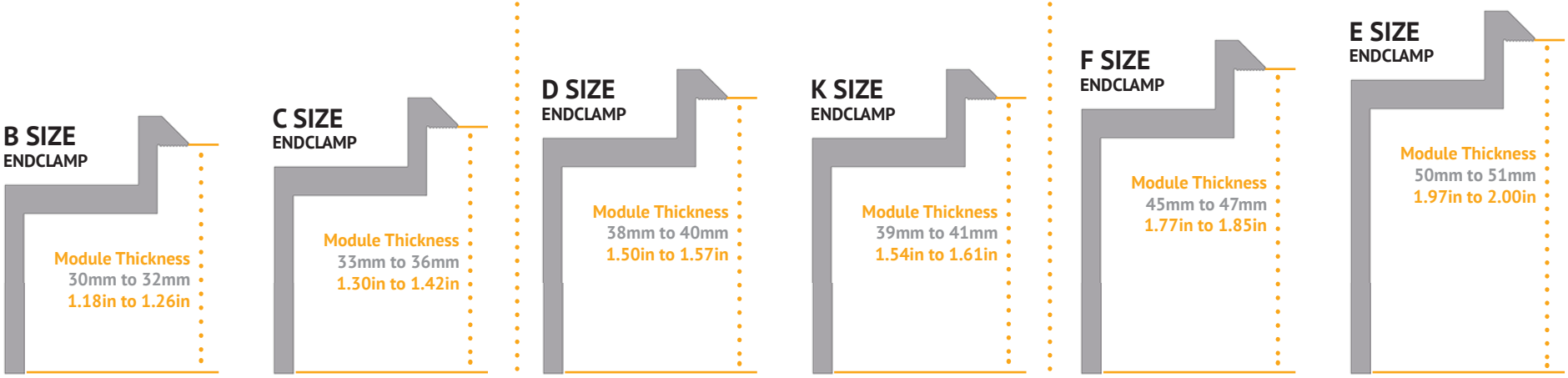
	Wrench Size	Recommended Torque (ft-lbs)
1/4" Hardware ❼❽❾	7/16"	*10
3/8" Hardware ❺	9/16"	*30
#12 Hardware ❸	5/16"	10

Torques are not designed for use with wood connectors *w/Anti-Seize.

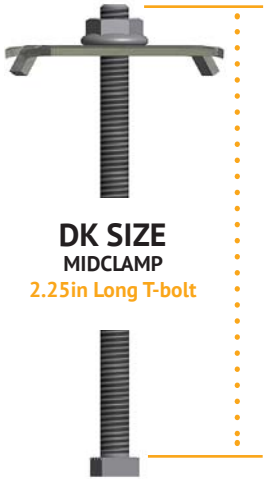
Anti-Seize*

Stainless steel hardware can seize up, a process called galling. To significantly reduce its likelihood:

1. Apply minimal lubricant to bolts, preferably Anti-Seize commonly found at auto parts stores
2. Shade hardware prior to installation, and
3. Avoid spinning stainless nuts onto bolts at high speed.



BC SIZE
MIDCLAMP
2in Long T-bolt



DK SIZE
MIDCLAMP
2.25in Long T-bolt

EF SIZE
MIDCLAMP
2.5in Long T-bolt

PLANNING YOUR SOLARMOUNT INSTALLATIONS

The installation can be laid out with rails parallel to the rafters or perpendicular to the rafters. Note that SOLARMOUNT rails make excellent straight edges for doing layouts.

Center the installation area over the structural members as much as possible.

Leave enough room to safely move around the array during installation. Some building codes and fire codes require minimum clearances around such installations, and the installer should check local building code requirements for compliance.

The length of the installation area is equal to:

- the total width of the modules,
- plus ¼" inch for each space between modules (for mid- clamp),
- plus approximately 3 inches (1½ inches for each Endclamp)

LAYING OUT L-FEET FOR TOP CLAMPS

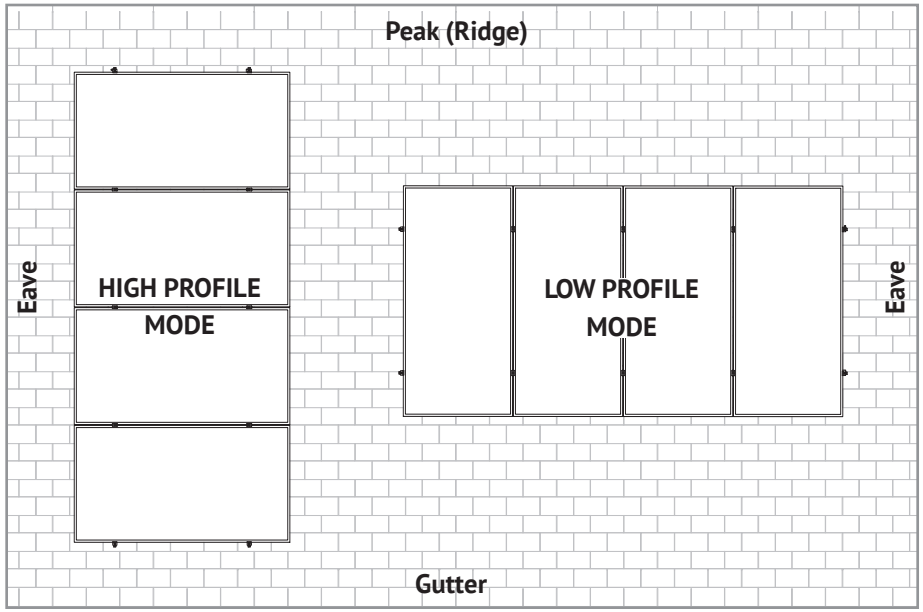
L-feet, in conjunction with proper flashing equipment and techniques, can be used for attachment through existing roofing material, such as asphalt shingles, sheathing or sheet metal to the building structure.

Locate and mark the position of the L-feet lag screw holes within the installation area as shown below. Follow manufacturer module guide for rail spacing based on appropriate mounting locations.

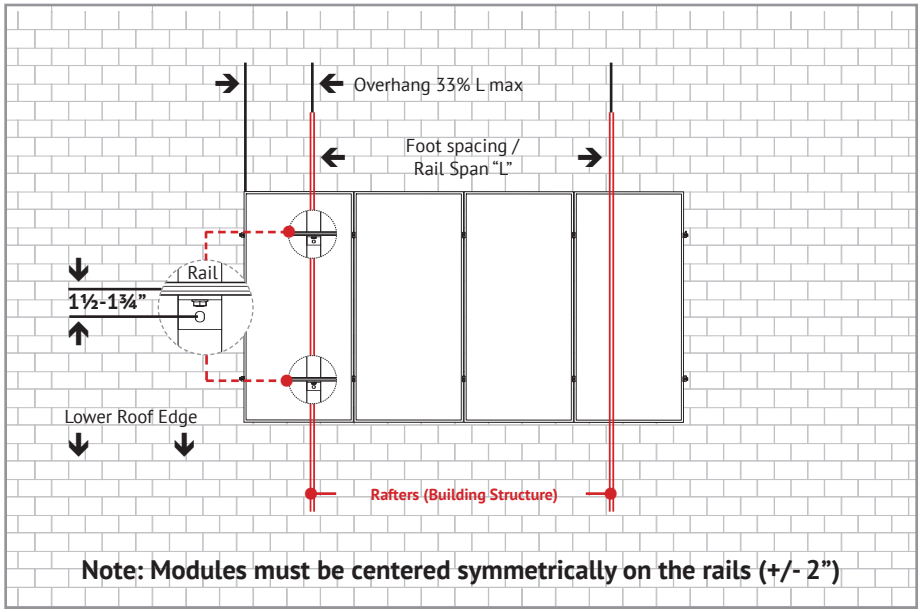
If multiple rows are to be installed adjacent to one another, it is not likely that each row will be centered above the rafters. Adjust as needed, following the guidelines below as closely as possible.

Refer to Unirac Solarmount D&E Guide & U-Builder for allowable spans and cantilevers.

RAILS MAY BE PLACED PARALLEL OR PERPENDICULAR TO RAFTERS



LAYOUT WITH RAILS PERPENDICULAR TO RAFTERS (RECOMMENDED)



Note: Modules must be centered symmetrically on the rails (+/- 2")

SM SOLAR MOUNT

INSTALLATION GUIDE

TABLE OF CONTENTS

A - SYSTEM COMPONENTS
B- MODULE COMPATIBILITY
C- SYSTEM LAYOUT
D- FIRE SYSTEM COMPLIANCE NOTES
E - ROOF ATTACHMENT & L-FEET
F- SPLICE & THERMAL BREAK
G- ATTACH RAIL TO L-FEET
H- MICROINVERTER MOUNTING
I- SYSTEM GROUNDING
J - ENDCLAMP, TRIM & FIRST MODULE
K- BONDING MIDCLAMP & TRIM
L- REMAINING MODULES & TRIM
M- BONDING CONNECTION GROUND PATHS
N- BONDING CONNECTION GROUND PATHS - MAINTENANCE
0- TRIM RETROFIT INSTALLATION

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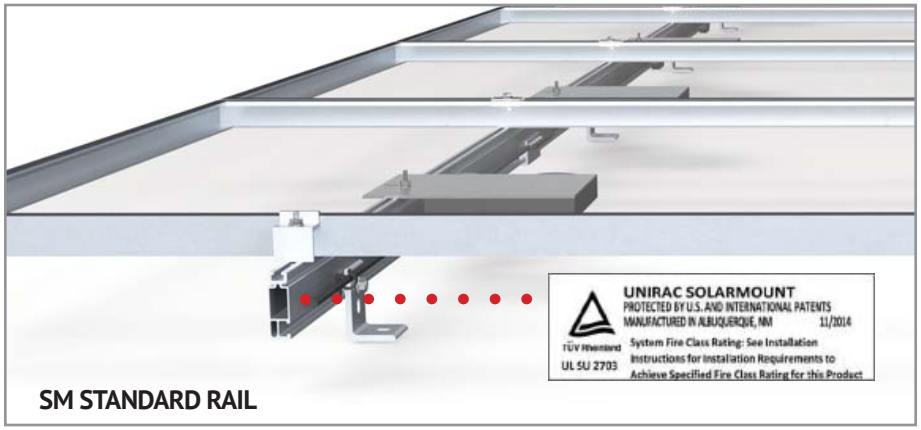
SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SOLARMOUNT Installation Guide. SOLARMOUNT 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. SOLARMOUNT has achieved system level performance for steep sloped roofs. System level fire performance is inherent in the SOLARMOUNT 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 SOLARMOUNT. Module Types & System Level Fire Ratings are listed below:

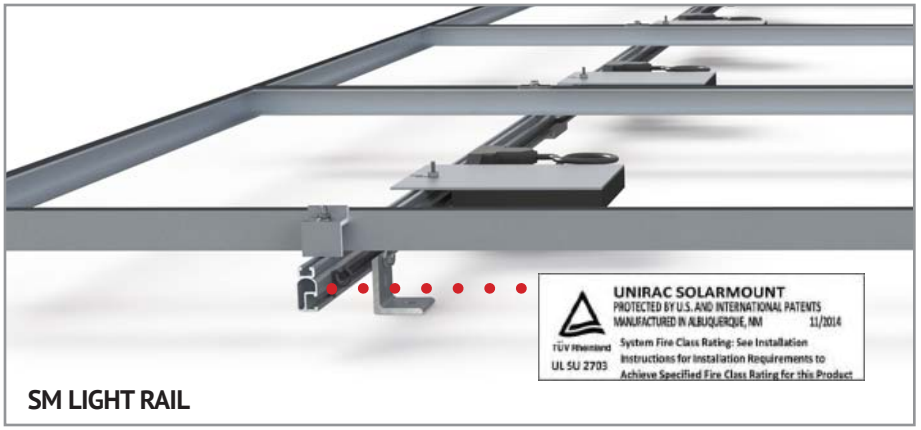
Rail Type	Module Type	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Standard Rail	Type 1, Type 2, Type 3 & Type 10	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Light Rail	Type 1 & Type 2	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required

UL2703 CERTIFICATION MARKING LABEL

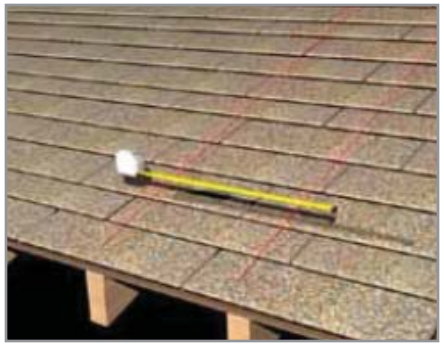
Unirac SOLARMOUNT is listed to UL 2703. Marking Labels are shipped with the Midclamps. After the racking system is fully assembled, a single Marking Label should be applied to the SOLARMOUNT rail at the edge of the array. Note: The sticker label should be placed such that it is visible, but not outward facing.



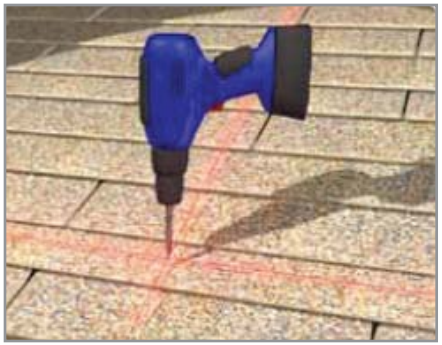
SM STANDARD RAIL



SM LIGHT RAIL



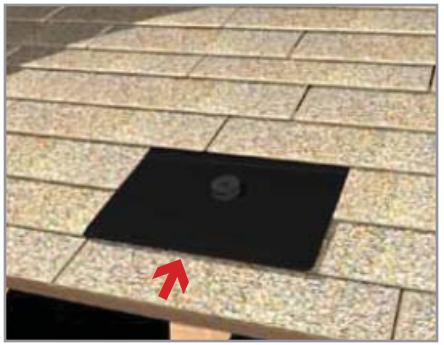
ROOF PREPARATION: Layout and install flashing at rafter locations determined per Design and Engineering Guide.



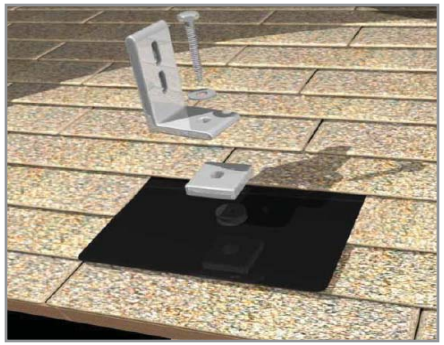
DRILL PILOT HOLES: Center the roof attachment over the rafter and drill a pilot hole(s) for the lag bolt(s).

NOTE: Determine lag bolt size and embedment depth.

Quick Tip: Pre-drill the pilot hole through the flat flashing lag bolt location for easier installation.

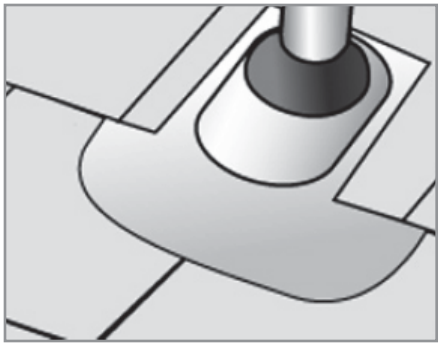


FLAT FLASHING INSTALLATION: Insert the Flat Flashing so the top part is under the next row of shingles and the hole lines up with the pilot hole.



INSTALL LAG BOLTS & L-FOOT: Insert the lag bolt through the L-Foot in the order shown in the illustration. Verify proper orientation before tightening lag bolts.

See Unirac Flat Flashing Manual for Additional Details.



2 PIECE ALUMINUM STANDOFF WITH FLASHING & L-FOOT:

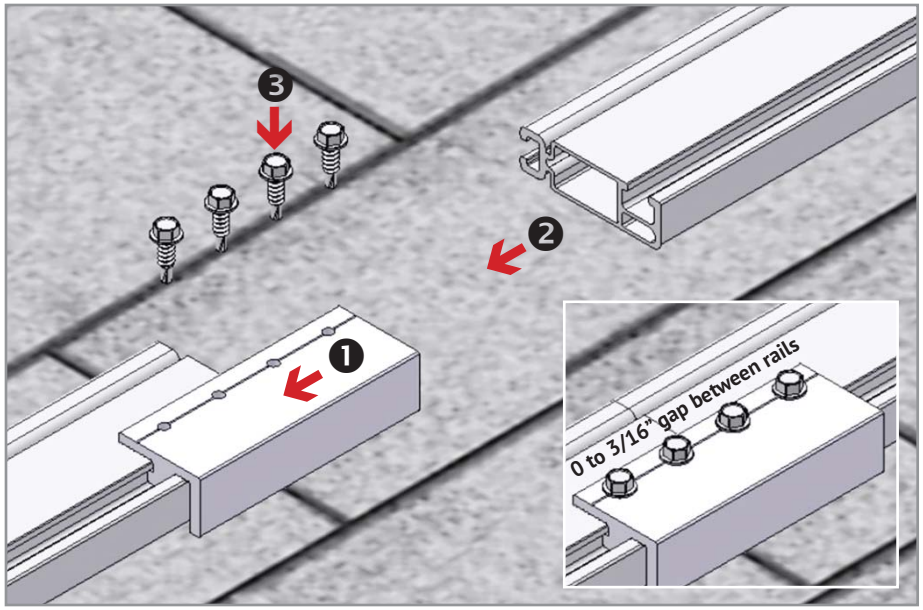
- If necessary cut an opening in the roofing material over a rafter to accommodate the flashing riser.
- Install the standoff, ensuring that both lag bolts are screwed into the rafter.
- Insert the flashing under the shingle above and over the shaft of the standoff. (No-Calk™ collar does not require sealing of the flashing and standoff shaft)
- Add L-Foot to top with bolt that secures the EPDM washer to the top of the standoff.

See Standoffs & Flashings Installation Manual 907.2 for Additional Details.

TOP MOUNT TILE HOOK & L-FOOT:

- Remove or slide up the roof tile, position the roof hook above the roof rafter
- Place Tile Hook in the middle of the underlying interlocking tile's valley. Drill 3/16 inch pilot holes through the underlayment into the center of the rafters. Securely fasten each tile hook to the rafters with two 5/16" x 3½" lag screws. Slide down or re-insert the tile.
- Attach L Foot to tile roof hook.

See Tile Hook Universal Mount Installation Manual for Additional Information.



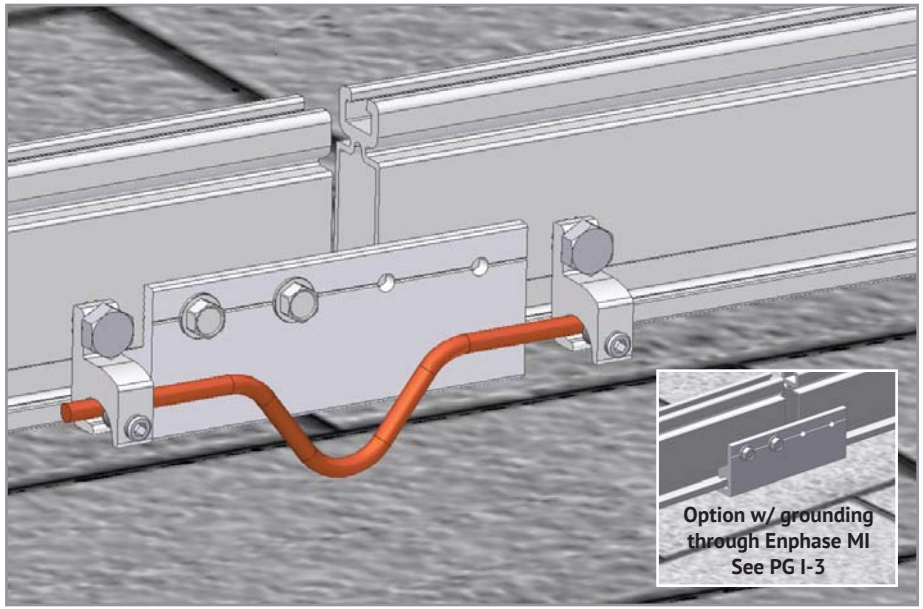
SPLICE INSTALLATION (IF REQUIRED PER SYSTEM DESIGN)

If your installation uses SOLARMOUNT splice bars, attach the rails together before mounting to the L-feet / footings. Use splice bars only with flush installations or those that use low-profile tilt legs. A rail should always be supported by more than one footing on both sides of the splice. There should be a gap between rails, up to 3/16" at the splice connections. T-bolts should not be placed less than a distance of 1" from the end of the rail regardless of a splice.

TORQUE VALUE (See Note on PG. A)

Hex head socket size 5/16" - Do not exceed 10 ft-lbs. Do not use Anti-Seize.

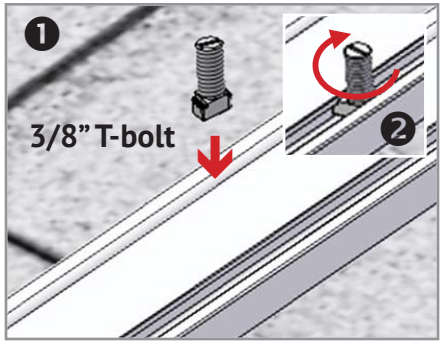
Max length of spliced rail is 40 ft. An expansion joint is required > 40 ft.



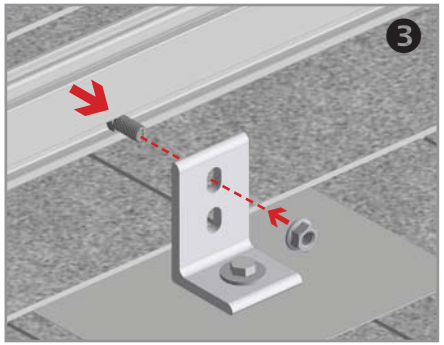
EXPANSION JOINT USED AS THERMAL BREAK

Expansion joints prevent buckling of rails due to thermal expansion. Splice bars may be used for thermal expansion joints. To create a thermal expansion joint, slide the splice bar into the footing slots of both rail lengths. Leave approximately ½" between the rail segments. Secure the splice bar with two screws on one side only. Footings (such as L-feet or standoffs) should be secured normally on both sides of the splice. No PV module or mounting hardware component should straddle the expansion joint. Modules must clearly end before the joint with mounting hardware (top mount Endclamps) terminating on that rail. T-bolts should not be placed less than a distance of 1" from the end of the rail regardless of a splice. The next set of modules would then start after the splice with mounting hardware beginning on the next rail. **A thermal break is required every 40 feet of continuously connected rail. For additional concerns on thermal breaks in your specific project, please consult a licensed structural engineer. Runs of rail less than 40 feet in length, with more than two pairs spliced together, are an acceptable installation for the SOLARMOUNT systems.**

Bonding connection for splice used as a thermal break. Option shown uses two Ilsco lugs (Model No. GBL-4DBT P/N GBL-4DBT - see product data sheet for more details) and solid copper wire.

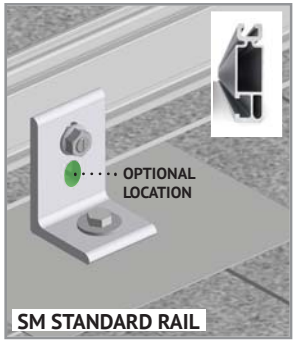


PLACE T-BOLT INTO RAIL & SECURE BOLT: Insert 3/8" T-bolt into rail at L-foot locations. Apply Anti-Seize to bolt. Rotate T-bolt into position.

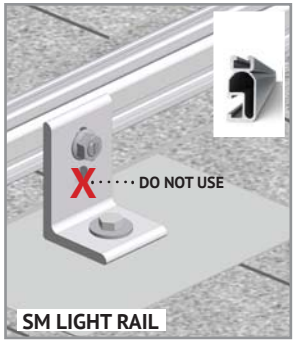


SECURE T-BOLT: Apply Anti-Seize to bolt. Rotate T-bolt into position.

Note:
Allowable L-foot slot locations for SM Standard & Light Rail.



SM STANDARD RAIL: Use either slot to connect the L-foot to the rail to obtain the desired height and alignment when using SM Standard rail.



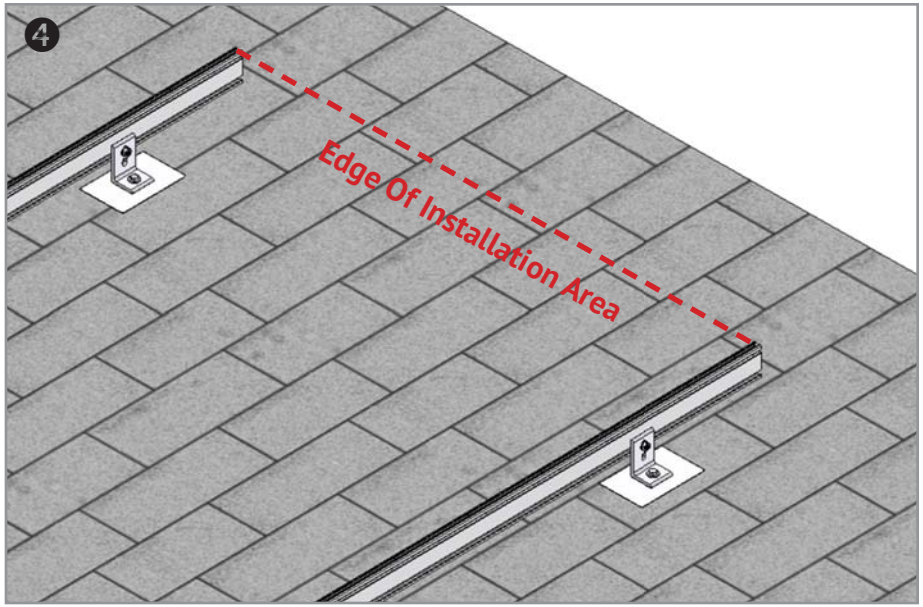
SM LIGHT RAIL: For a lower profile array when using SM Light rail, rotate the L-foot to orient the side with only one (1) slot against the rail. **Only use the slot location closet to the rail to connect the lag bolt to the flashing / roof on the side with two (2) slots.**

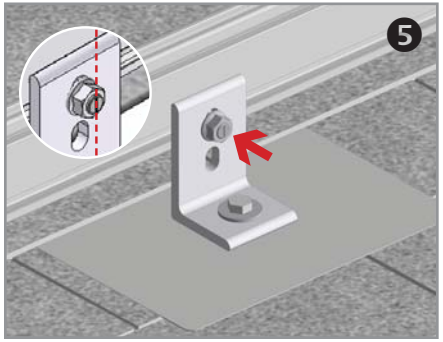
NOTE: Use only the top slot to connect the L-foot to the rail to obtain the desired height and alignment when using SM Light rail.

ALIGN RAILS: Align one pair of rail ends to the edge of the installation area. The opposite pair of rail ends will overhang installation area. Do not Trim them off until the installation is complete. If the rails are perpendicular to the rafters, either end of the rails can be aligned, but the first module must be installed at the aligned end.

If the rails are parallel to the rafters, the aligned end of the rails must face the lower edge of the roof. Securely tighten all hardware after alignment is complete.

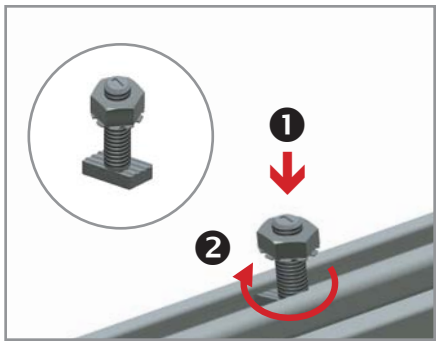
Mount modules to the rails as soon as possible. Large temperature changes may bow the rails within a few hours if module placement is delayed.



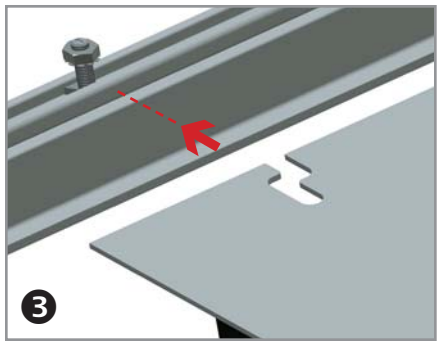


ALIGN POSITION INDICATOR: Hand tighten nut until rail alignment is complete. Verify that position indicator on bolt is vertical (perpendicular to rail)

TORQUE VALUE (See Note on PG. A)
3/8" nut to 30 ft-lbs



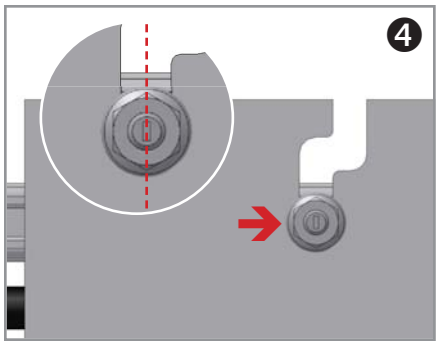
INSTALL MICROINVERTER MOUNT T-BOLT: Apply Anti-Seize and install pre-assembled ¼" dia. bonding T-bolts into top ¼" rail slot at microinverter locations. Rotate bolts into position.



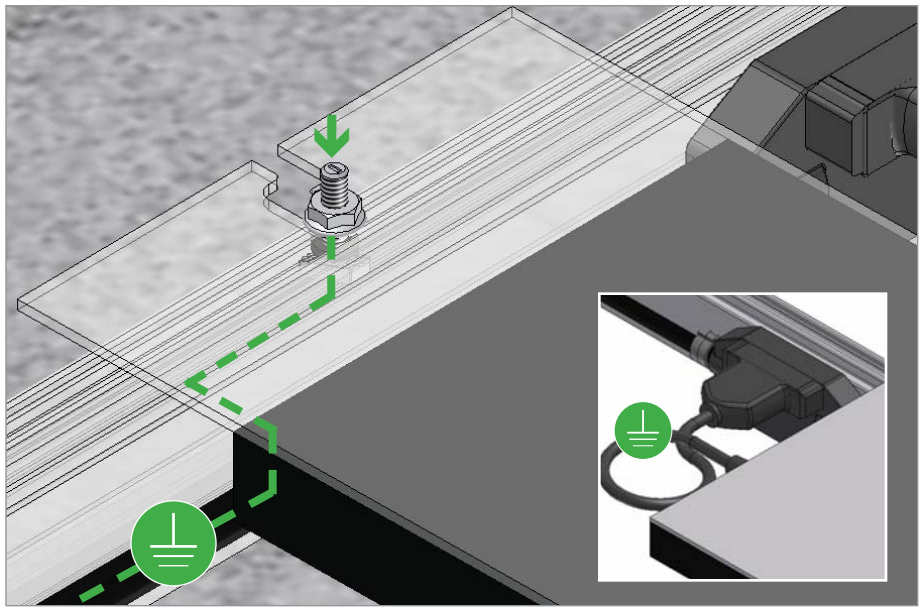
INSTALL MICROINVERTER: Install microinverter on to rail. Engage with bolt.

INSTALL MICROINVERTER:

TORQUE VALUE (See Note on PG. A)
1/4" nut to 10 ft-lbs w/Anti-Seize



ALIGN POSITION INDICATOR: Verify that position indicator on bolt is perpendicular to rail.



SM EQUIPMENT GROUNDING THROUGH ENPHASE MICROINVERTERS

The Enphase M215 and M250 microinverters have integrated grounding capabilities built in. In this case, the DC circuit is isolated from the AC circuit, and the AC equipment grounding conductor (EGC) is built into the Enphase Engage integrated grounding (IG) cabling.

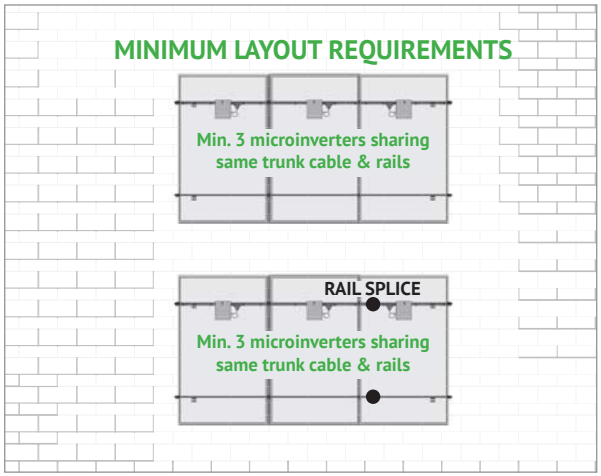
In order to ground the SOLARMOUNT racking system through the Enphase microinverter and Engage cable assembly, there must be a minimum of three PV modules connected to the same trunk cable within a continuous row. Continuous row is defined as a grouping of modules installed and bonded per the requirements of this installation guide sharing the same two rails. The microinverters are bonded to the SOLARMOUNT rail via the mounting hardware. Complete equipment grounding is achieved through the Enphase Engage cabling with integrated grounding (IG). No additional EGC grounding cables are required, as all fault current is carried to ground through the Engage cable.

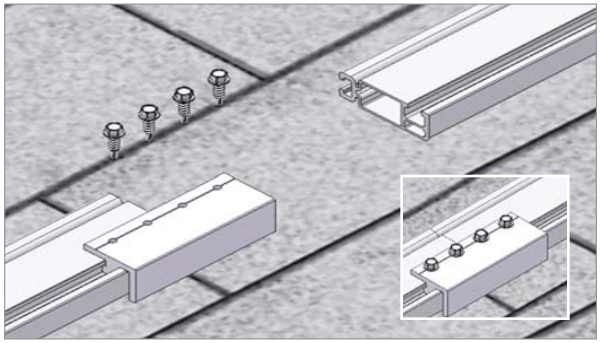
SOLARMOUNT INTEGRATED BONDING ADVANTAGE

WITH SYSTEM GROUNDING THROUGH ENPHASE MICROINVERTERS AND TRUNK CABLES

LOSE ALL THE COPPER & LUGS

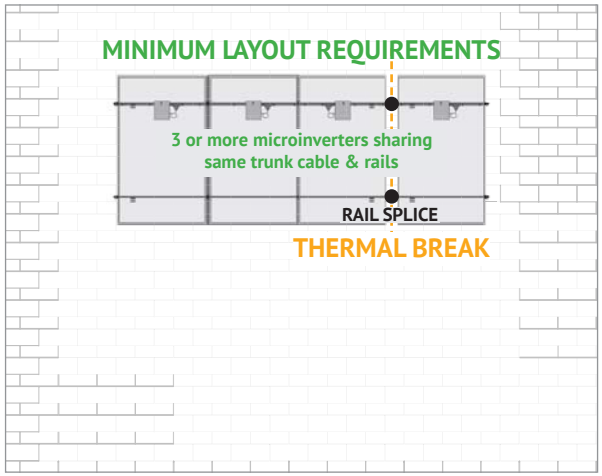
CONTINUOUS RAIL & ELECTRICAL BONDING SPLICE
Enphase Microinverter (MI) Requirements (Model No. M215 & M250)
3 Microinverters sharing same trunk cable & rails

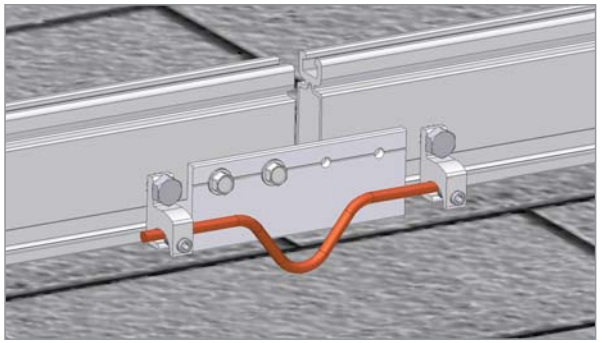




ELECTRICAL BONDING SPLICE

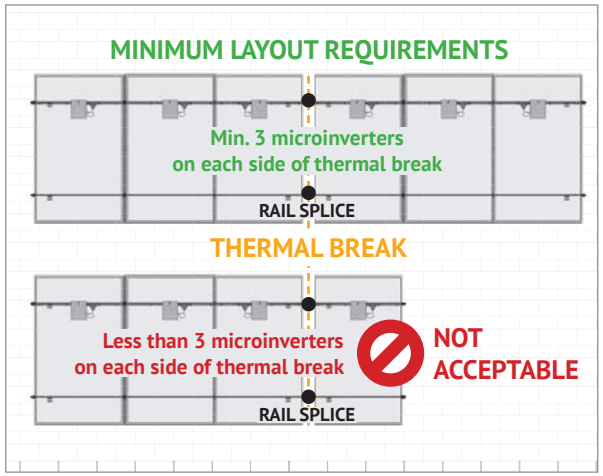
EXPANSION JOINT W/GROUNDING LUGS & COPPER JUMPER
Enphase Microinverter (MI) Requirements (Model No. M215 & M250)
3 or more Microinverters sharing same trunk cable & rails

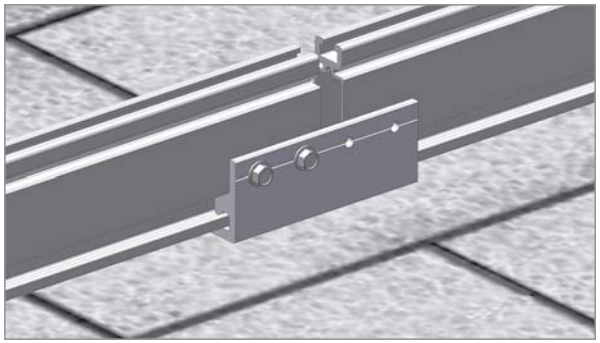




EXPANSION JOINT USED AS THERMAL BREAK W/ GROUNDING LUGS & COPPER JUMPER

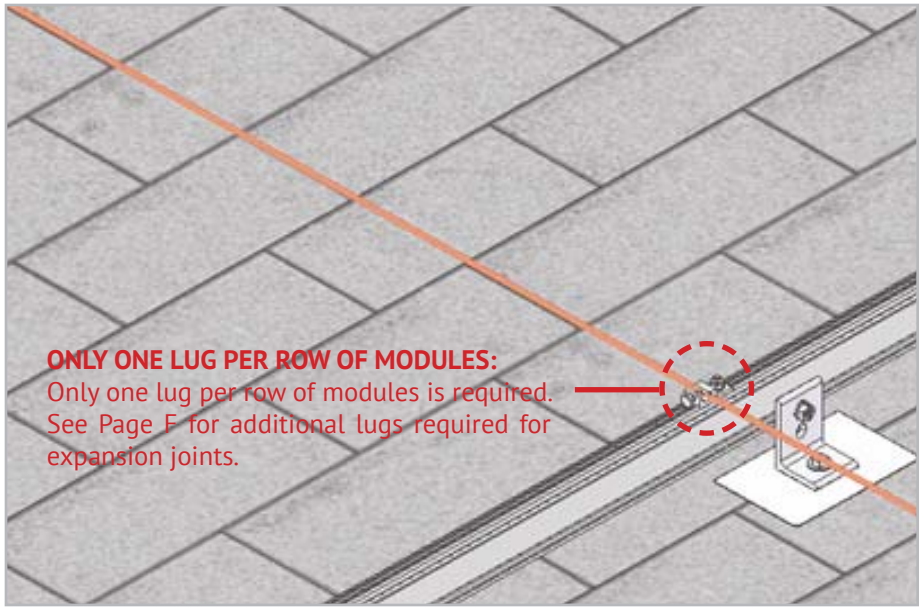
EXPANSION JOINT W/O ELECTRICAL BONDING CONNECTION
Enphase Microinverter (MI) Requirements (Model No. M215 & M250)
MIn. 3 Microinverters on each side of thermal break





EXPANSION JOINT USED AS THERMAL BREAK W/O ELECTRICAL BONDING CONNECTION

NOTE: THE ABOVE IMAGES ARE SAMPLE CONFIGURATIONS TO ILLUSTRATE THE REQUIREMENTS FOR SM SYSTEM GROUNDING THROUGH ENPHASE MICROINVERTERS DESCRIBED ON PAGE I-2

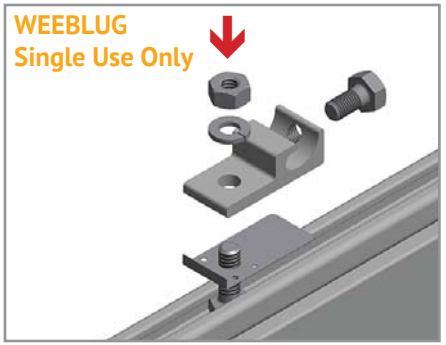


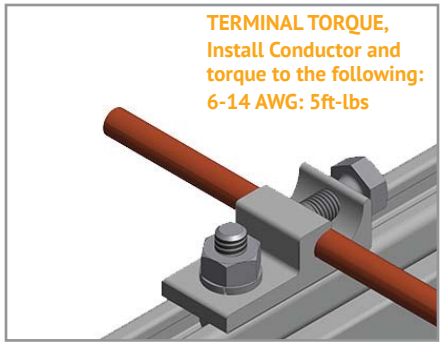
GROUNDING LUG MOUNTING DETAILS:
Details are provided for both the WEEB and Ilsco products. The WEEBLug has a grounding symbol located on the lug assembly. The Ilsco lug has a green colored set screw for grounding indication purposes. Installation must be in accordance with NFPA NEC 70, however the electrical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

Required if not using approved integrated grounding microinveters

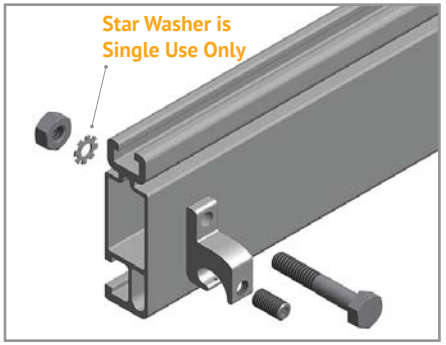
GROUNDING LUG - BOLT SIZE & DRILL SIZE		
GROUND LUG	**BOLT SIZE**	**DRILL SIZE**
WEEBLug	1/4"	N/A - Place in Top SM Rail Slot
IlSCO Lug	#10-32	7/32"

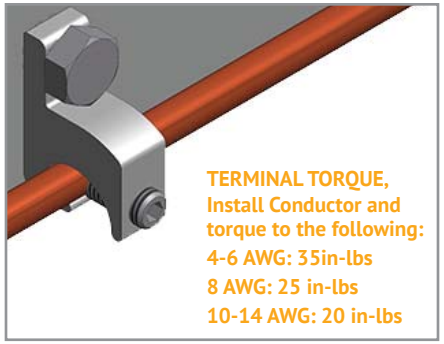
- Torque value depends on conductor size.
- See product data sheet for torque value.





WEEBLUG CONDUCTOR - UNIRAC P/N 008002S:
Apply Anti Seize and insert a bolt in the aluminum rail and through the clearance hole in the stainless steel flat washer. 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 Note on PG. A)
See product data sheet for more details, Model No. WEEB-LUG-6.7

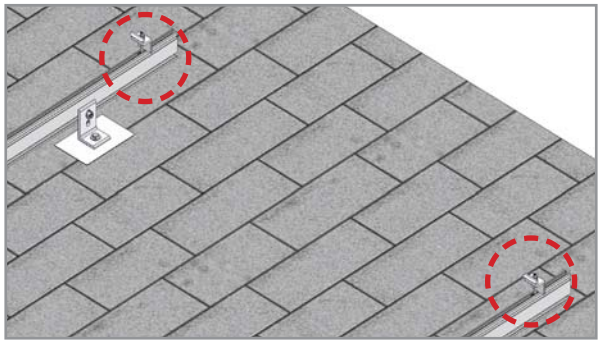




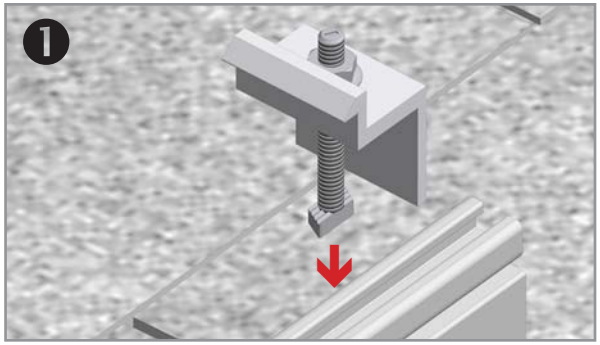
ILSCO LAY-IN LUG CONDUCTOR - UNIRAC P/N 008009P: Alternate Grounding Lug - Drill, deburr hole and bolt thru both rail walls per table.
TORQUE VALUE 5 ft lbs. (See Note on PG. A)
See ILSCO product data sheet for more details, Model No. GBL-4DBT.

NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION

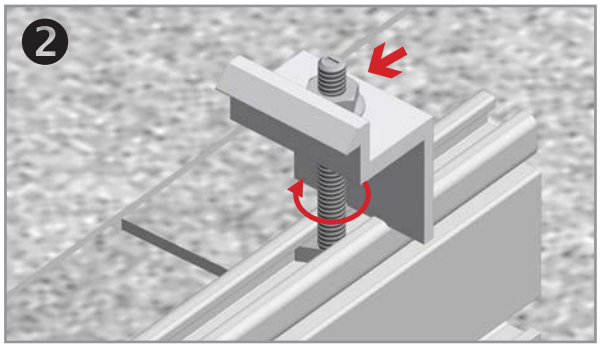
ENDCLAMP, FIRST MODULE &TRIM



INSTALL MODULE ENDCLAMPS: The Endclamp is supplied as an assembly with a T-bolt, serrated flange nut, and washer. The washer retains the clamp at the top of the assembly. This will enable the clamp to remain upright for module installation.

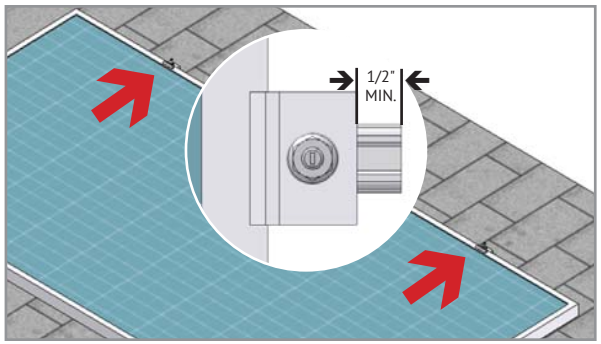


INSERT ENDCLAMP T-BOLT: Insert 1/4" T-bolt into rail.



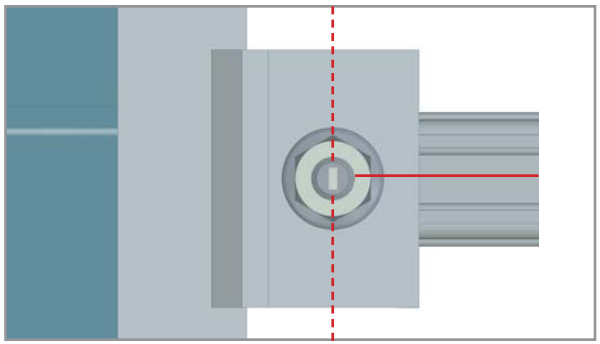
ROTATE ENDCLAMP T-BOLT: Rotate T-bolt into position. Verify that the position indicator & T-bolt shaft are angled in the correct position.

End clamps are positioned on rails prior to the first end module and installed after the last end module.



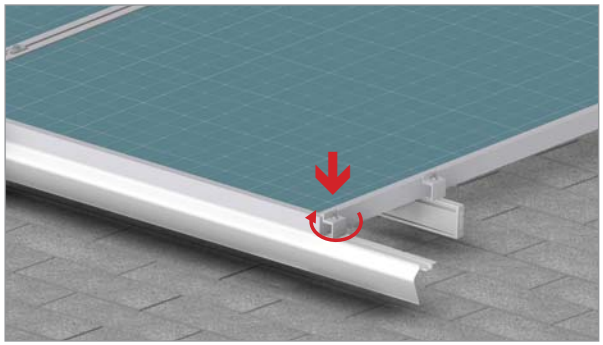
INSTALL FIRST MODULE: Install the first end module onto rails. Engage module frame with Endclamps. Verify that the position indicator & T-bolt shaft are angled in the correct position.

TORQUE VALUE (See Note on PG. A) 1/4" nuts to 10 ft-lbs. w/Anti Seize



POSITION INDICATOR - SERRATED T-BOLT: Verify the T-bolt position indicator is perpendicular to the rail.

TRIM INSTALLATION INSTRUCTIONS

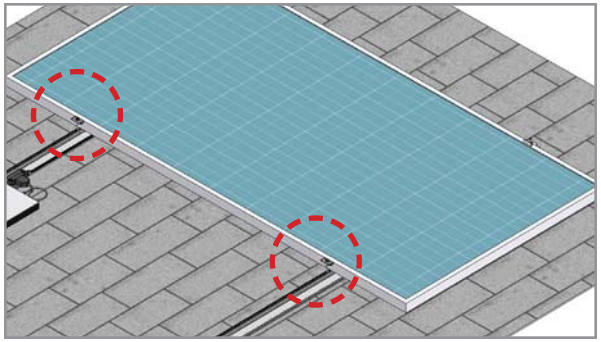


TRIM ENDCLAMPS: Install Endclamps on Trim in like manner to module endclamps per install instructions above.

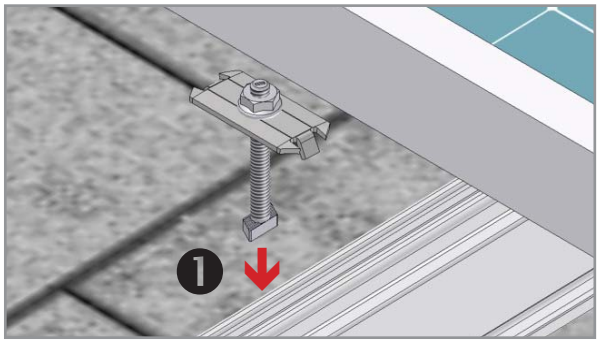
TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs w/ Anti Seize

BONDING MIDCLAMP & TRIM

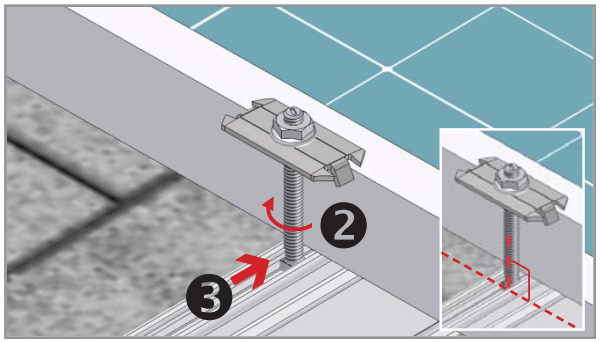
INSTALLATION GUIDE



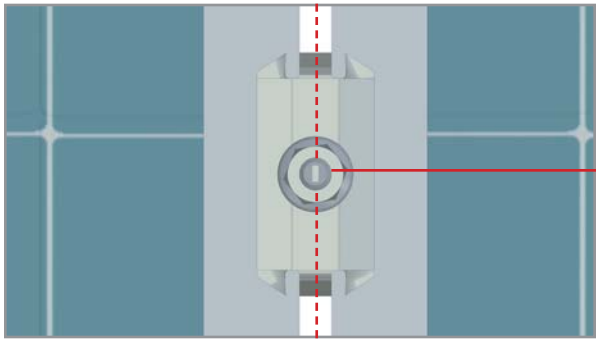
INSTALL MIDCLAMPS: Midclamp is supplied as an assembly with a T-bolt for module installation. Clamp assemblies may be positioned in rail near point of use prior to module placement.



INSERT MIDCLAMP T-BOLT: Apply Anti-Seize and insert 1/4" T-bolt into rail.

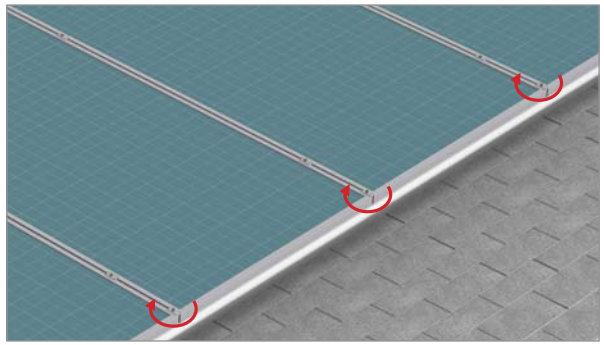


ROTATE MIDCLAMP T-BOLT: Rotate bolt into position and slide until bolt and clamp are against module frame. Do not tighten nut until next module is in position. Verify that the position indicator & T-bolt shaft are angled in the correct position.



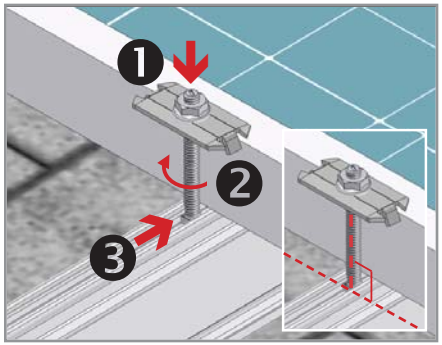
POSITION INDICATOR - SERRATED T-BOLT: Verify the T-bolt position indicator is perpendicular to the rail.

TRIM INSTALLATION INSTRUCTIONS



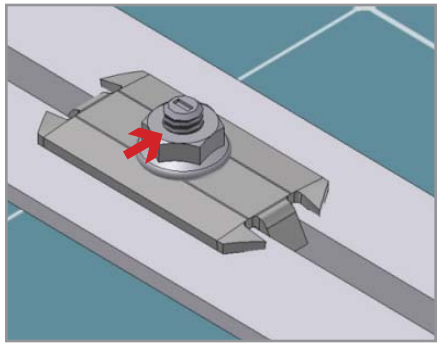
TRIM MIDCLAMPS: Ensure Trim lip is in contact with module face and verify alignment marks on T-bolts are in proper position, tighten midclamp on Trim, repeat at each gap between modules.

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs w/ Anti Seize



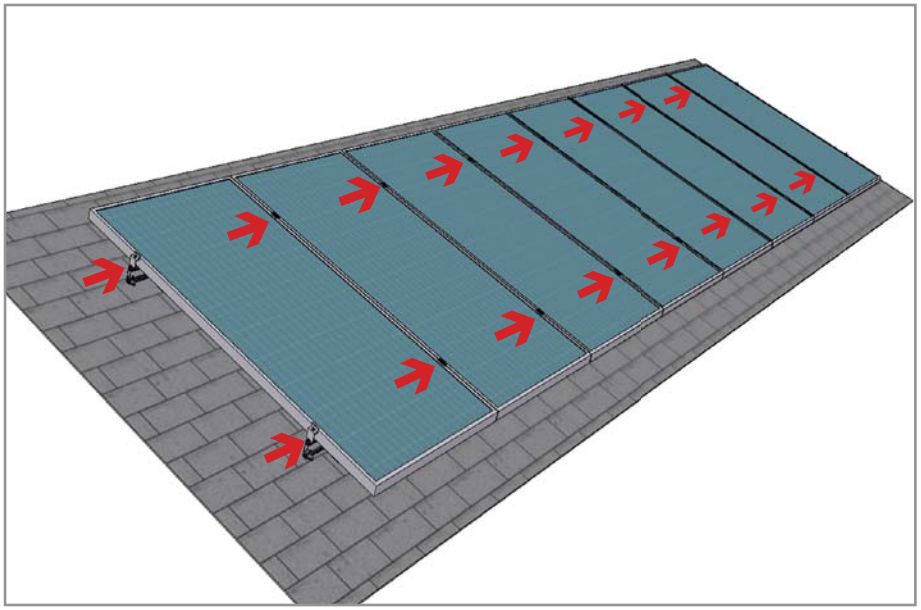
INSTALL REMAINING MID-CLAMPS: Proceed with module installation. Engage each module with previously positioned Midclamp assemblies.

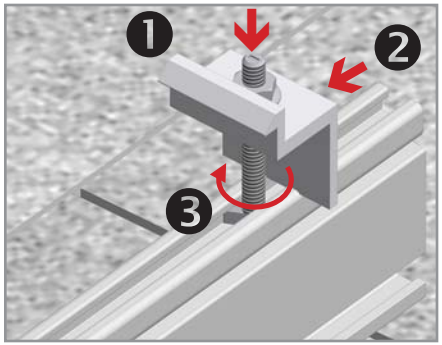
NOTE: Apply Anti-Seize to each Mid Clamp prior to installation.



POSITION T-BOLT ALIGNMENT MARKS: Verify that the position indicator(s) & T-bolt shaft(s) are angled in the correct position.

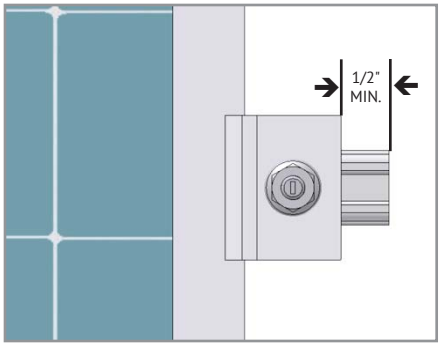
TORQUE VALUE (See Note on PG. A)
1/4" nuts to 10 ft-lbs. w/Anti Seize





INSTALL ENDCLAMPS: Apply Anti-Seize and install final Endclamps in same manner as first Endclamps. Slide clamps against module.

TORQUE VALUE (See Note on PG. A)
1/4" nuts to 10 ft-lbs. w/Anti Seize

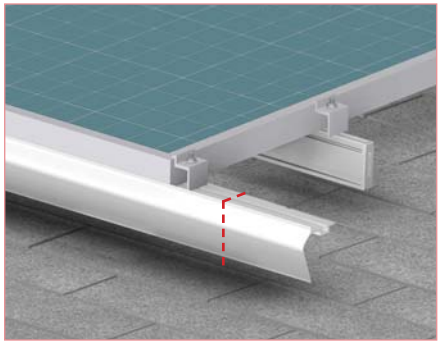


POSITION T-BOLT ALIGNMENT MARKS & CUT RAIL: Verify that the position indicator(s) & T-bolt shaft(s) are angled in the correct position. Trim off any excess rail, being careful not to cut into the roof. Allow ½" between the Endclamp and the end of the rail.

FINISH MODULE INSTALLATION: Proceed with module installation. Engage each module with the previously positioned clamp assembly:

- Install second module
- Install remaining Midclamps & modules & position alignment marks
- Install Endclamps & position alignment marks
- Cut rail to desired length

TRIM INSTALLATION INSTRUCTIONS



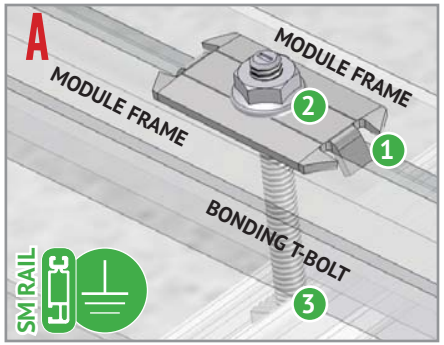
FINISH TRIM INSTALLATION, INSTALL ENDCLAMP & CUT EXCESS RAIL: Install final endclamp & Cut away excess Trim at end of array or where required for proper cantilevers. **See D&E Guide or U-Builder for allowable cantilevers.**

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs w/ Anti Seize

SM SOLAR MOUNT

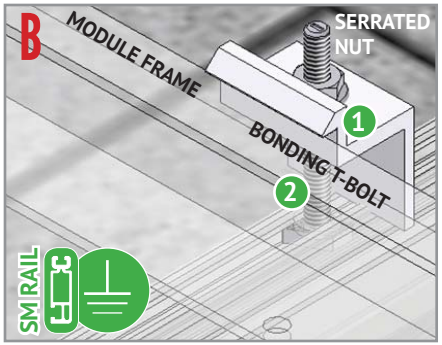
BONDING CONNECTION GROUND PATHS

INSTALLATION GUIDE | M PAGE



BONDING MIDCLAMP ASSEMBLY

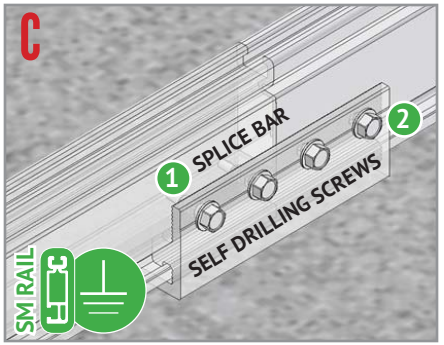
1. Stainless steel Midclamp points, 2 per module, pierce module frame anodization to bond module to module through clamp.
2. Serrated flange nut bonds stainless steel clamp to stainless steel T-bolt
3. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, clamp, and modules to grounded SM rail.



ENDCLAMP ASSEMBLY

1. Serrated flange nut bonds aluminum Endclamp to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and Endclamp to grounded SM rail

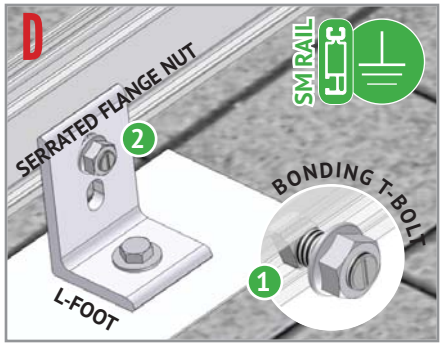
Note: End clamp does not bond to module frame.



BONDING RAIL SPLICE BAR

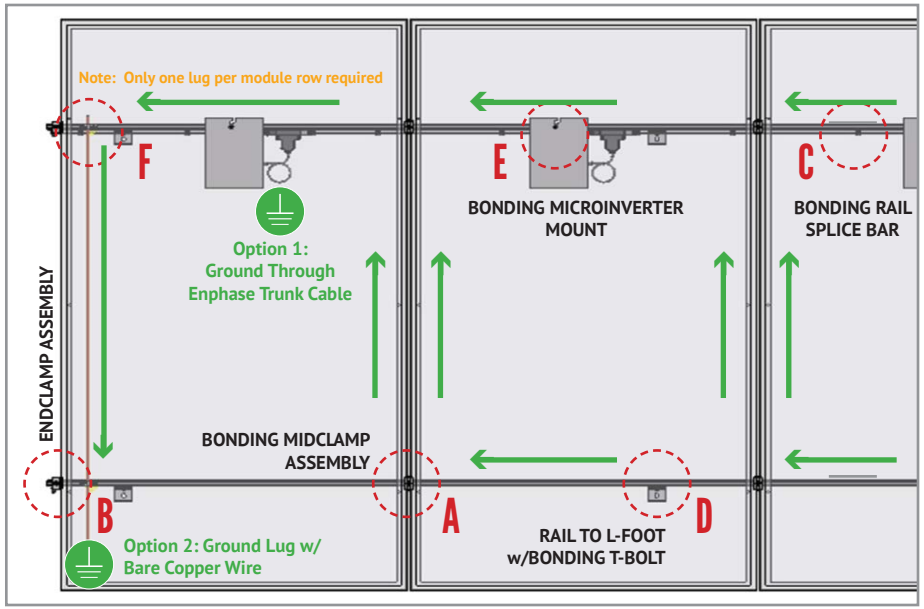
1. Stainless steel self drilling screws drill and tap into splice bar and rail creating bond between splice bar and each rail section
2. Aluminum splice bar spans across rail gap to create rail to rail bond. Rail on at least one side of splice will be grounded.

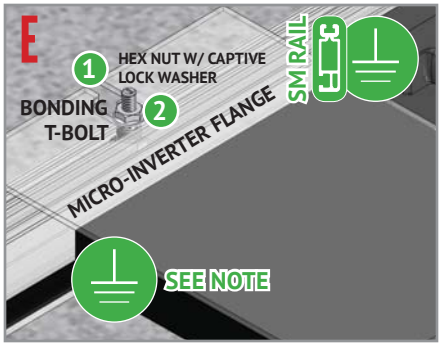
Note: Splice bar and bolted connection are non-structural. The splice bar function is rail alignment and bonding.



RAIL TO L-FOOT w/BONDING T-BOLT

1. Serrated flange nut removes L-foot anodization to bond L-Foot to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail

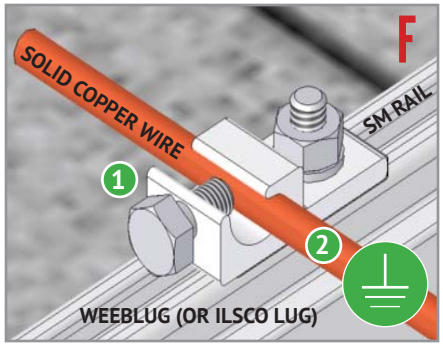




BONDING MICROINVERTER MOUNT

1. Hex nut with captive lock washer bonds metal microinverter flange to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail

System ground including racking and modules may be achieved through the trunk cable of approved microinverter systems. See page I for details

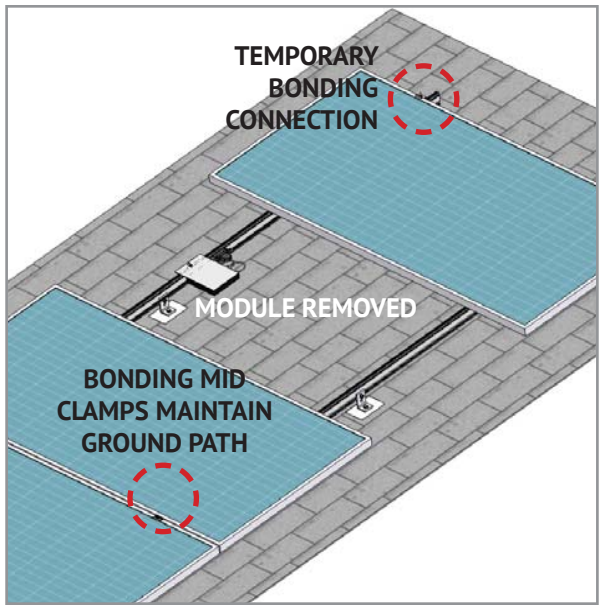


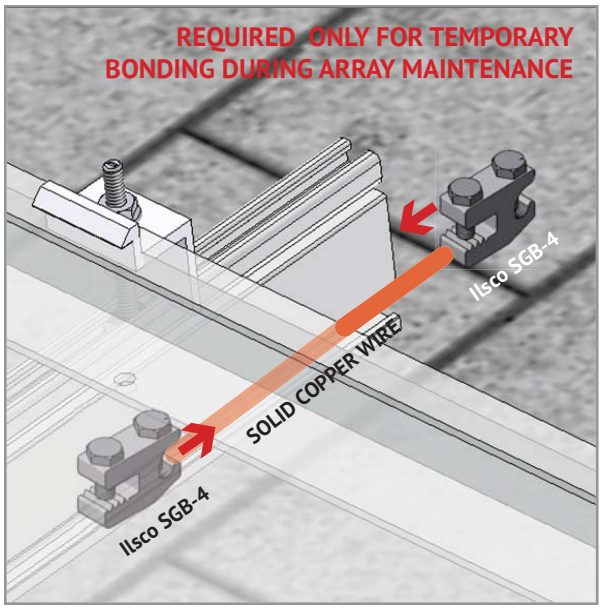
RACK SYSTEM GROUND

1. WEEB washer dimples pierce anodized rail to create bond between rail and lug
2. Solid copper wire connected to lug is routed to provide final system ground connection.

NOTE: Ilsco lug can also be used when secured to the side of the rail. See page I-3 for details

BONDING CONNECTION GROUND PATHS





TEMPORARY BONDING CONNECTION DURING ARRAY MAINTENANCE

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

- Attach Ilsco SGB4 to wall of rail
- Attach Ilsco SGB4 to module frame
- Install solid copper wire jumper to Ilsco lugs

ELECTRICAL CONSIDERATIONS

SOLARMOUNT is intended to be used with PV modules that have a system voltage less than or equal to 1000 VDC. For standard system grounding a minimum 10AWG, 105°C copper grounding conductor should be used to ground a 1000 VDC system, according to the National Electric Code (NEC). It is the installer's responsibility to check local codes, which may vary. See below for interconnection information.

INTERCONNECTION INFORMATION

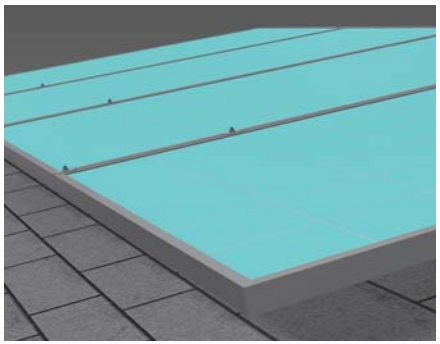
There is no size limit on how many SOLARMOUNT & PV modules can be mechanically interconnected for any given configuration, provided that the installation meets the requirements of applicable building and fire codes.

GROUNDING NOTES

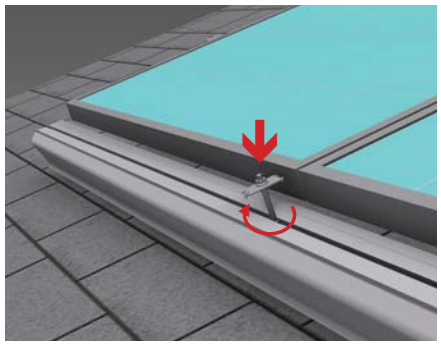
The installation must be conducted in accordance with the National Electric Code (NEC) and the authority having jurisdiction. Please refer to these resources in your location for required grounding lug quantities specific to your project.

The grounding / bonding components may overhang parts of the array so care must be made when walking around the array to avoid damage.

Conductor fastener torque values depend on conductor size. See product data sheets for correct torque values.

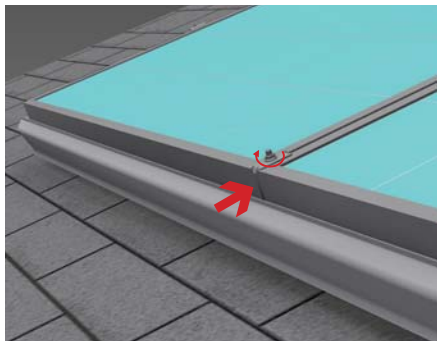


PREPARATION: At front edge of array, ensure at least 3.25 inches of space between modules and roof surface and that modules are aligned to within 3/8". Plan for Trim length so that Endclamps can be properly installed.



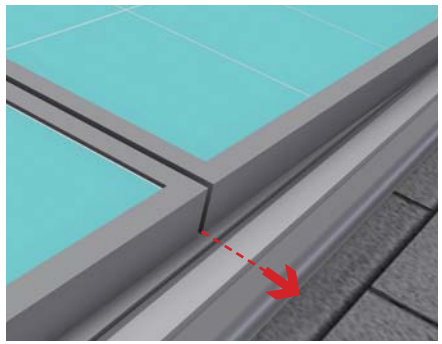
1ST MIDCLAMP: Position Trim in front of array. Insert Midclamp into the Trim slot, aligned with the gap between the 1st two modules at either end of array.

NOTE: Apply Anti-Seize to Each Mid-Clamp prior to installation

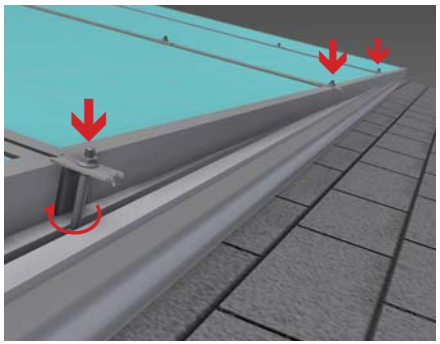


MOUNT TRIM: Position Trim beneath modules by sliding T-bolt into gap between modules and tighten. Midclamp should stay in position and support Trim. Tighten snugly enough so that Trim is held firmly in place.

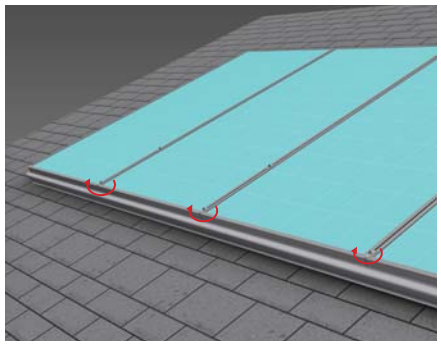
TORQUE VALUE: Do not exceed specified torque value (10 ft-lbs)



CLEAR T-BOLT SLOT: Rotate unattached end of Trim out and away from array so T-bolt slot (at next T-bolt insertion point) is clear of modules. This may require force to deflect the Trim slightly. Deflect only enough to insert T-bolt.

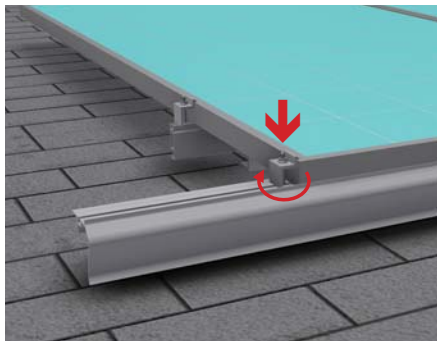


INSERT MIDCLAMPS: Insert T-bolt into slot and slide clamp (rotating Trim) into position between modules and leave loose. Continue to work down array, inserting Midclamps and positioning in gaps between modules.



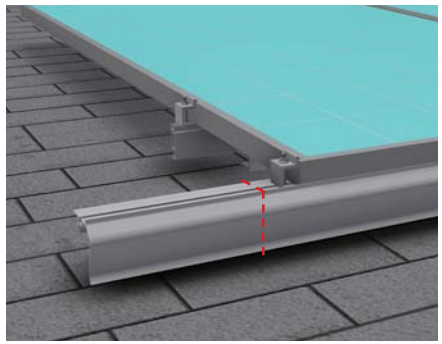
FASTEN MIDCLAMPS: Return to each inserted Midclamp. Ensuring Trim lip is in contact with module face and verifying alignment marks on T-bolts are in proper position, tighten clamp.

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs w/ Anti Seize



ENDCLAMPS: Install Endclamps per previous Endclamp install instructions

TORQUE VALUE (See Note on PG. 1)
1/4" nuts to 10 ft-lbs w/ Anti Seize

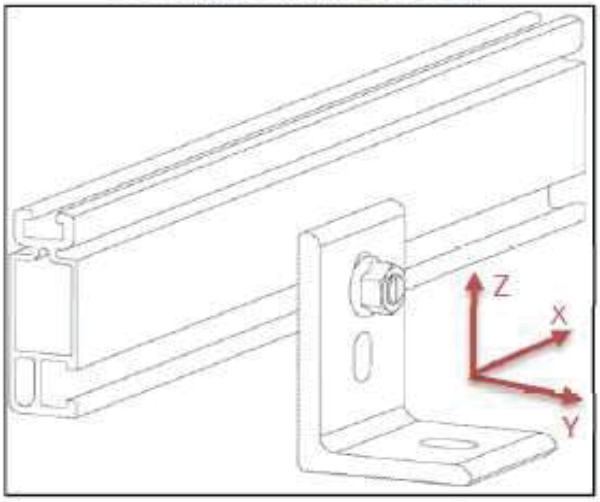


CUT EXCESS TRIM: Mark excess Trim and cut at end of array or where required for proper cantilevers.

Appendix C

L-Foot Roof Connection Capacities provided by Unirac, Inc.

SOLARMOUNT L-FOOT



L-Foot with 3/8" T-Bolt	
Direction	**Limit States Design Values (lbs)**
	SM Rail
X ±, Sliding	1413
Y ±, Transverse	330
Z +, Tension	1896
Z -, Compression	3074

Appendix D

Design Tables for 60 Cell Panels (North – South Rail Orientation)

Table 1: Maximum Span Length (m) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	2.3	1.9	1.7	1.5	1.4
	0.30	2.3	1.9	1.7	1.5	1.4
	0.35	2.3	1.9	1.7	1.5	1.4
	0.40	2.3	1.9	1.7	1.5	1.4
	0.45	2.3	1.9	1.7	1.5	1.4
	0.50	2.3	1.9	1.7	1.5	1.4
	0.55	2.2	1.9	1.7	1.5	1.4

Table 2: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.2	-1.0	-0.9	-0.8	-0.8
	0.30	-1.5	-1.3	-1.1	-1.0	-0.9
	0.35	-1.8	-1.5	-1.3	-1.2	-1.1
	0.40	-2.1	-1.8	-1.6	-1.4	-1.3
	0.45	-2.4	-2.0	-1.8	-1.6	-1.5
	0.50	-2.7	-2.3	-2.0	-1.8	-1.7
	0.55	-3.0	-2.5	-2.2	-2.0	-1.9

Table 3: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.2	-1.9	-1.7	-1.5	-1.4
	0.30	-2.7	-2.3	-2.0	-1.8	-1.7
	0.35	-3.2	-2.7	-2.4	-2.2	-2.0
	0.40	-3.7	-3.1	-2.8	-2.5	-2.3
	0.45	-4.2	-3.6	-3.2	-2.9	-2.6
	0.50	-4.7	-4.0	-3.5	-3.2	-2.9
	0.55	-5.2	-4.4	-3.9	-3.5	-3.3

Table 4: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.7	-2.3	-2.0	-1.8	-1.7
	0.30	-3.3	-2.8	-2.5	-2.2	-2.1
	0.35	-3.9	-3.3	-2.9	-2.6	-2.4
	0.40	-4.5	-3.8	-3.4	-3.0	-2.8
	0.45	-5.1	-4.3	-3.8	-3.4	-3.2
	0.50	-5.6	-4.8	-4.2	-3.8	-3.5
	0.55	-6.2	-5.3	-4.7	-4.2	-3.9

Table 5: Maximum Applied Downforce (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	4.2	5.1	5.8	6.4	7.0
	0.30	4.2	5.1	5.8	6.4	7.0
	0.35	4.3	5.1	5.8	6.4	7.0
	0.40	4.3	5.1	5.8	6.4	7.0
	0.45	4.3	5.1	5.8	6.4	7.0
	0.50	4.3	5.1	5.8	6.4	7.0
	0.55	4.3	5.1	5.8	6.4	7.0

Table 6: Maximum Applied Shear Force (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.72	2.07	2.36	2.63	2.86
	0.30	1.71	2.06	2.36	2.62	2.86
	0.35	1.71	2.06	2.35	2.62	2.86
	0.40	1.70	2.05	2.35	2.61	2.86
	0.45	1.70	2.05	2.35	2.61	2.85
	0.50	1.69	2.04	2.34	2.61	2.85
	0.55	1.69	2.04	2.34	2.60	2.85

Table 7: Maximum Span Length (m) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	3.1	2.4	2.1	1.8	1.7
	0.30	3.1	2.4	2.1	1.8	1.7
	0.35	3.0	2.4	2.1	1.8	1.7
	0.40	2.9	2.4	2.1	1.8	1.7
	0.45	2.8	2.4	2.0	1.8	1.7
	0.50	2.7	2.4	2.0	1.8	1.6
	0.55	2.6	2.3	2.0	1.8	1.6

Table 8: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.1	-0.9	-0.8	-0.7	-0.6
	0.30	-1.4	-1.1	-1.0	-0.9	-0.8
	0.35	-1.7	-1.3	-1.2	-1.0	-0.9
	0.40	-1.9	-1.6	-1.4	-1.2	-1.1
	0.45	-2.1	-1.8	-1.5	-1.4	-1.3
	0.50	-2.3	-2.0	-1.7	-1.5	-1.4
	0.55	-2.5	-2.2	-1.9	-1.7	-1.6

Table 9: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.4	-1.1	-0.9	-0.8	-0.8
	0.30	-1.7	-1.4	-1.2	-1.0	-0.9
	0.35	-2.0	-1.6	-1.4	-1.2	-1.1
	0.40	-2.3	-1.9	-1.6	-1.4	-1.3
	0.45	-2.5	-2.1	-1.8	-1.6	-1.5
	0.50	-2.7	-2.4	-2.0	-1.8	-1.7
	0.55	-2.9	-2.6	-2.3	-2.0	-1.8

Table 10: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.4	-1.1	-0.9	-0.8	-0.8
	0.30	-1.7	-1.4	-1.2	-1.0	-0.9
	0.35	-2.0	-1.6	-1.4	-1.2	-1.1
	0.40	-2.3	-1.9	-1.6	-1.4	-1.3
	0.45	-2.5	-2.1	-1.8	-1.6	-1.5
	0.50	-2.7	-2.4	-2.0	-1.8	-1.7
	0.55	-2.9	-2.6	-2.3	-2.0	-1.8

Table 11: Maximum Applied Downforce (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	3.0	3.9	4.7	5.3	5.8
	0.30	3.1	3.9	4.7	5.3	5.9
	0.35	3.1	4.0	4.7	5.3	5.9
	0.40	3.1	4.0	4.7	5.3	5.9
	0.45	3.2	4.0	4.7	5.4	5.9
	0.50	3.3	4.0	4.8	5.4	5.9
	0.55	3.4	4.1	4.8	5.4	5.9

Table 12: Maximum Applied Shear Force (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.78	2.36	2.83	3.24	3.60
	0.30	1.76	2.35	2.82	3.22	3.58
	0.35	1.73	2.33	2.80	3.21	3.57
	0.40	1.67	2.31	2.79	3.20	3.56
	0.45	1.61	2.30	2.78	3.19	3.55
	0.50	1.56	2.28	2.76	3.17	3.54
	0.55	1.51	2.27	2.75	3.16	3.52

Table 13: Maximum Span Length (m) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	2.3	1.9	1.7	1.5	1.4
	0.30	2.3	1.9	1.7	1.5	1.4
	0.35	2.3	1.9	1.7	1.5	1.4
	0.40	2.3	1.9	1.7	1.5	1.4
	0.45	2.3	1.9	1.7	1.5	1.4
	0.50	2.3	1.9	1.7	1.5	1.4
	0.55	2.3	1.9	1.7	1.5	1.4

Table 14: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-0.9	-0.7	-0.7	-0.6	-0.5
	0.30	-1.1	-0.9	-0.8	-0.8	-0.7
	0.35	-1.3	-1.1	-1.0	-0.9	-0.8
	0.40	-1.6	-1.3	-1.2	-1.1	-1.0
	0.45	-1.8	-1.5	-1.3	-1.2	-1.1
	0.50	-2.0	-1.7	-1.5	-1.4	-1.3
	0.55	-2.2	-1.9	-1.7	-1.5	-1.4

Table 15: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.7	-1.4	-1.2	-1.1	-1.0
	0.30	-2.1	-1.7	-1.5	-1.4	-1.3
	0.35	-2.4	-2.1	-1.8	-1.7	-1.5
	0.40	-2.8	-2.4	-2.1	-1.9	-1.8
	0.45	-3.2	-2.7	-2.4	-2.2	-2.0
	0.50	-3.6	-3.1	-2.7	-2.5	-2.3
	0.55	-4.0	-3.4	-3.0	-2.7	-2.5

Table 16: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.0	-1.7	-1.5	-1.4	-1.3
	0.30	-2.5	-2.1	-1.9	-1.7	-1.6
	0.35	-3.0	-2.5	-2.2	-2.0	-1.9
	0.40	-3.4	-2.9	-2.6	-2.3	-2.1
	0.45	-3.9	-3.3	-2.9	-2.6	-2.4
	0.50	-4.3	-3.7	-3.3	-3.0	-2.7
	0.55	-4.8	-4.1	-3.6	-3.3	-3.0

Table 17: Maximum Applied Downforce (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	4.2	5.0	5.8	6.4	6.9
	0.30	4.2	5.1	5.8	6.4	7.0
	0.35	4.2	5.1	5.8	6.4	7.0
	0.40	4.3	5.1	5.8	6.4	7.0
	0.45	4.3	5.1	5.8	6.4	7.0
	0.50	4.3	5.1	5.8	6.4	7.0
	0.55	4.3	5.1	5.8	6.4	7.0

Table 18: Maximum Applied Shear Force (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.72	2.07	2.37	2.63	2.87
	0.30	1.72	2.07	2.36	2.63	2.87
	0.35	1.72	2.06	2.36	2.62	2.86
	0.40	1.71	2.06	2.36	2.62	2.86
	0.45	1.71	2.06	2.35	2.62	2.86
	0.50	1.70	2.05	2.35	2.62	2.86
	0.55	1.70	2.05	2.35	2.61	2.85

Table 19: Maximum Span Length (m) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	3.1	2.5	2.1	1.9	1.7
	0.30	3.1	2.5	2.1	1.8	1.7
	0.35	3.1	2.4	2.1	1.8	1.7
	0.40	3.1	2.4	2.1	1.8	1.7
	0.45	3.0	2.4	2.1	1.8	1.7
	0.50	2.9	2.4	2.1	1.8	1.7
	0.55	2.9	2.4	2.0	1.8	1.7

Table 20: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.8	-0.6	-0.6	-0.5	-0.5
	0.30	-1.0	-0.8	-0.7	-0.6	-0.6
	0.35	-1.3	-1.0	-0.9	-0.8	-0.7
	0.40	-1.5	-1.2	-1.0	-0.9	-0.8
	0.45	-1.7	-1.3	-1.2	-1.0	-0.9
	0.50	-1.8	-1.5	-1.3	-1.2	-1.1
	0.55	-2.0	-1.7	-1.5	-1.3	-1.2

Table 21: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.0	-0.8	-0.7	-0.6	-0.6
	0.30	-1.3	-1.0	-0.9	-0.8	-0.7
	0.35	-1.5	-1.2	-1.0	-0.9	-0.8
	0.40	-1.8	-1.4	-1.2	-1.1	-1.0
	0.45	-2.0	-1.6	-1.4	-1.2	-1.1
	0.50	-2.2	-1.8	-1.6	-1.4	-1.3
	0.55	-2.4	-2.0	-1.7	-1.5	-1.4

Table 22: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.0	-0.8	-0.7	-0.6	-0.6
	0.30	-1.3	-1.0	-0.9	-0.8	-0.7
	0.35	-1.5	-1.2	-1.0	-0.9	-0.8
	0.40	-1.8	-1.4	-1.2	-1.1	-1.0
	0.45	-2.0	-1.6	-1.4	-1.2	-1.1
	0.50	-2.2	-1.8	-1.6	-1.4	-1.3
	0.55	-2.4	-2.0	-1.7	-1.5	-1.4

Table 23: Maximum Applied Downforce (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	3.0	3.9	4.6	5.3	5.8
	0.30	3.0	3.9	4.6	5.3	5.8
	0.35	3.0	3.9	4.7	5.3	5.8
	0.40	3.1	4.0	4.7	5.3	5.9
	0.45	3.1	4.0	4.7	5.3	5.9
	0.50	3.0	4.0	4.7	5.3	5.9
	0.55	3.1	4.0	4.7	5.3	5.9

Table 24: Maximum Applied Shear Force (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.80	2.38	2.85	3.25	3.61
	0.30	1.78	2.37	2.84	3.24	3.60
	0.35	1.77	2.36	2.83	3.23	3.59
	0.40	1.75	2.34	2.82	3.22	3.58
	0.45	1.73	2.33	2.80	3.21	3.57
	0.50	1.68	2.32	2.79	3.20	3.56
	0.55	1.63	2.30	2.78	3.19	3.55

Table 25: Maximum Span Length (m) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	2.3	1.9	1.7	1.5	1.4
	0.30	2.3	1.9	1.7	1.5	1.4
	0.35	2.3	1.9	1.7	1.5	1.4
	0.40	2.3	1.9	1.7	1.5	1.4
	0.45	2.3	1.9	1.7	1.5	1.4
	0.50	2.2	1.9	1.7	1.5	1.4
	0.55	2.2	1.9	1.7	1.5	1.4

Table 26: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.4	-1.2	-1.0	-0.9	-0.9
	0.30	-1.7	-1.4	-1.3	-1.2	-1.1
	0.35	-2.0	-1.7	-1.5	-1.4	-1.3
	0.40	-2.3	-2.0	-1.8	-1.6	-1.5
	0.45	-2.7	-2.3	-2.0	-1.8	-1.7
	0.50	-3.0	-2.5	-2.3	-2.0	-1.9
	0.55	-3.3	-2.8	-2.5	-2.3	-2.1

Table 27: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.5	-2.1	-1.9	-1.7	-1.6
	0.30	-3.1	-2.6	-2.3	-2.1	-1.9
	0.35	-3.6	-3.1	-2.7	-2.5	-2.3
	0.40	-4.1	-3.5	-3.1	-2.8	-2.6
	0.45	-4.7	-4.0	-3.5	-3.2	-2.9
	0.50	-5.2	-4.4	-3.9	-3.6	-3.3
	0.55	-5.8	-4.9	-4.3	-3.9	-3.6

Table 28: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-3.0	-2.6	-2.3	-2.1	-1.9
	0.30	-3.7	-3.1	-2.8	-2.5	-2.3
	0.35	-4.3	-3.7	-3.3	-3.0	-2.7
	0.40	-5.0	-4.2	-3.8	-3.4	-3.1
	0.45	-5.6	-4.8	-4.2	-3.8	-3.5
	0.50	-6.3	-5.3	-4.7	-4.3	-4.0
	0.55	-6.9	-5.9	-5.2	-4.7	-4.4

Table 29: Maximum Applied Downforce (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	4.2	5.1	5.8	6.4	7.0
	0.30	4.3	5.1	5.8	6.4	7.0
	0.35	4.3	5.1	5.8	6.4	7.0
	0.40	4.3	5.1	5.8	6.4	7.0
	0.45	4.3	5.1	5.8	6.4	7.0
	0.50	4.3	5.1	5.8	6.4	7.0
	0.55	4.3	5.1	5.8	6.5	7.0

Table 30: Maximum Applied Shear Force (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.72	2.06	2.36	2.62	2.86
	0.30	1.71	2.06	2.36	2.62	2.86
	0.35	1.70	2.05	2.35	2.62	2.86
	0.40	1.70	2.05	2.35	2.61	2.85
	0.45	1.69	2.04	2.34	2.61	2.85
	0.50	1.69	2.04	2.34	2.60	2.85
	0.55	1.68	2.03	2.33	2.60	2.84

Table 31: Maximum Span Length (m) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	3.1	2.4	2.1	1.8	1.7
	0.30	3.0	2.4	2.1	1.8	1.7
	0.35	2.9	2.4	2.1	1.8	1.7
	0.40	2.8	2.4	2.0	1.8	1.7
	0.45	2.7	2.4	2.0	1.8	1.6
	0.50	2.6	2.3	2.0	1.8	1.6
	0.55	2.5	2.3	2.0	1.8	1.6

Table 32: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.3	-1.0	-0.9	-0.8	-0.7
	0.30	-1.6	-1.3	-1.1	-1.0	-0.9
	0.35	-1.8	-1.5	-1.3	-1.2	-1.1
	0.40	-2.1	-1.8	-1.5	-1.4	-1.2
	0.45	-2.3	-2.0	-1.7	-1.5	-1.4
	0.50	-2.5	-2.2	-1.9	-1.7	-1.6
	0.55	-2.7	-2.5	-2.1	-1.9	-1.7

Table 33: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.6	-1.2	-1.1	-1.0	-0.9
	0.30	-1.9	-1.5	-1.3	-1.2	-1.1
	0.35	-2.2	-1.8	-1.6	-1.4	-1.3
	0.40	-2.5	-2.1	-1.8	-1.6	-1.5
	0.45	-2.7	-2.4	-2.0	-1.8	-1.7
	0.50	-3.0	-2.6	-2.3	-2.0	-1.9
	0.55	-3.2	-2.9	-2.5	-2.3	-2.1

Table 34: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.6	-1.2	-1.1	-1.0	-0.9
	0.30	-1.9	-1.5	-1.3	-1.2	-1.1
	0.35	-2.2	-1.8	-1.6	-1.4	-1.3
	0.40	-2.5	-2.1	-1.8	-1.6	-1.5
	0.45	-2.7	-2.4	-2.0	-1.8	-1.7
	0.50	-3.0	-2.6	-2.3	-2.0	-1.9
	0.55	-3.2	-2.9	-2.5	-2.3	-2.1

Table 35: Maximum Applied Downforce (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	3.0	3.9	4.7	5.3	5.9
	0.30	3.1	4.0	4.7	5.3	5.9
	0.35	3.0	4.0	4.7	5.3	5.9
	0.40	3.2	4.0	4.7	5.4	5.9
	0.45	3.3	4.0	4.8	5.4	5.9
	0.50	3.4	4.1	4.8	5.4	5.9
	0.55	3.5	4.1	4.8	5.4	6.0

Table 36: Maximum Applied Shear Force (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.76	2.35	2.83	3.23	3.59
	0.30	1.74	2.34	2.81	3.22	3.58
	0.35	1.68	2.32	2.79	3.20	3.56
	0.40	1.62	2.30	2.78	3.19	3.55
	0.45	1.56	2.28	2.76	3.17	3.54
	0.50	1.51	2.27	2.75	3.16	3.52
	0.55	1.46	2.25	2.73	3.14	3.51

Appendix E

Design Tables for 72 Cell Panels (North – South Rail Orientation)

Table 1: Maximum Span Length (m) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, , North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	2.1	1.8	1.6	1.4	1.3
	0.30	2.1	1.8	1.6	1.4	1.3
	0.35	2.1	1.8	1.6	1.4	1.3
	0.40	2.1	1.8	1.6	1.4	1.3
	0.45	2.1	1.8	1.6	1.4	1.3
	0.50	2.1	1.8	1.6	1.4	1.3
	0.55	2.1	1.8	1.6	1.4	1.3

Table 2: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.3	-1.1	-1.0	-0.9	-0.8
	0.30	-1.6	-1.4	-1.2	-1.1	-1.0
	0.35	-1.9	-1.6	-1.5	-1.3	-1.2
	0.40	-2.3	-1.9	-1.7	-1.5	-1.4
	0.45	-2.6	-2.2	-1.9	-1.8	-1.6
	0.50	-2.9	-2.5	-2.2	-2.0	-1.8
	0.55	-3.2	-2.7	-2.4	-2.2	-2.0

Table 3: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height,10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.4	-2.0	-1.8	-1.6	-1.5
	0.30	-2.9	-2.5	-2.2	-2.0	-1.8
	0.35	-3.5	-3.0	-2.6	-2.4	-2.2
	0.40	-4.0	-3.4	-3.0	-2.7	-2.5
	0.45	-4.6	-3.9	-3.4	-3.1	-2.9
	0.50	-5.1	-4.3	-3.8	-3.5	-3.2
	0.55	-5.6	-4.8	-4.2	-3.8	-3.5

Table 4: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.9	-2.5	-2.2	-2.0	-1.8
	0.30	-3.6	-3.0	-2.7	-2.4	-2.2
	0.35	-4.2	-3.6	-3.2	-2.9	-2.6
	0.40	-4.9	-4.1	-3.6	-3.3	-3.0
	0.45	-5.5	-4.7	-4.1	-3.7	-3.4
	0.50	-6.1	-5.2	-4.6	-4.2	-3.8
	0.55	-6.8	-5.7	-5.1	-4.6	-4.2

Table 5: Maximum Applied Downforce (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	4.6	5.5	6.3	6.9	7.6
	0.30	4.6	5.5	6.3	6.9	7.6
	0.35	4.6	5.5	6.3	7.0	7.6
	0.40	4.6	5.5	6.3	7.0	7.6
	0.45	4.7	5.5	6.3	7.0	7.6
	0.50	4.7	5.5	6.3	7.0	7.6
	0.55	4.7	5.6	6.3	7.0	7.6

Table 6: Maximum Applied Shear Force (kN) - Open Terrain, 0m-5.9m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.87	2.24	2.57	2.85	3.11
	0.30	1.86	2.24	2.56	2.85	3.11
	0.35	1.85	2.23	2.56	2.84	3.10
	0.40	1.85	2.23	2.55	2.84	3.10
	0.45	1.84	2.22	2.55	2.84	3.10
	0.50	1.84	2.22	2.54	2.83	3.09
	0.55	1.83	2.21	2.54	2.83	3.09

Table 7: Maximum Span Length (m) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.9	2.3	1.9	1.7	1.5
	0.30	2.8	2.2	1.9	1.7	1.5
	0.35	2.8	2.2	1.9	1.7	1.5
	0.40	2.7	2.2	1.9	1.7	1.5
	0.45	2.6	2.2	1.9	1.7	1.5
	0.50	2.5	2.2	1.9	1.7	1.5
	0.55	2.4	2.2	1.9	1.7	1.5

Table 8: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.2	-1.0	-0.8	-0.7	-0.7
	0.30	-1.5	-1.2	-1.0	-0.9	-0.9
	0.35	-1.8	-1.5	-1.3	-1.1	-1.0
	0.40	-2.1	-1.7	-1.5	-1.3	-1.2
	0.45	-2.3	-1.9	-1.7	-1.5	-1.4
	0.50	-2.5	-2.2	-1.9	-1.7	-1.5
	0.55	-2.7	-2.4	-2.1	-1.8	-1.7

Table 9: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.5	-1.2	-1.0	-0.9	-0.8
	0.30	-1.8	-1.5	-1.3	-1.1	-1.0
	0.35	-2.2	-1.8	-1.5	-1.3	-1.2
	0.40	-2.5	-2.0	-1.7	-1.6	-1.4
	0.45	-2.7	-2.3	-2.0	-1.8	-1.6
	0.50	-3.0	-2.6	-2.2	-2.0	-1.8
	0.55	-3.2	-2.8	-2.5	-2.2	-2.0

Table 10: Maximum Applied Uplift (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.5	-1.2	-1.0	-0.9	-0.8
	0.30	-1.8	-1.5	-1.3	-1.1	-1.0
	0.35	-2.2	-1.8	-1.5	-1.3	-1.2
	0.40	-2.5	-2.0	-1.7	-1.6	-1.4
	0.45	-2.7	-2.3	-2.0	-1.8	-1.6
	0.50	-3.0	-2.6	-2.2	-2.0	-1.8
	0.55	-3.2	-2.8	-2.5	-2.2	-2.0

Table 11: Maximum Applied Downforce (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	3.3	4.3	5.0	5.7	6.3
	0.30	3.3	4.3	5.1	5.7	6.4
	0.35	3.3	4.3	5.1	5.8	6.4
	0.40	3.3	4.3	5.1	5.8	6.4
	0.45	3.4	4.4	5.1	5.8	6.4
	0.50	3.6	4.4	5.2	5.8	6.4
	0.55	3.7	4.4	5.2	5.8	6.4

Table 12: Maximum Applied Shear Force (kN) - Open Terrain, 0m-5.9m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.93	2.57	3.08	3.52	3.91
	0.30	1.91	2.55	3.06	3.50	3.89
	0.35	1.88	2.53	3.05	3.49	3.88
	0.40	1.81	2.51	3.03	3.47	3.87
	0.45	1.75	2.50	3.01	3.46	3.85
	0.50	1.69	2.48	3.00	3.45	3.84
	0.55	1.64	2.46	2.98	3.43	3.83

Table 13: Maximum Span Length (m) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	2.1	1.8	1.6	1.4	1.3
	0.30	2.1	1.8	1.6	1.4	1.3
	0.35	2.1	1.8	1.6	1.4	1.3
	0.40	2.1	1.8	1.6	1.4	1.3
	0.45	2.1	1.8	1.6	1.4	1.3
	0.50	2.1	1.8	1.6	1.4	1.3
	0.55	2.1	1.8	1.6	1.4	1.3

Table 14: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-0.9	-0.8	-0.7	-0.6	-0.6
	0.30	-1.2	-1.0	-0.9	-0.8	-0.7
	0.35	-1.4	-1.2	-1.1	-1.0	-0.9
	0.40	-1.7	-1.4	-1.3	-1.2	-1.1
	0.45	-1.9	-1.6	-1.5	-1.3	-1.2
	0.50	-2.2	-1.9	-1.6	-1.5	-1.4
	0.55	-2.4	-2.1	-1.8	-1.7	-1.5

Table 15: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.8	-1.5	-1.3	-1.2	-1.1
	0.30	-2.2	-1.9	-1.7	-1.5	-1.4
	0.35	-2.6	-2.2	-2.0	-1.8	-1.7
	0.40	-3.1	-2.6	-2.3	-2.1	-1.9
	0.45	-3.5	-3.0	-2.6	-2.4	-2.2
	0.50	-3.9	-3.3	-2.9	-2.7	-2.4
	0.55	-4.3	-3.7	-3.2	-2.9	-2.7

Table 16: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.2	-1.9	-1.7	-1.5	-1.4
	0.30	-2.7	-2.3	-2.0	-1.8	-1.7
	0.35	-3.2	-2.7	-2.4	-2.2	-2.0
	0.40	-3.7	-3.2	-2.8	-2.5	-2.3
	0.45	-4.2	-3.6	-3.2	-2.9	-2.6
	0.50	-4.7	-4.0	-3.5	-3.2	-3.0
	0.55	-5.2	-4.4	-3.9	-3.5	-3.3

Table 17: Maximum Applied Downforce (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	4.6	5.5	6.2	6.9	7.5
	0.30	4.6	5.5	6.2	6.9	7.5
	0.35	4.6	5.5	6.3	6.9	7.6
	0.40	4.6	5.5	6.3	6.9	7.6
	0.45	4.6	5.5	6.3	7.0	7.6
	0.50	4.6	5.5	6.3	7.0	7.6
	0.55	4.6	5.5	6.3	7.0	7.6

Table 18: Maximum Applied Shear Force (kN) - Rough Terrain, 0m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.87	2.25	2.57	2.86	3.12
	0.30	1.87	2.24	2.57	2.85	3.11
	0.35	1.86	2.24	2.56	2.85	3.11
	0.40	1.86	2.24	2.56	2.85	3.11
	0.45	1.85	2.23	2.56	2.84	3.10
	0.50	1.85	2.23	2.55	2.84	3.10
	0.55	1.85	2.23	2.55	2.84	3.10

Table 19: Maximum Span Length (m) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.9	2.3	1.9	1.7	1.5
	0.30	2.9	2.3	1.9	1.7	1.5
	0.35	2.8	2.2	1.9	1.7	1.5
	0.40	2.8	2.2	1.9	1.7	1.5
	0.45	2.8	2.2	1.9	1.7	1.5
	0.50	2.7	2.2	1.9	1.7	1.5
	0.55	2.6	2.2	1.9	1.7	1.5

Table 20: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-0.9	-0.7	-0.6	-0.5	-0.5
	0.30	-1.1	-0.9	-0.8	-0.7	-0.6
	0.35	-1.4	-1.1	-0.9	-0.8	-0.8
	0.40	-1.6	-1.3	-1.1	-1.0	-0.9
	0.45	-1.8	-1.5	-1.3	-1.1	-1.0
	0.50	-2.0	-1.6	-1.4	-1.3	-1.2
	0.55	-2.2	-1.8	-1.6	-1.4	-1.3

Table 21: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.1	-0.9	-0.7	-0.7	-0.6
	0.30	-1.4	-1.1	-0.9	-0.8	-0.8
	0.35	-1.6	-1.3	-1.1	-1.0	-0.9
	0.40	-1.9	-1.5	-1.3	-1.2	-1.1
	0.45	-2.2	-1.8	-1.5	-1.3	-1.2
	0.50	-2.4	-2.0	-1.7	-1.5	-1.4
	0.55	-2.6	-2.2	-1.9	-1.7	-1.5

Table 22: Maximum Applied Uplift (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.1	-0.9	-0.7	-0.7	-0.6
	0.30	-1.4	-1.1	-0.9	-0.8	-0.8
	0.35	-1.6	-1.3	-1.1	-1.0	-0.9
	0.40	-1.9	-1.5	-1.3	-1.2	-1.1
	0.45	-2.2	-1.8	-1.5	-1.3	-1.2
	0.50	-2.4	-2.0	-1.7	-1.5	-1.4
	0.55	-2.6	-2.2	-1.9	-1.7	-1.5

Table 23: Maximum Applied Downforce (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	3.2	4.2	5.0	5.7	6.3
	0.30	3.3	4.2	5.0	5.7	6.3
	0.35	3.3	4.3	5.1	5.7	6.3
	0.40	3.3	4.3	5.1	5.8	6.4
	0.45	3.3	4.3	5.1	5.8	6.4
	0.50	3.3	4.3	5.1	5.8	6.4
	0.55	3.4	4.3	5.1	5.8	6.4

Table 24: Maximum Applied Shear Force (kN) - Rough Terrain, 0m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category						
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.95	2.59	3.10	3.53	3.92
	0.30	1.94	2.57	3.08	3.52	3.91
	0.35	1.92	2.56	3.07	3.51	3.90
	0.40	1.90	2.54	3.06	3.50	3.89
	0.45	1.88	2.53	3.05	3.49	3.88
	0.50	1.82	2.52	3.03	3.48	3.87
	0.55	1.77	2.50	3.02	3.47	3.86

Table 25: Maximum Span Length (m) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	2.1	1.8	1.6	1.4	1.3
	0.30	2.1	1.8	1.6	1.4	1.3
	0.35	2.1	1.8	1.6	1.4	1.3
	0.40	2.1	1.8	1.6	1.4	1.3
	0.45	2.1	1.8	1.6	1.4	1.3
	0.50	2.1	1.8	1.6	1.4	1.3
	0.55	2.1	1.7	1.5	1.4	1.3

Table 26: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-1.5	-1.2	-1.1	-1.0	-0.9
	0.30	-1.8	-1.6	-1.4	-1.2	-1.2
	0.35	-2.2	-1.9	-1.6	-1.5	-1.4
	0.40	-2.5	-2.2	-1.9	-1.7	-1.6
	0.45	-2.9	-2.5	-2.2	-2.0	-1.8
	0.50	-3.2	-2.8	-2.4	-2.2	-2.0
	0.55	-3.6	-3.1	-2.7	-2.5	-2.3

Table 27: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-2.7	-2.3	-2.0	-1.8	-1.7
	0.30	-3.3	-2.8	-2.5	-2.2	-2.1
	0.35	-3.9	-3.3	-2.9	-2.7	-2.4
	0.40	-4.5	-3.8	-3.4	-3.1	-2.8
	0.45	-5.1	-4.3	-3.8	-3.5	-3.2
	0.50	-5.7	-4.8	-4.3	-3.9	-3.6
	0.55	-6.3	-5.3	-4.7	-4.3	-3.9

Table 28: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	-3.3	-2.8	-2.5	-2.2	-2.1
	0.30	-4.0	-3.4	-3.0	-2.7	-2.5
	0.35	-4.7	-4.0	-3.5	-3.2	-3.0
	0.40	-5.4	-4.6	-4.1	-3.7	-3.4
	0.45	-6.1	-5.2	-4.6	-4.2	-3.8
	0.50	-6.8	-5.8	-5.1	-4.7	-4.3
	0.55	-7.5	-6.4	-5.7	-5.1	-4.7

Table 29: Maximum Applied Downforce (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	4.6	5.5	6.3	6.9	7.6
	0.30	4.6	5.5	6.3	6.9	7.6
	0.35	4.6	5.5	6.3	7.0	7.6
	0.40	4.6	5.5	6.3	7.0	7.6
	0.45	4.7	5.5	6.3	7.0	7.6
	0.50	4.7	5.6	6.3	7.0	7.6
	0.55	4.7	5.6	6.3	7.0	7.6

Table 30: Maximum Applied Shear Force (kN) - Open Terrain, 5.9m-10m Roof Height, 10°-27° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 1.0	1.5	2.0	2.5	3.0
Roof Angle 10°-27°	0.25	1.86	2.24	2.56	2.85	3.11
	0.30	1.86	2.23	2.56	2.84	3.11
	0.35	1.85	2.23	2.55	2.84	3.10
	0.40	1.84	2.22	2.55	2.84	3.10
	0.45	1.84	2.22	2.54	2.83	3.09
	0.50	1.83	2.21	2.54	2.83	3.09
	0.55	1.83	2.21	2.53	2.82	3.09

Table 31: Maximum Span Length (m) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Low Importance Category

Roof Section "R", "S", "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) (ULS) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	2.8	2.2	1.9	1.7	1.5
	0.30	2.8	2.2	1.9	1.7	1.5
	0.35	2.7	2.2	1.9	1.7	1.5
	0.40	2.6	2.2	1.9	1.7	1.5
	0.45	2.5	2.2	1.9	1.7	1.5
	0.50	2.4	2.2	1.9	1.7	1.5
	0.55	2.3	2.1	1.8	1.7	1.5

Table 32: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.4	-1.1	-1.0	-0.9	-0.8
	0.30	-1.7	-1.4	-1.2	-1.1	-1.0
	0.35	-2.0	-1.6	-1.4	-1.3	-1.2
	0.40	-2.3	-1.9	-1.6	-1.5	-1.3
	0.45	-2.5	-2.2	-1.9	-1.7	-1.5
	0.50	-2.7	-2.4	-2.1	-1.9	-1.7
	0.55	-2.9	-2.7	-2.3	-2.1	-1.9

Table 33: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "S"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.7	-1.3	-1.2	-1.0	-0.9
	0.30	-2.1	-1.7	-1.4	-1.3	-1.2
	0.35	-2.4	-2.0	-1.7	-1.5	-1.4
	0.40	-2.7	-2.3	-2.0	-1.7	-1.6
	0.45	-3.0	-2.6	-2.2	-2.0	-1.8
	0.50	-3.2	-2.9	-2.5	-2.2	-2.0
	0.55	-3.5	-3.2	-2.7	-2.4	-2.2

Table 34: Maximum Applied Uplift (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	-1.7	-1.3	-1.2	-1.0	-0.9
	0.30	-2.1	-1.7	-1.4	-1.3	-1.2
	0.35	-2.4	-2.0	-1.7	-1.5	-1.4
	0.40	-2.7	-2.3	-2.0	-1.7	-1.6
	0.45	-3.0	-2.6	-2.2	-2.0	-1.8
	0.50	-3.2	-2.9	-2.5	-2.2	-2.0
	0.55	-3.5	-3.2	-2.7	-2.4	-2.2

Table 35: Maximum Applied Downforce (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	3.3	4.3	5.1	5.7	6.3
	0.30	3.3	4.3	5.1	5.8	6.4
	0.35	3.3	4.3	5.1	5.8	6.4
	0.40	3.4	4.4	5.1	5.8	6.4
	0.45	3.6	4.4	5.2	5.8	6.4
	0.50	3.7	4.4	5.2	5.8	6.4
	0.55	3.8	4.4	5.2	5.9	6.5

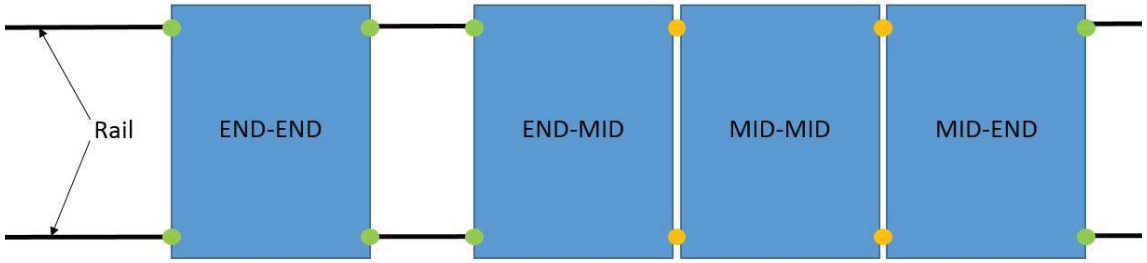
Table 36: Maximum Applied Shear Force (kN) - Open Terrain, 5.9m-10m Roof Height, 27°-45° Roof Angle, North – South Rail Orientation, Normal Importance Category

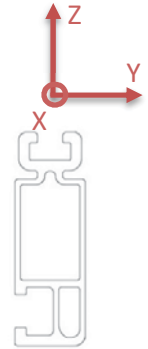
Roof Section "R, S & C"	Reference Velocity Pressure, $q_{1/50}$ (kPa)	Specified Snow Load (kPa) 0.5	1.0	1.5	2.0	2.5
Roof Angle 27°-45°	0.25	1.92	2.56	3.07	3.51	3.90
	0.30	1.89	2.54	3.05	3.49	3.88
	0.35	1.82	2.52	3.03	3.48	3.87
	0.40	1.75	2.50	3.02	3.46	3.85
	0.45	1.69	2.48	3.00	3.45	3.84
	0.50	1.63	2.46	2.98	3.43	3.83
	0.55	1.58	2.44	2.97	3.41	3.81

Enclosure 3:

Technical Data Sheets
(Limit States Design)

Midclamp and Endclamp Loads per Module





Module Condition Definitions:

END-END: The END-END module shown above, correlating with the loads below, indicates a module that is secured by 4 Endclamps on 2 rails.

END-MID/MID-END: The END-MID and MID-END modules shown above, correlating with the loads below, indicate modules that are secured by 2 Endclamps and 2 Midclamps on 2 rails.

MID-MID: The MID-MID module shown above, correlating with the loads below, indicate a module that is properly secured by 4 Midclamps on 2 rails.

Midclamp and Endclamp Loads per Module				
Rail	Loading Condition (with Respect to the Rail)	Limit States Design Load (lbs)		
		End-End	End-Mid & Mid-End	Mid-Mid
SM Standard Rail	Z+, Tension	4496	4027	3557
	Y±, Transverse*	401*	696*	826
	X±, Sliding	620	620	1942
	Y±, Transverse w/33mm Module	198	512	826

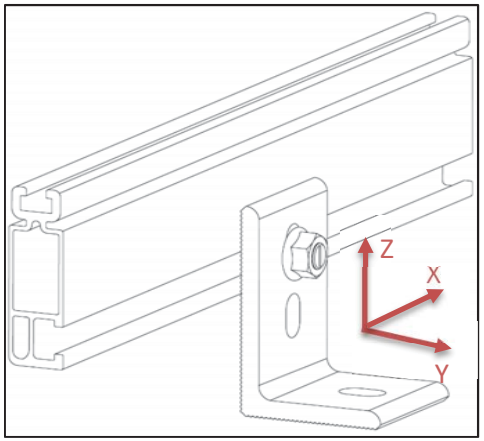
*For transverse loads associated with using "C" Endclamps and 33 mm Modules, please see "Y±, Transverse w/33mm Module"

Midclamp: Part No. - 302027C, 302027D, 302028C, 302028D, 302029C, 302029D. Material - Stainless Steel 300 Series. Ultimate Tensile Strength - 85 ksi. Finish - Clear or Black Oxide. Weight - 0.05 lbs (23 g).

Endclamp: Part No. - 302021C, 302021D, 302022C, 302022D, 302023C, 302023D, 302024C, 302024D, 302025C, 302025D, 302026C, 302026D. Material - 6000 Series Aluminum Alloys. Ultimate Tensile Strength - 38 ksi. Yield Strength - 35 ksi. Finish - Clear or Dark Anodized. Weight ~ 0.06 lbs (26 g)

****NOTE: See additional NOTES on Page H2.

SOLARMOUNT L-FOOT



L-Foot with 3/8" T-Bolt	
Direction	Limit States Design Load (lbs)
	SM Rail
X ±, Sliding	1413
Y ±, Transverse	330
Z +, Tension	1896
Z -, Compression	3074

Part No. 304001C, 304001D
L-Foot material: 6000 Series Aluminum Alloys
Ultimate Tensile: 38 ksi, Yield: 35 ksi
Finish: Clear or Dark Anodized
L-Foot Weight: 0.215 lbs (98g)

NOTES:

Allowable and design loads are valid when components are assembled according to authorized UNIRAC documents.

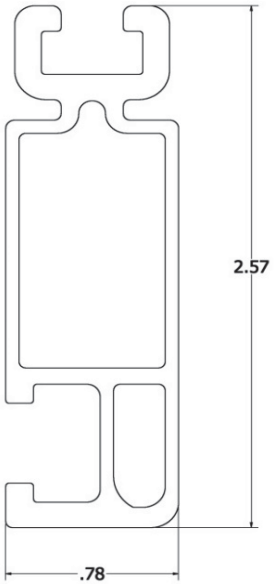
For the beam to L-Foot connection: Assemble with one Unirac $^{3}/_{8}$"-20 T-Bolt and one $^{3}/_{8}$"-20 ASTM F594 serrated flange nut.

Use anti-seize and torque the Midclamp, Endclamp, and Bottom Mounting Clip to 10 ft-lbs. Use anti-seize and torque the L-Foot to 30 ft-lbs.

Values for the L-Foot and Bottom Mounting Clip represent the capacity of a single part when used with a SOLARMOUNT series rail to retain a module in the direction indicated.

Assemble Midclamp and Endclamp with one Unirac ¼"-20 T-Bolt and one ¼"-20 ASTM F594 serrated flange nut.

SM = SOLARMOUNT Standard Rail



Properties	SOLARMOUNT Rail Profile 2	Units
BEAM HEIGHT	2.57	in
APPROX WEIGHT	0.728	plf
CROSS SECTION AREA	0.625	in^2
SECTION MODULUS (X-AXIS)	0.363	in^3
SECTION MODULUS (Y-AXIS)	0.113	in^3
MOMENT OF INERTIA (X-AXIS)	0.467	in^4
MOMENT OF INERTIA (Y-AXIS)	0.045	in^4
RADIUS OF GYRATION (X-AXIS)	0.865	in
RADIUS OF GYRATION (Y-AXIS)	0.269	in