

January 11, 2019

Everest Solar Systems, LLC
3809 Ocean Ranch Blvd, Suite 111
Oceanside, CA 92056



RE: *CrossRail 48-XL Connector Evaluation*

To whom it may concern:

Per your request, Moment Engineering + Design has performed a comprehensive structural review of the Everest CrossRail 48-XL Splice Connector. When installed per the conditions and design criteria described herein, the Splice Connector specified is compliant with the applicable sections of the design reference documents noted below.

Design Reference Documents

- ASCE/SEI 7-10 & 7-05 – *Minimum Design Loads for Buildings and Other Structures*
- ADM1 - *2010 Aluminum Design Manual*, by the Aluminum Association
- AAMA TIR A9-91 – *Metal Curtain Wall Fasteners*

Overview

The proposed connector secures two shorter pieces of rail together to form a longer rail section with a channel nut located each side of the splice (on one side) and a continuous interlocking T-Groove connection on the opposite side as shown in product literature (attached). The connected pieces of rail are then used in a similar application as an un-spliced rail transferring loads from connected PV panels thru the rail system to support brackets providing points of attachment to an existing roof structure.

Note that connections to an existing structure are not included in this analysis and should be analyzed by a registered design professional where required by the authority having jurisdiction. Designer should note eccentricity of applied loads in anchorage consideration.

Methods & Design Parameters

Calculated allowable loads were based on the following data:

- *Section and materials data provided by K2 Systems GmbH*
- *Load/deflection test data provided by K2 Systems GmbH*
- *Calculation model of bending stresses based on applied loads*

Technical Data

Material selection for CrossRail 48-XL connector is region-dependent and may be any of the following. Analysis of connector is based on least values for material yield and ultimate stresses. Refer to attached product data sheets for supplementary technical data.

<u>Material</u>	<u>Fy</u>	<u>Fu</u>	
EN AW 6063-T66	29	35.5	ksi
6005A-T5	31	38	ksi
6005A-T61	35	38	ksi

6061-T6 35 38 ksi

Section Properties

Tested assembly was based on the following:

<u>Property</u>	<u>CrossRail 48-XL</u>	<u>Connector</u>
Sx (horizontal axis)	0.242 in ³	0.241 in ³
Sy (vertical axis)	0.214 in ³	0.351 in ³
A (x-Section)	0.652 in ²	0.688 in ²

Installation Notes

The following guidelines apply to all installations using the CrossRail 48-XL Connector:

- Connector shall be used for the sole purpose of connecting two pieces of CrossRail 48-XL as part of a complete rail system in accordance with manufacturer's installation instructions.
- Adjoining pieces of rail should be assembled in the connector prior to installation and attachment to the mounting brackets. Do not place gaps (including thermal expansion gaps) between rails in the connector.
- Only manufacturer supplied parts equivalent to those in the tested assembly should be used to connect the rails and secure the connector (including M10x25 T-bolts & M10 serrated flange nuts).
- Ensure location of connector does not land at mounting bracket locations as it will prevent the mounting bracket from securing to the rail.
- For proper performance of the connector, t-bolts must be tightened to the specified torque per the installation instructions provided from the manufacturer.

Summary

When the CrossRail 48-XL connector is installed in accordance with the parameters noted it will not adversely affect the load carrying capacity of the CrossRail 48-XL rail system in accordance with previously established span charts.

Maximum Allowable Loads

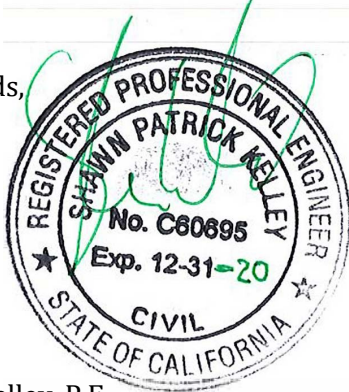
When utilizing the 48-XL Splice Connector, please refer to published reaction load tables, provided by Everest Solar Systems, to compare reaction loads of rail and the max allowable loads of the 48-XL Splice, listed below:

- Max down force: 500#
- Max shear force: 350#
- Max uplift force: 500#

For any configurations exceeding the abovementioned allowable loads, refer to Everest Solar Systems for further engineering support. This evaluation report does not provide analysis of any existing structures, as may be required by the local authority having jurisdiction.

We appreciate the opportunity to have assisted you with this project. Should you have any further questions regarding this analysis, please feel free to contact us by phone or email.

Best Regards,



Shawn P. Kelley, P.E.

Principal

moment ENGINEERING + DESIGN

spkelley@msegllc.com

Attachments:

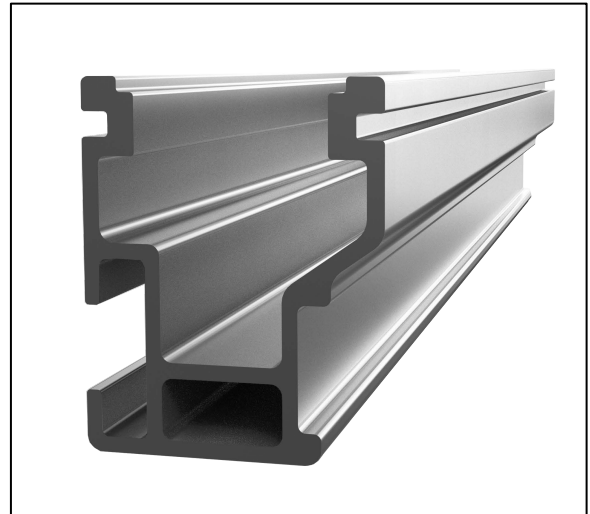
1. CrossRail 48-XL Technical Data Sheet
2. Assembly instructions for Crossrail 48-X/48-XL Rail Connector



CrossRail 48-XL Technical Data Sheet

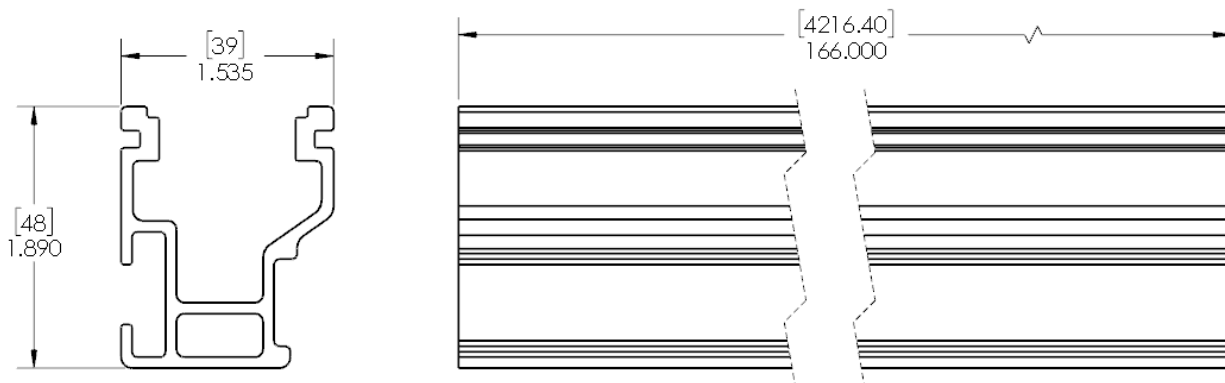
Overview:

MECHANICAL PROPERTIES	
Material:	6000 Series Aluminum
Ultimate Tensile Strength:	37.7 ksi (260 MPa)
Yield Strength:	34.8 ksi (240 MPa)
Weight:	0.76 lbs./ft. (1.13 kg/m)
Finish:	Mill or Dark Anodized



SECTION PROPERTIES	
Sx:	0.279 in ³ (4.571 cm ³)
Sy:	0.257 in ³ (4.213 cm ³)
A (X-Section):	0.652 in ² (4.207 cm ²)

General Dimensions:



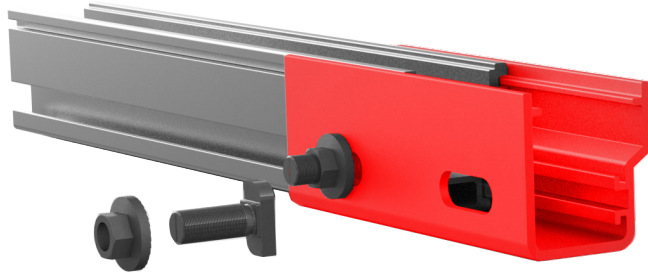
Dimensions in [mm] Inches

Notes:

- ▶ Structural values and span charts determined in accordance with Aluminum Design Manual and ASCE 7-10
- ▶ UL2703 Listed System for Fire and Bonding



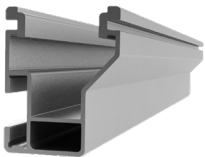
Mounting systems for solar technology



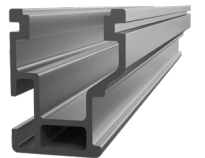
CrossRail 48-X / 48-XL Rail Connector:

- ▶ Structural properties
- ▶ One splice connects CrossRail 48-X and CrossRail 48-XL
- ▶ Uses 2 T-bolts

EVEREST SOLAR SYSTEMS CROSSRAIL 48-X / 48-XL RAIL CONNECTOR



CrossRail 48-X / 48-XL
Material: Aluminum



CrossRail 48-X / 48-XL Rail Connector
Material: Aluminum
Hardware: Stainless Steel

INSTALLATION OF CROSSRAIL 48-X AND 48-XL RAIL CONNECTOR: STEP BY STEP

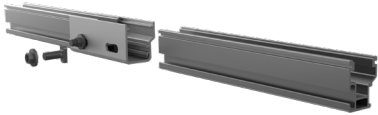


1
of 3

INSERT RAIL CONNECTOR

Slide the rail connector onto CrossRail 48-X or 48-XL

The rail connector contains mating features and must be inserted prior to aligning the rails together.



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of 3

ALIGN RAILS

Align the two rail ends next to each other and center the rail connector between the two rails.

Note: CrossRail 48-XL pictured.



3
of 3

CONNECT THE RAILS

Attach the rail connector using two M10 T-Bolts (use bonding T-Bolts with dark rail) and two hex nuts.

Ensure that the slot on the bottom of the T-Bolt is vertical, indicating that the T-Bolt head is properly engaged in the rail channel.

Torque M10 serrated hex nuts to 25.8 ft-lbs (35 Nm)

Note: Please refer to the system and state-specific engineering letters for allowable spans, limitations and installation notes regarding the capabilities of CrossRail 48-X or 48-XL and the CrossRail 48-X / 48-XL Rail Connector.

Note: CrossRail 48-XL pictured.

Ready!

THANK YOU FOR CHOOSING AN EVEREST SOLAR SYSTEMS MOUNTING SYSTEM.

The CrossRail Rail Connector is simple and fast to install. Please contact us for further assistance:

SERVICE-HOTLINE +1.760.301.5300

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CrossRail 48-X / 48-XL Rail Connector Quick Guide
US1-0518

Product images are for illustrative purposes only. Specifications are subject to change without notice. All sales of our products shall be subject to Everest Solar Systems terms and conditions, including the exclusive limited warranty set forth therein.