

SolarRoof

Code-Compliant Planning and Installation Guide V 5.1
Complying with AS/NZS 1170.2:2021



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Introduction

The Clenergy PVezRack® SolarRoof has been developed as a universal PV-mounting system for roof-mounting on pitched and flat roofs. The use of patented aluminium base rails, Z-Module technology and telescopic mounting technology eliminates custom cutting and enables fast installation.

Please review this manual thoroughly before installing PVezRack® SolarRoof. This manual provides:

1) Supporting documentation for building permit applications relating to PVezRack® SolarRoof Universal PV Module Mounting System,

2) Planning and installation instructions.

The PVezRack® SolarRoof parts, when installed in accordance with this guide, will be structurally sound and will meet the AS/NZS 1170.2:2021 standard. During installation, and especially when working on the roof, please comply with the appropriate Occupational Health and Safety regulations. Please also pay attention to any other relevant State or Federal regulations. Please check that you are using the latest version of the Installation Manual, which you can do by contacting Clenergy Australia via email on tech@clenergy.com.au, or contacting your local distributor in Australia.

The installer is solely responsible for:

- Complying with all applicable local or national building codes, including any updates that may supersede this manual;
- Ensuring that PVezRack® and other products are appropriate for the particular installation and the installation environment;

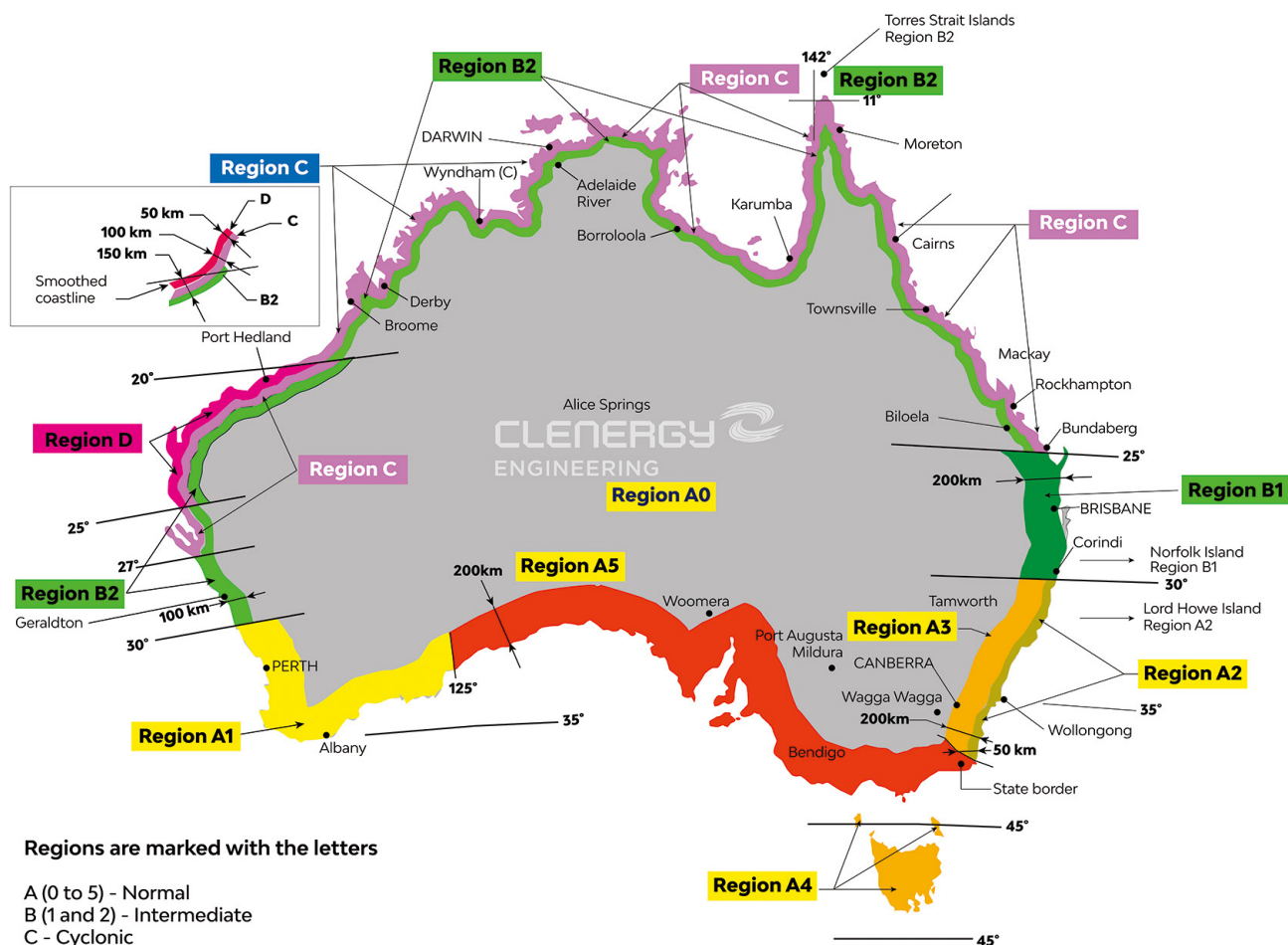
Product Warranty:

Please refer [PVezRack® Product Warranty](#) on our website.

- Using only PVezRack® parts and installer-supplied parts as specified by PVezRack® project plan (substitution of parts may void the warranty and invalidate the letter of certification);
- Recycling: Recycle according to the local relative statute;
- Removal: Reverse installation process;
- Ensuring that there are no less than two professionals working on panel installation;
- Ensuring the installation of related electrical equipment is performed by licenced electricians;
- Ensuring safe installation of all electrical aspects of the PV array, This includes adequate earth bonding of the PV array and PVezRack® SolarRoof components as required in AS/NZS 5033: 2021.
- Ensuring that the roof, its rafters/purlins, connections, and other structural support members can support the array under building live load conditions;
- Ensuring that screws to fix interfaces have adequate pullout strength and shear capacities as installed;
- Maintaining the waterproof integrity of the roof, including selection of appropriate flashing;
- Verifying the compatibility of the installation considering preventing electrochemical corrosion between dissimilar metals. This may occur between structures and the building and also between structures, fasteners and PV modules, as detailed in AS/NZS 5033: 2021.
- Verifying atmospheric corrosivity zone of installation site by referring to AS 4312-2008 or consulting local construction business to determine appropriate products and installations.

Planning

Determine the wind region of your installation site



Wind regions are pre-defined for the whole of Australia by the Australian Standard 1170.2:2021. Comparing to 1170.2:2011, 2021 version has a lot of changes in wind regions.

- Central Australia is now classified as Wind Region A0 and Terrain Classification 2 instead of Wind Region A4.
- Region A1, previously most of the South coast of Australia, now is divided into Regions A1 and A5.
- Tasmania is now Region A4.
- Region B has been divided into regions B1 and B2. This will affect installations in Northern NSW, Gold Coast, Brisbane, Sunshine Coast, and Gladstone.
- Region B1 was increased to include more inland cities around Brisbane. This will likely mean extra structural requirements such as extra rail for installs.

Importance Levels of Structure

The importance level of the structure PV system installs on shall be determined in accordance with the structure occupancy and use. In general term, each of 4 importance levels corresponds to different wind annual probability of exceedance for ultimate limit states depending on the design working life. For Clenergy mounting system having 25 years design working life, its importance level 1-4 corresponds to 1/100, 1/200, 1/500 and 1/1000 annual probability of exceedance of wind.

Engineering certificates of 1/200 and 1/500 annual probability of exceedance can be found at the end of installation guide. In those certificates, structure type of examples of different importance level have been provided then.

Determine the Terrain Category

It requires to determine the right terrain category to ensure the installation meets the maximum interface spacing specified in the engineering certificate.

In 1170.2-2021, Terrain category 1.5 was removed and Terrain category 2.5 was added. See the definitions below.

Terrain Category 1 (TC1) – Very exposed open terrain with very few or no obstructions, and all water surfaces (e.g. flat, treeless, poorly grassed plains; open ocean, rivers, canals, bays and lakes).

Terrain Category 2 (TC2) – Open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 m to 5 m, with no more than two obstructions per hectare (e.g. farmland and cleared subdivisions with isolated trees and uncut grass).

Terrain Category 2.5 (TC2.5) – Terrain with some trees or isolated obstructions, terrain in developing outer urban areas with scattered houses, or larger acreage developments with more than two and less than 10 buildings per hectare.

Terrain Category 3 (TC3) – Terrain with numerous closely spaced obstructions having heights generally from 3 m to 10 m. The minimum density of obstructions shall be at least the equivalent of 10 house-size obstructions per hectare (e.g. suburban housing, light industrial estates or dense forests).

Terrain Category 4 (TC4) – Terrain with numerous large, high (10 m to 30 m tall) and closely spaced constructions, such as large city centres and well-developed industrial complexes.

If your installation site is not at TC 2, 2.5 or 3, please contact Clenergy to obtain a project specific engineering certificate to support your installation.

Verify Atmospheric Corrosivity Zone of Installation Site

Please refer to “AS 4312-2008 Atmospheric Corrosivity Zones in Australia” or consult local construction business to verify corrosivity category of installation site to determine appropriate corrosivity class roof interface screw.

Determine the Height of the Installation Site

This document provides sufficient information for the PV-ezRack® SolarRoof system installation up to heights of 30 meters. If your installation site is more than 30 meters high please contact Clenergy to obtain project specific engineering certificate to support your installation.

Determine Roof slope

The PV-ezRack® SolarRoof system can be used for roof slopes up to 60°. Please verify that the Installation site roof slope is between 0° and 60°.

Determine the Installation Area of Roof

Please refer to the last notes of Certification Letters to determine the installation area based on building height, length and width. Please be aware at certain building conditions there is an Exclusion Zone for flush installation, which is the minimum distance between PV solar panel and roof edge of "2s", where "s" is the gap between the underside of the panel and the roof surface.

Verify Rafter/Purlin Properties of Building

Please verify rafter/purlin properties of building, which could affect the interface spacing. For example, tin interface spacing on the metal purlin in the certification letter is based on steel purlin G450 1.5 mm thick. If the steel purlin is less than 1.5 mm thick, the corresponding reduction factor of interface spacing will be applied. Please refer generic notes for details.

Determine the Maximum Rail Support Spacing

Please refer to the Certification Letter and Interface Spacing Table. If a project specific Certification Letter has been provided, please refer to the support spacing in this letter.

Verify Maximum Rail End Overhang

Rail end overhang should be not over 40% of the interface spacing. For example, if the interface spacing is 1500mm, the Rail end overhang can be up to 600mm only.

Acquire PV Modules Clamping Zone Information

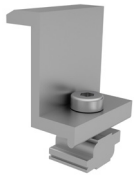
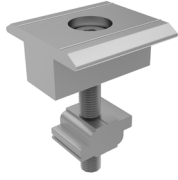
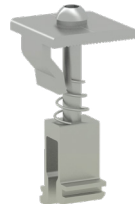
It is recommended to acquire PV modules clamping zone info. from PV modules manufacturer, which can help to plan interfaces positions on the roof and rails orientation and positions.

Tools and Components

Tools

				
Angle Grinder with Stone Disk	Screw Driver (for M8 Hexagon Socket Screw)	Torque Spanner	Spanner	5m Tape
				
String & Marker Pen				

Components

				
ER-EC-ST End Clamp	ER-IC-ST Inter Clamp	C-U/30/46-G Akashi Clamp	C-U/30/46 Akashi Clamp	ER-EC-DU35/40 End Clamp, Dual 35 or 40mm
				
ER-EC-DU40/46 End Clamp, Dual 40 or 46mm	ER-R-ECO ECO Rail	ER-SP-ECO Splice for ECO Rail	SCO-ECO/380 Side Channel Cover for Cutter-Rail, length 380 mm	

				
ER-I-41/EZC/ECO Adjustable Tile Interface with ezClick connection, 120 mm horizontal arm	ER-I-61/EZC/ECO Adjustable Tile Interface with ezClick connection, 170 mm horizontal arm	ER-I-01 Tile Interface	ER-I-01/CS Tile Interface, Carbon Steel	ER-I-01/EZC/ECO Tile Interface with ezClick connection for ECO-Rail
				
ER-I-02 Flat Tile Interface	ER-I-04 Slate Interface	ER-I-23 Tile Interface -Landscape	ER-I-26 Tile Interface -Side mount	ER-I-51 Tile Interface, 118mm horizontal arm

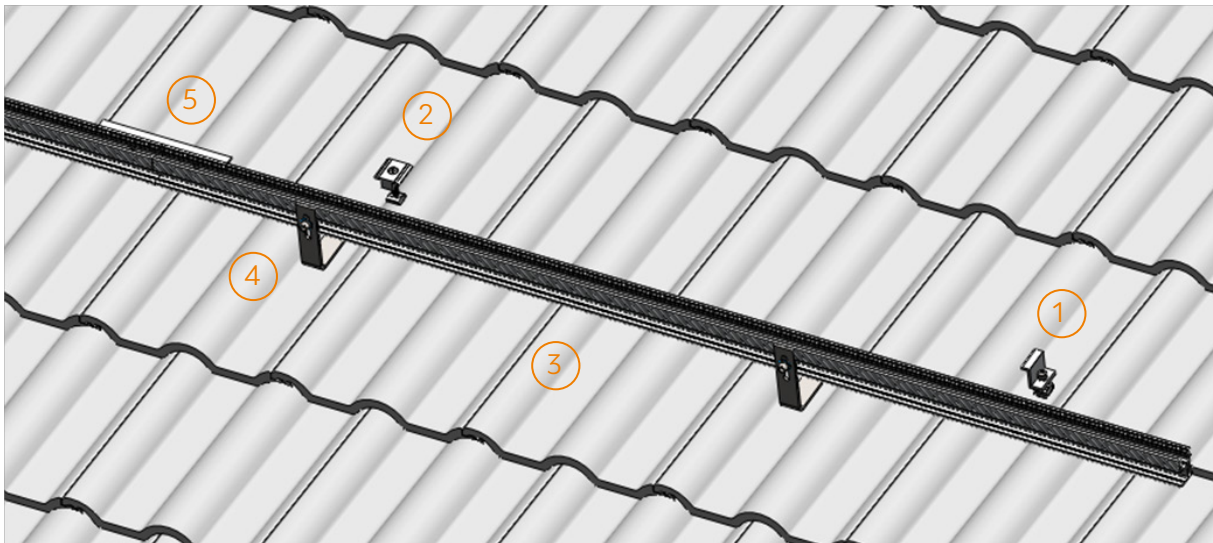
Components

 ER-I-71 Tile Interface, 190 mm horizontal arm	 ER-I-05 Tin Interface	 ER-I-05/CM Tin Interface with Click Module	 ER-I-05A/EZC/ECO Tin Interface A with ezClick connection	 ER-I-25 Tin Interface with Curved Base for Corrugated Roof
 ER-HB-8/150 Hanger Bolt for wood purlin	 ER-HB-MP/8/150EP Hanger Bolt for metal purlin	 EZ-RE-200 Roof Hook Extender	 EZ-AD-C43 Adapter (Puck) for Corrugated Iron Roof	

System Overview

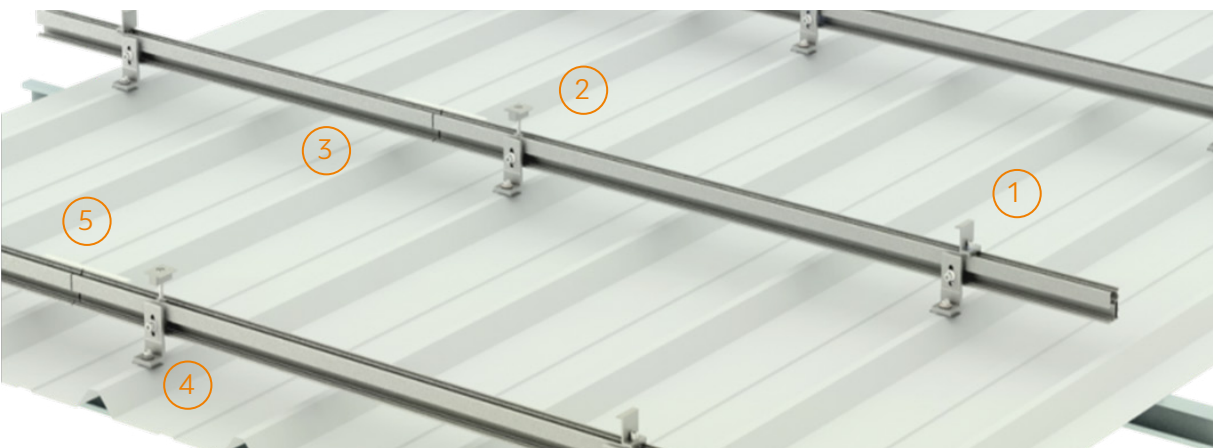
Overview of PV-ezRack® SolarRoof

Tile Roof



1. End Clamp 2. Inter Clamp 3. ECO Rail 4. Tile interface 5. Splice for ECO Rail

Tin Roof



1. End Clamp 2. Inter Clamp 3. ECO Rail 4. Tin interface 5. Splice for ECO Rail

Precautions during Stainless Steel Fastener Installation

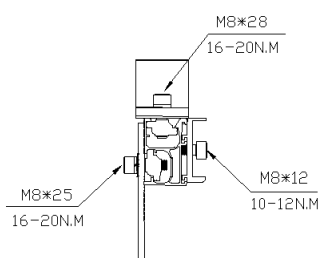
Improper operation may lead to deadlock of Nuts and Bolts. The steps below should be applied to stainless steel nut and bolt assembly to reduce this risk.

General installation instructions:

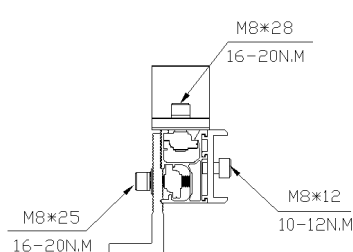
- (1) Apply force to fasteners in the direction of thread
- (2) Apply force uniformly, to maintain the required torque
- (3) Professional tools and tool belts are recommended
- (4) In some cases, fasteners could be seized over time. As an option, if want to avoid galling or seizing of thread, apply lubricant (grease or 40# engine oil) to fasteners prior to tightening.

Safe Torques

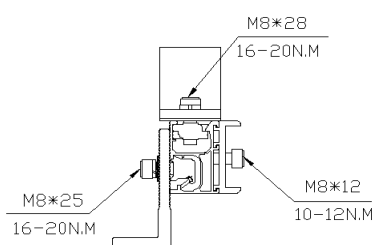
Please refer to safe torques defined in this guide as shown in the figures below. In case power tools are required, Clenergy recommends the use of low speed only. High speed and impact drivers increase the risk of bolt galling (deadlock) If deadlock occurs and you need to cut fasteners, ensure that there is no load on the fastener before you cut it. Avoid damaging the anodized or galvanized surfaces.



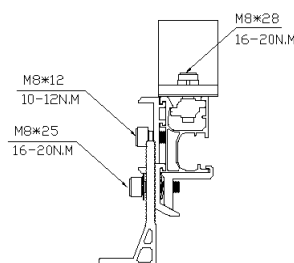
ER-I-01 and other tile interfaces



ER-I-05 and ER-I-25



ER-I-05/CM



ER-I-05A/EZC/ECO

Installation Instructions

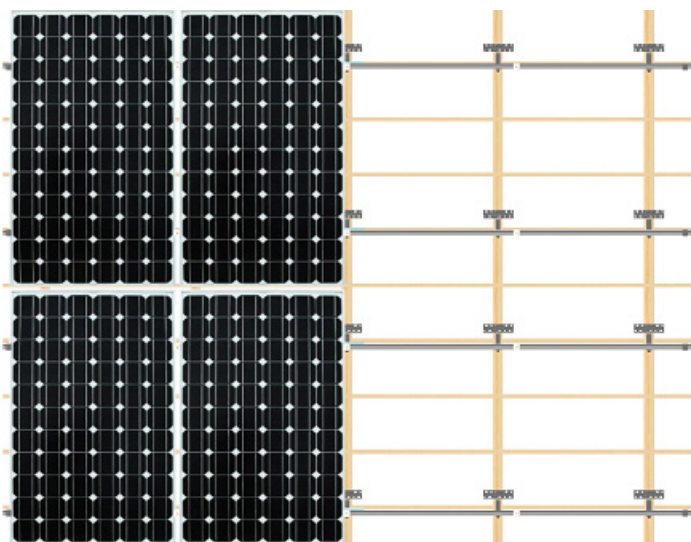
Installation Dimensions

All drawings and dimensions in this Installation Guide are a generic reference only. PV-ezRack® SolarRoof is to be optimized to suit specific conditions for each project and should be documented in a construction drawing.

Major components of PV-ezRack® SolarRoof may be provided in section sizes and lengths varying from those shown in this guide. The installation process detailed in this instruction guide remains the same regardless of changes in component size.

If you need to do any on-site modifications or alteration of the system please provide marked up drawings/sketches for Clenergy's review, prior to modification, for comment and approval.

Installation Instruction



- Assess the number of modules in the vertical direction using the module height plus at least 18mm between modules (please check the installation manual of the solar module manufacturer);
- Assess the Number of modules in the horizontal direction using the module width plus 18 mm (20 mm if using Akashi Clamps) between the modules.

Notes:

The standard end clamp will also add 20 mm (except for dual end clamps) on each side to the space required;

- Assess the horizontal spacing of the Roof Hooks;
- Assess the vertical spacing of the Roof Hooks = approx. 1/2 to 3/4 of module height;
- Always check the installation manual of the PV-Module you use in order to determine the allowed fixing points on the module frame.

Tile Interface Installation

Note:

It is recommended not to install tile interfaces on tile roofs under 15 degrees pitch considering potential damage to building through water ingress, unless the tile manufacturer confirms that the tiles are designed for lower roof pitch.

Determine the positions of the Roof Hooks according to your plans. Remove the roof tiles at the marked positions or, if possible, simply push them up slightly.

Fix the Roof Hooks to the rafter using Clenergy provided Buildex 14 gauge Hex Head Zips screw with minimum 25 mm embedment as shown in the figure on the right following the Buildex screws installation guide below:

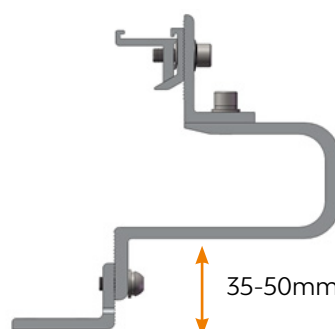
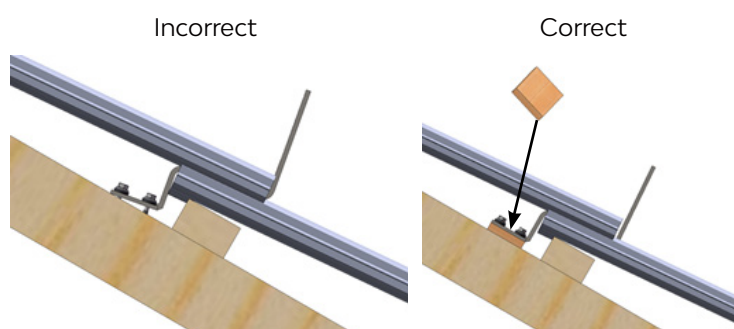
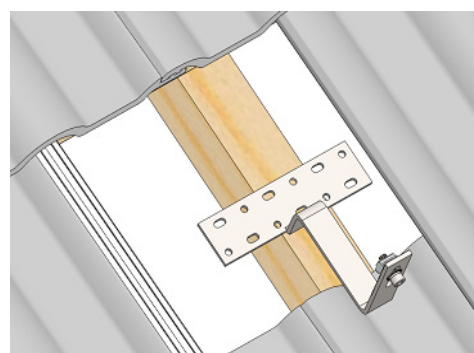
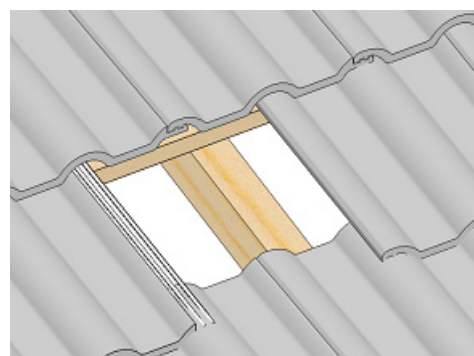
- Use a 3/8" Hex Socket.
- Use a mains powered or cordless screw driver with a drive speed of 3,000 RPM maximum.
- Fit the driver bit into the screw and place at the fastening position.
- Apply consistently firm pressure (end load) to the screw driver until the screw is fastened.

The roof hook must not press against the roof tile. If necessary, pack the roof hook with max pack height of 17 mm for Clenergy provided Buildex 50 mm long screw, with max pack height of 35 mm for Clenergy provided Buildex 65 mm long screw.

Notes:

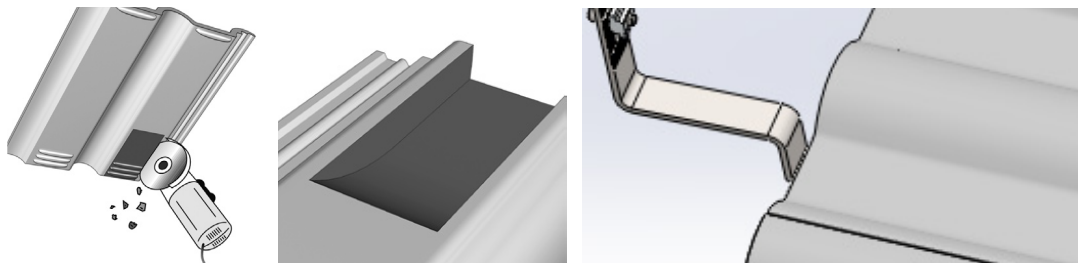
When installing Adjustable Tile Interface (ER-I-41/EZC/ECO or ER-I-61/EZC/ECO), height can be adjustable from 35mm to 50mm.

The recommended torque of bolt for height adjustment is 16-20 N·m.



If necessary, use an angle grinder

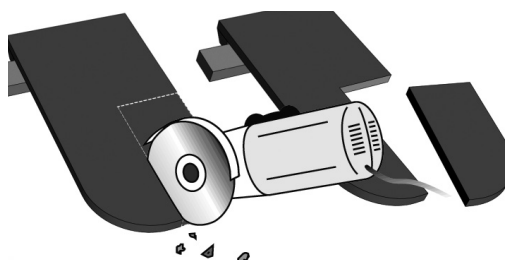
to cut a recess in the tile covering the Roof Hook at the point where the Roof Hook extends so that the tile lies flat on the surface. If grooved tiles are used, it will also be necessary to cut a recess in the lower tile.



Caution! Do not use fitted roof hooks as a ladder, as this extreme point load could damage the tile below.

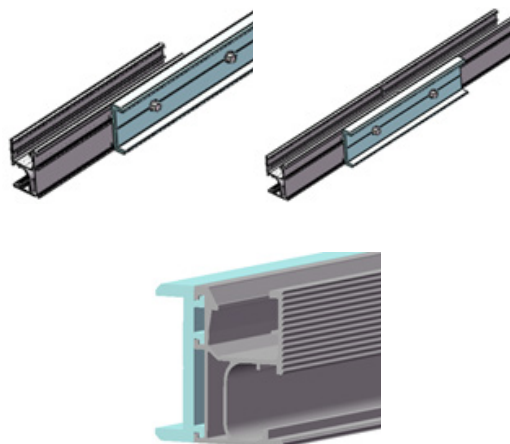


Variation for installation on plain tile roofs with plain tile roof cladding: A recess must be cut into the tiles around the position of the roof hook. The tile flashing should be used if necessary to prevent ingress of water.

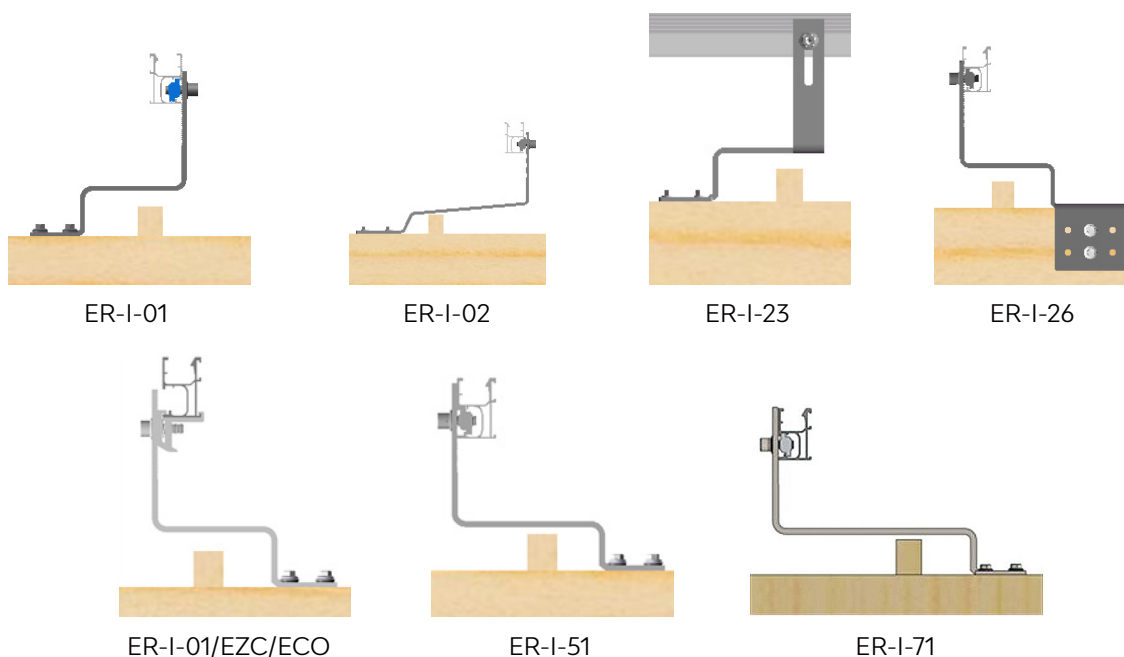


Rail Installation

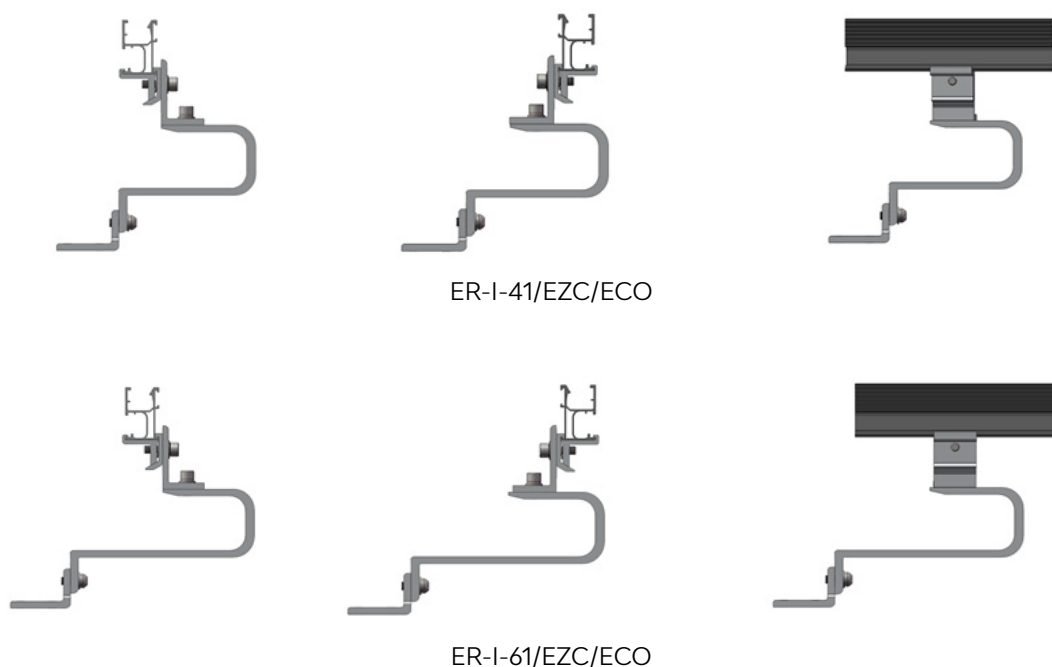
To connect several rails together, slide half of the splice into the rear side of the rail. Fasten the first M8 Bolt using an Allen key, and slide the next rail into the splice. Tighten the second M8 Bolt using an Allen key. Splice provides the electrical connection between the 2 rails through the pressure bolts. This eliminates the need of using 2 earthing lugs. Recommended torque is 10 ~12 Nm.



If the rails consist of different lengths, always begin with the shortest piece. Install the PV modules on the Roof Hooks and fasten loosely with M8 x 25 bolt and washers as shown in the figure on the right. Two to three screw turns are adequate for loose installation.



Adjustable Tile Interface (ER-I-41/EZC/ECO or ER-I-61/EZC/ECO) can adjust L profile bracket on the top to achieve rail running parallel or perpendicular to the rafter. See the figures below.

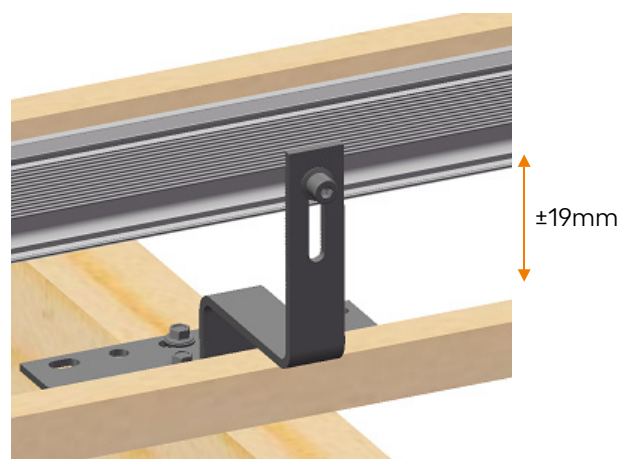


Notes:

1. For ER-I-41/EZC/ECO adjustable tile interface, interface spacings at 3 different scenarios above are different;
2. There is an adjustable tile interface specific engineering letter (at the end of this installation guide) for both ER-I-41/EZC/ECO and ER-I-61/EZC/ECO.

Adjust the vertical and horizontal positioning using the long hole in the Roof Hook and the loosely connected Z Module in the rail, as shown in the figure on the right. The roof hook should not protrude over the rail after the adjustment.

The recommended torque is 16~20N·m.



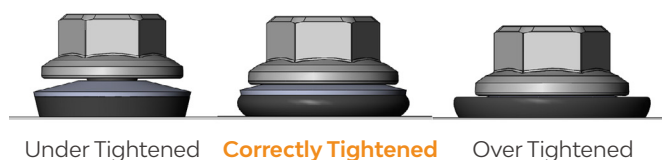
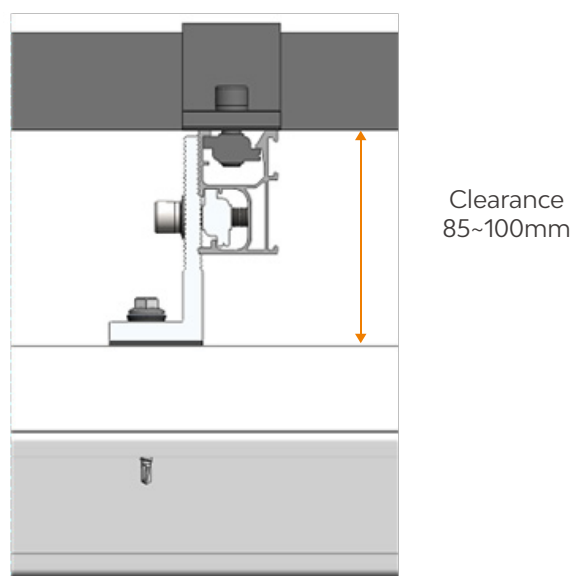
PV Module Installation

- 1) Please refer [PV-ezRack® Grounding System](#) for PV modules clamps and grounding lugs installations.
- 2) The installers must ensure panel clamps are installed flush mounted to the panel frame and apply correct torque value of clamp fastener as shown in section "**Safe Torques (Page 10)**".

Tin Interface Installation

For installations using ER-I-05, Tin Interface equipped with Buildex 14-11 x 70 (14 gauge, 6.3 mm, 11 TPI, 70 mm long) Hex Head Zips screw. Fix the ER-I-05 at the planned locations on metal or wood purlins as shown in the figure on the right following the Buildex screws installation guide below:

- Use a 3/8" Hex Socket.
- Use a mains powered or cordless screw driver with a drive speed of 3,000 RPM maximum.
- Fit the driver bit into the screw and place at the fastening position.
- Apply consistently firm pressure (end load) to the screw driver until the screw is fastened.
- Screws with bonded washers should be tightened only until the washer is gripped firmly enough to provide a watertight seal. The screws should be neither under tightened nor over tightened to lead to water penetration. Take particular care to ensure the screw is driven perpendicular to the interface to avoid deformation of the washer.

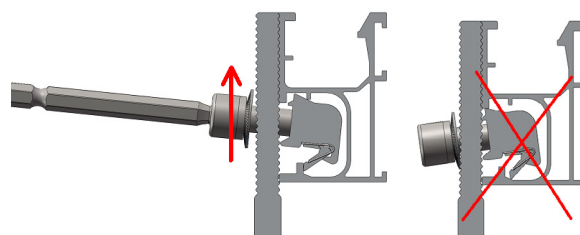


Repeat "**Rail Installation (Page 13)**" and "**PV Module Installation (Page 15)**" to install the Rails and PV Modules.

Notes:

- The purlin thickness should be no less than 0.42mm and no more than 2.4mm;
- Please refer to the recommended torques in "**Safe Torques (Page 10)**";
- Screws not exposed to frequent rain should be washed down with fresh water at least every 6 months to meet the warranty conditions of Buildex screws.

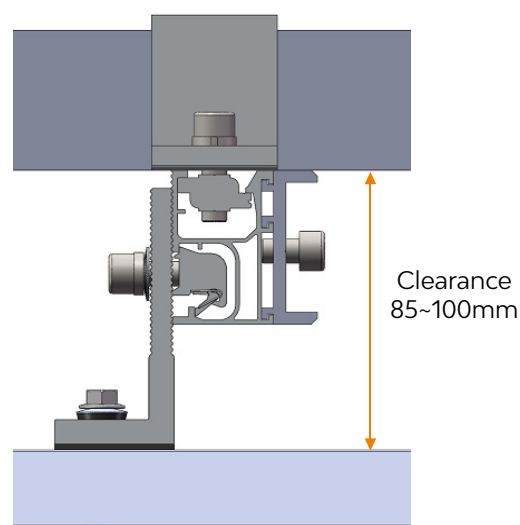
For installations using ER-I-05/CM, Tin Interface with Click Module, equipped with Buildex 14-11 x 70 (14 gauge, 6.3 mm, 11 TPI, 70 mm long) Hex Head Zips screw. . Fix the ER-I-05/CM at the planned locations on metal or wood purlins as shown in the figure on the right following the Buildex screws installation guide above. Repeat **"Rail Installation (Page 13)"** and **"PV Module Installation (Page 15)"** to install the Rails and PV Modules.



When fastening ER-I-05/CM with rail, it needs to lift up the bolt of click module to make click module well touch with upper rib of side channel of rail. So, the click module can be fixed into the rail properly as shown in the figure on the right.

Notes:

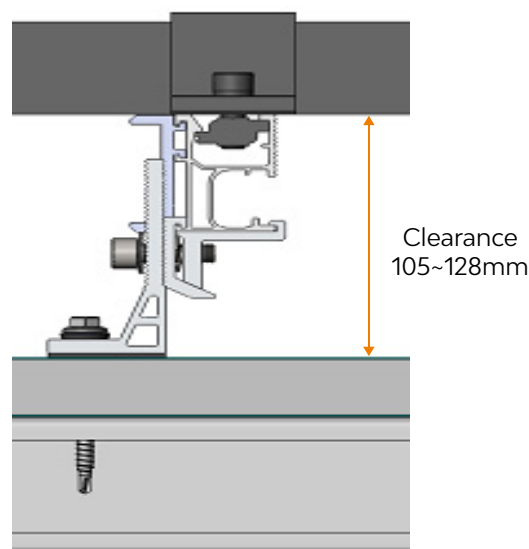
- The purlin thickness should be no less than 0.42mm and no more than 2.4mm;
- Please refer to the recommended torques in **"Safe Torques (Page 10)"**;
- Screws not exposed to frequent rain should be washed down with fresh water at least every 6 months to meet the warranty conditions of Buildex screws.



For installations using ER-I-05A/EZC/ECO, Tin Interface with ezClick connection with Buildex 14-11 x 70 (14 gauge, 6.3 mm, 11 TPI, 70 mm long) Hex Head Zips screw. Fix the ER-I-05A/EZC/ECO at the planned locations on metal or wood purlins as shown in the figure on the right following the Buildex screws installation guide above. Repeat **"Rail Installation (Page 13)"** and **"PV Module Installation (Page 15)"** to install Rails and PV Modules.

Notes:

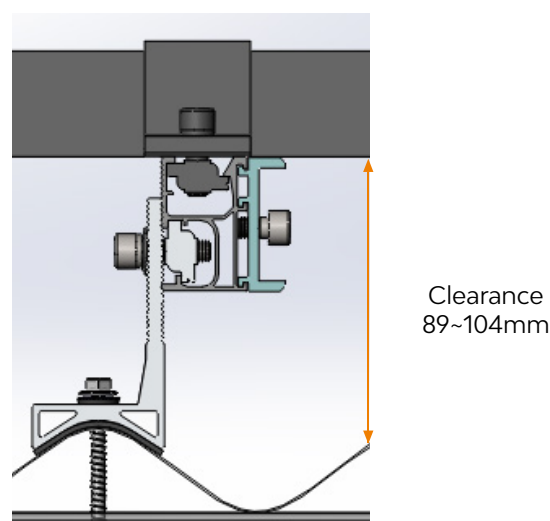
- The purlin thickness should be no less than 0.42mm and no more than 2.4mm;
- Please refer to the recommended torques in **"Safe Torques (Page 10)"**;
- Screws not exposed to frequent rain should be washed down with fresh water at least every 6 months to meet the warranty conditions of Buildex screws.



For installations using ER-I-25, Tin Interface with Curved Base for Corrugated Roof with Buildex 14-11 x 70 (14 gauge, 6.3 mm, 11 TPI, 70 mm long) Hex Head Zips screw. Fix the ER-I-25 at the planned locations on metal or wood purlins as shown in the figure on the right following the Buildex screws installation guide above. Repeat "Rail Installation (Page 13)" and "PV Module Installation (Page 15)" to install Rails and PV Modules.

Notes:

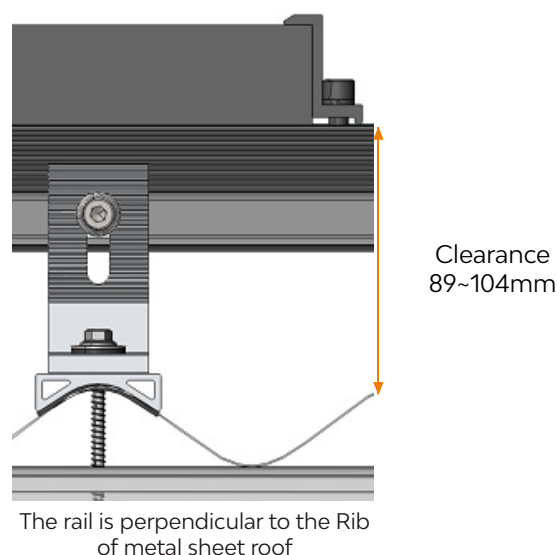
- The purlin thickness should be no less than 0.42mm and no more than 2.4mm;
- Please refer to the recommended torques in "Safe Torques (Page 10)";
- Screws not exposed to frequent rain should be washed down with fresh water at least every 6 months to meet the warranty conditions of Buildex screws.



For installations using EZ-AD-C43 and ER-I-05, Adapter (Puck) for Corrugated Iron Roof and Tin Interface. Attach the EZ-AD-C43 on the planned position and then fix the ER-I-05 on metal or wood purlins as shown in the figure on the right following the Buildex screws installation guide above. Repeat "Rail Installation (Page 13)" and "PV Module Installation (Page 15)" to install Rails and PV Modules.

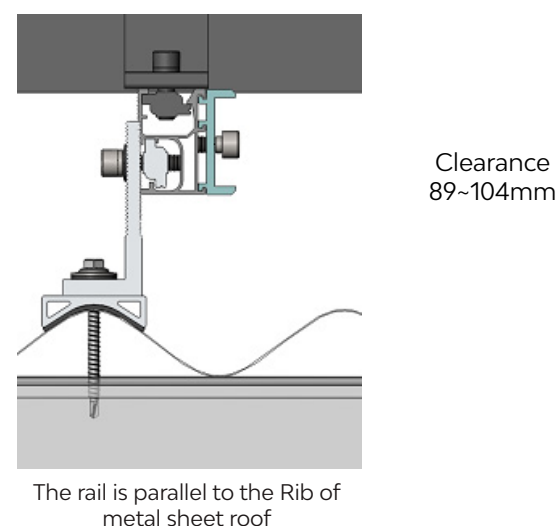
Notes:

- The purlin thickness should be no less than 0.42mm and no more than 2.4mm;
- Please refer to the recommended torques in "Safe Torques (Page 10)";
- Screws not exposed to frequent rain should be washed down with fresh water at least every 6 months to meet the warranty conditions of Buildex screws.



NOTE:

WHEN USING TIN INTERFACES FOR INSTALLATION WORKS, SCREWS NOT EXPOSED TO FREQUENT RAIN SHOULD BE WASHED DOWN WITH FRESH WATER AT LEAST EVERY 6 MONTHS TO MEET THE WARRANTY CONDITIONS OF BUILDDEX SCREWS.



Side Channel Cover for Cutter-Rail Installation (optional)

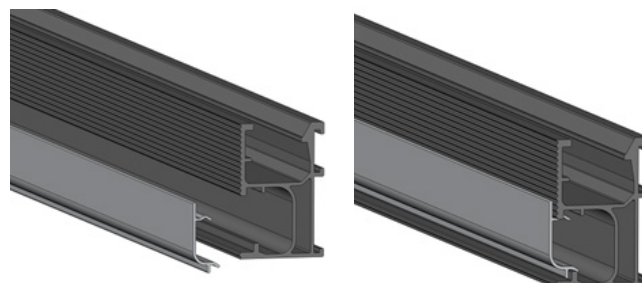
After cables going into the side channel of Cutter-Rail, click covers into side channel of Cutter-Rail at the required places shown in Figures at the right side.

Notes:

1. Side channel cover is made of mill finish aluminium, which is only compatible with Cutter rail;

2. The main purpose of side channel cover is to cover the cables running through side channel of Cutter rail. To achieve the cable management purpose is also to require ezclick tile or tin interfaces only as they can leave side channel full open and not cause any obstruction or damage to the cables;

3. If requires the position adjustment, it is recommended to slide it on the channel rather than un/installation and reinstallation, which could deform it due to very thin thickness.



Hanger Bolt Installation

Hanger Bolt for Tile Roof Installation

Hanger bolt (ER-HB-8/150) installation on tile roof is only applicable for tile having some part of flat surface, where the rubber seal of hanger bot can mount flush on the tile not to cause waterproof problem. Please note it is installer's responsibility to verify feasibility of tile brackets penetration and to ensure tiles are not cracked and damaged in hanger bolt installation.

1. Purlins are to be identified when opening tiles and their positions are marked out on the tiles.
2. Based on installation plan and Hanger bolt spacing info., hanger bolt locations are marked on the tiles.

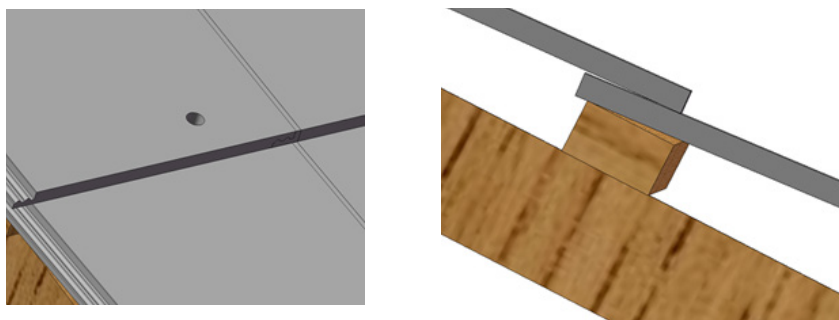
Note:

Please find tin interface spacing in the certification letter for hanger bolt spacing.

3. Drill 10 mm hole on the marked location of tile and stop when reaching the purlins.

Note:

For some installations, it needs to drill through two tiles (overlap) to reach the purlin;



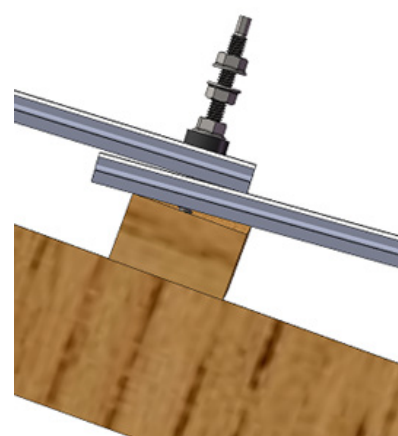
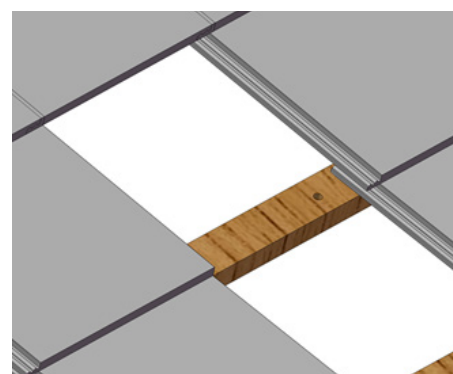
4. Through 10 mm hole on the tiles, pre-drill 6.5 mm hole on the wood purlin for hanger bolt. The tiles are not removed when drilling this hole. After the drilling, clean the dust around 10 mm hole.

5. Adjust the position of rubber seal on the hanger bolt (ER-HB-8/150) to ensure hanger bolt have minimum 25 mm penetration depth into the wood purlin.

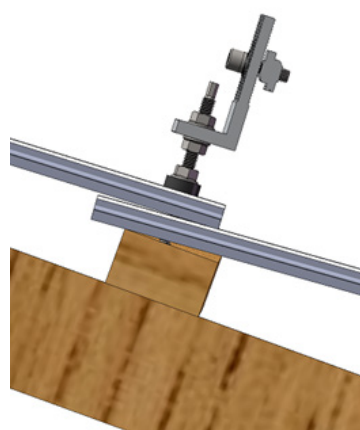
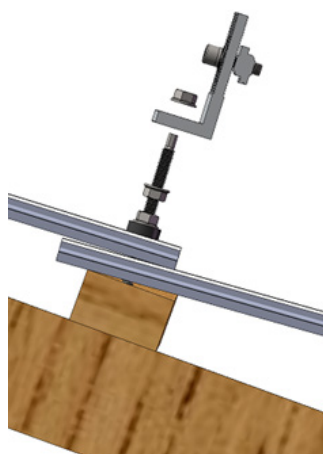
Drive and press the hanger bolt firmly in an axial manner to the wood purlin till the rubber seal is firmly flush on the tile and turn the nut down till touching the rubber seal. Please apply for low rotational speed of drive, preferably less than 300 rpm to reduce threads damage. Please turn another 4 threads cycle to press the rubber seal.

Notes:

- 1) Purlin thickness and tile thickness need to be verified to decide position of rubber seal for appropriate penetration depth;
- 2) It shall apply Sikaflex (or similar) sealant around the bolt to fill the gap between the bolt and tile before fixing hanger bolt. Please refer Sikaflex (or similar) instruction for use. It is also recommended to use Loctite Threadlocker Blue (or similar) for the nut holding the rubber seal in place to prevent hanger bolt/nut from leaking or loosening. Please refer Loctite (or similar) instruction for use.



6. Screw out the top nut of hanger bolt, connect and adjust tin foot position and tighten the top nut with the recommended torque of 16~20 N·m.



Follow sections "Rail Installation (Page 13)" and "PV Module Installation (Page 15)" to install the Rails and PV Modules.

Hanger Bolt Installation

Hanger Bolt for Tin Roof Installation

1. Hanger Bolt for wood purlin Installation

Hanger bolt (ER-HB-8/150) installation on tin roof is recommended for trapezoidal profile of roof or similar one having flat surface on the rib.

Drill 11 mm hole on the marked location of roof sheet according to installation plan.

Through 11 mm hole on the roof sheet, pre-drill 6.5 mm hole on the wood purlin for hanger bolt.

Adjust the position of rubber seal on the hanger bolt (ER-HB-8/150) to ensure hanger bolt have minimum 25 mm penetration depth into the wood purlin.

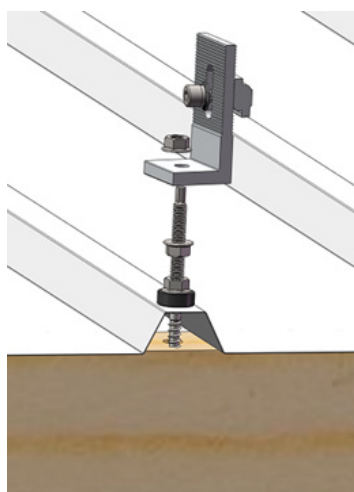
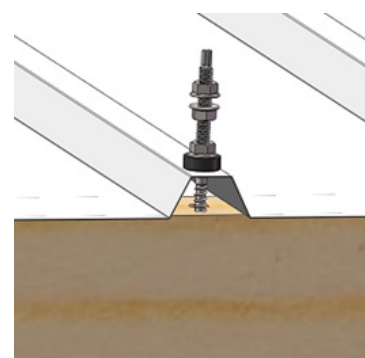
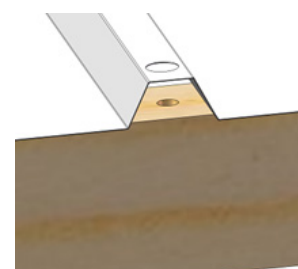
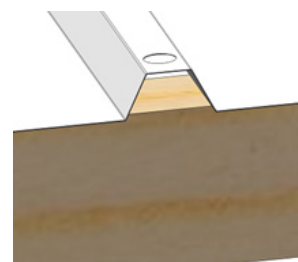
Drive and press the hanger bolt firmly in an axial manner to the wood purlin till the rubber seal is firmly flush on the tile and turn the nut down till touching the rubber seal. Please apply for low rotational speed of drive, preferably less than 300 rpm to reduce threads damage. Please turn another 4 threads cycle to press the rubber seal.

Notes:

- 1) Penetration depth into the wood purlin is used to decide position of rubber seal;
- 2) It shall apply Sikaflex (or similar) sealant around the bolt to fill the gap between the bolt and tin roof sheet before fixing hanger bolt. Please refer Sikaflex (or similar) instruction for use. It is also recommended to use Loctite Threadlocker Blue (or similar) for the nut holding the rubber seal in place to prevent hanger bolt/nut from leaking or loosening. Please refer Loctite (or similar) instruction for use.
- 3) The roof sheet should not have visible deformation after hanger bolt installation.

Screw out the top nut of hanger bolt, connect and adjust tin foot position and tighten the top nut with the recommended torque of 16~20 N·m.

Follow sections "Rail Installation (Page 13)" and "PV Module Installation (Page 15)" to install the Rails and PV Modules.



2. Hanger Bolt for metal purlin Installation

Hanger bolt (ER-HB-MP/8/150EP) installation on tin roof is recommended for trapezoidal profile of roof or similar one having flat surface on the rib.

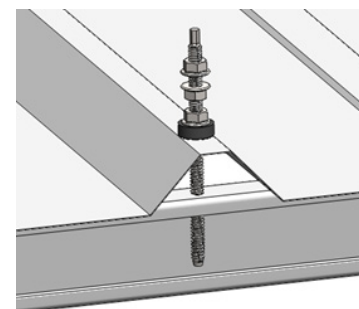
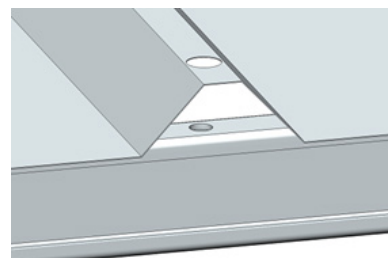
Drill 11 mm hole on the marked location of roof sheet according to installation plan.

Through 11 mm hole on the roof sheet, pre-drill 6.5 mm hole on the metal purlin for hanger bolt.

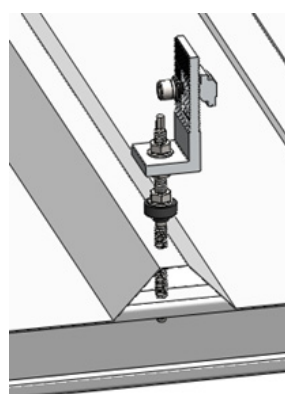
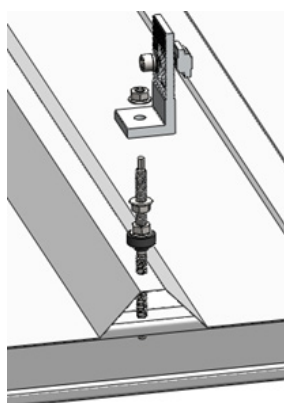
Drive and press the hanger bolt (ER-HB-MP/8/150EP) firmly in an axial manner to the metal purlin till the rubber seal is firmly flush on the tile and turn the nut down till touching the rubber seal. Please apply for low rotational speed of drive, preferably less than 300 rpm to reduce threads damage. Please turn another 4 threads cycle to press the rubber seal.

Notes:

- 1) It shall apply Sikaflex (or similar) sealant around the bolt to fill the gap between the bolt and tin roof sheet before fixing hanger bolt. Please refer Sikaflex (or similar) instruction for use. It is also recommended to use Loctite Threadlocker Blue (or similar) for the nut holding the rubber seal in place to prevent hanger bolt/nut from leaking or loosening. Please refer Loctite (or similar) instruction for use.
- 2) The roof sheet should not have visible deformation after hanger bolt installation.



Screw out the top nut of hanger bolt, connect and adjust tin foot position and tighten the top nut with the recommended torque of 16~20 N·m.



Follow sections "Rail Installation (Page 13)" and "PV Module Installation (Page 15)" to install the Rails and PV Modules.

Roof Hook Extender Installation

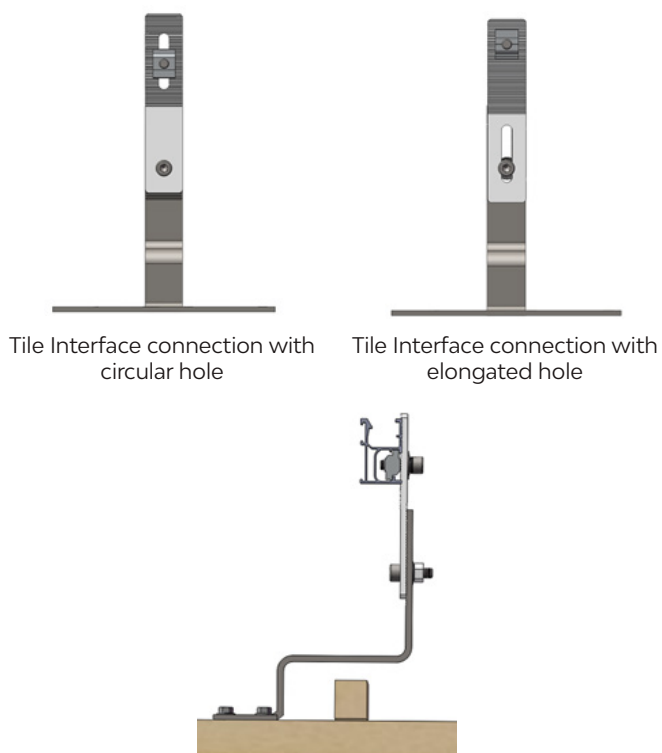
1. Roof Hook Extender with Tile Interface Installation

Install the roof hook extender with Tile Interface as shown in the figures on the right.

Either use circular hole or elongated hole of roof hook extender to connect with Tile Interface is allowed.

Recommended torque of M8 bolt is 16~20N·m

Follow sections "Rail Installation (Page 13)" and "PV Module Installation (Page 15)" to install the Rails and PV Modules.



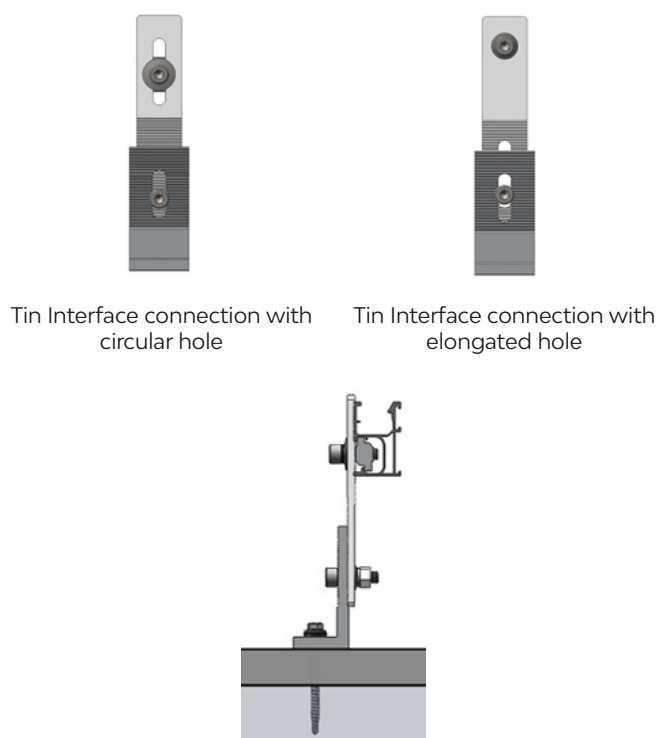
2. Roof Hook Extender with Tin Interface Installation

Install the Roof hook Extender with L feet as shown in the figure on the right.

Either use circular hole or elongated hole of roof hook extender to connect with Tin Interface is allowed.

Recommended torque of M8 bolt is 16~20N·m

Follow sections "Rail Installation (Page 13)" and "PV Module Installation (Page 15)" to install the Rails and PV Modules.



Tin and Tile Flush Installation Certification Letter

(Wind average recurrence of 200 years)



CIVIL & STRUCTURAL ENGINEERS
RESIDENTIAL - INDUSTRIAL - COMMERCIAL - PRODUCT DEVELOPMENT

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ABN 37 605 815 585

18 July 2023

Clenergy Australia
1/10 Duerdin Street
Clayton, VIC 3168

CERTIFICATION LETTER

Clenergy PV-ezRack Solar Roof Certification – TC2, 2.5, 3 – Wind Region A, B1, B2, C, D. Internal
REF: **00115**. Project REF: **CL-088-SM-REV-L**.

MW Engineering Melbourne, being Structural Engineers within the meaning of Australian regulations, have calculated the maximum spacings for the PV ez-Rack rail system for the following conditions:

- **Wind Loads to AS 1170.2-2021**
 - o **Wind Terrain Category 2, 2.5 and 3**
 - o **Wind average recurrence of 200 years**
 - o **Wind Region A, B1, B2, C, D**
- **Solar panel length up to 2.4m**
- **Solar panel width up to 1.2m**

Attached are the tables showing the spacings according to Wind Region, roof pitch, and building height.

The values shown on these tables will be valid unless an amendment is issued on any of the following codes:

- | | |
|--|---------------------------|
| - AS/NZS 1170.0- 2002 AMDT 4-2016 | General Principles |
| - AS/NZS 1170.1- 2002 AMDT 4-2016 | Imposed Loadings |
| - AS/NZS 1170.2- 2021 | Wind Loadings |
| - AS/NZS 1664.1- 1997 AMDT 1:1999 | Aluminium Code |

Should you have any queries, do not hesitate to contact us.

Best Regards,

Alberto Escobar
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July 2023

STRUCTURAL DESIGN CERTIFICATION



Tin and Tile Interface spacing tables

Standard: AS/NZS 1170.2:2021

Terrain Category: 2, 2.5 & 3

Topographic Multiplier: 1

Client: Clenergy Australia

REF: 00115

Date: JULY 2023

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Clenergy reference: CL-088-S-REV L

Project: PV-ezRack SolarRoof Tin and Tile interface spacing tables

Australian Standards

AS/NZS 1170.0:2002 (R2016)	General Principles
AS/NZS 1170.1:2002 (R2016)	Imposed Loadings
AS/NZS 1170.2:2021	Wind Loadings
AS/NZS 1664.1:1997-Amdt 1:1999	Aluminium

Rail type: ECO-RAIL

Wind Terrain Category: 2, 2.5 & 3

Wind average recurrence: 200 years

This engineering document was designed to cater for most common installation scenarios defined with an importance level 2 (200 years wind average recurrence) such as residential shed or garage, small - isolated warehouses and farm sheds, residential carports, and one or double storey dwelling. If the project conditions do not fit on the above criteria, please contact Clenergy for an assessment.

From 1 May 2023 installers must follow AS/NZS 1170.2:2021 only.

Designed: AE

Date: July 2023

Disclaimer: From the date of publication onwards, any amendment made to any of the above-mentioned Standards will make this report outdated and a new one will have to be released, unless the amendment has no implications on this certificate.

PV-ezRack SolarRoof Interface spacing table

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-01 (Tile Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)

ROOF ANGLE	$0^\circ < \alpha \leq 10^\circ$									
TC	3									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1669	1836	1619	1781	1536	1689	1519	1671	1469	1616
B1	1452	1597	1227	1350	1118	1230	1027	1140	955	1050
B2	1002	1102	918	1010	801	881	694	764	651	716
C	951	1047	781	859	709	780	662	728	618	680
D	579	637	532	585	456	501	412	454	391	430

ROOF ANGLE	$0^\circ < \alpha \leq 10^\circ$									
TC	2.5									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1569	1726	1522	1674	1444	1588	1428	1571	1381	1519
B1	1365	1502	1153	1269	1051	1157	966	1072	898	987
B2	942	1036	863	949	753	829	653	718	612	673
C	894	984	734	808	666	733	622	684	581	640
D	544	598	500	550	428	471	388	426	367	404

ROOF ANGLE	$0^\circ < \alpha \leq 10^\circ$									
TC	2									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1488	1637	1444	1588	1369	1506	1355	1490	1310	1441
B1	1295	1424	1094	1203	997	1097	916	1017	851	937
B2	893	982	819	901	714	786	619	681	581	639
C	848	933	697	766	632	695	590	649	551	607
D	516	568	474	521	406	447	368	404	348	383

PV-ezRack SolarRoof Interface spacing table (Cont.)

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-01 (Tile Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)

ROOF ANGLE	$10^{\circ} < \alpha \leq 20^{\circ}$									
TC	3									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1635	1798	1586	1744	1504	1654	1488	1636	1438	1582
B1	1422	1564	1201	1322	1095	1205	1006	1116	935	1029
B2	981	1079	899	989	785	863	680	748	638	701
C	932	1025	765	842	694	764	648	713	606	666
D	567	623	521	573	446	491	404	444	383	421

ROOF ANGLE	$10^{\circ} < \alpha \leq 20^{\circ}$									
TC	2.5									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1531	1684	1485	1633	1408	1549	1393	1532	1347	1482
B1	1332	1465	1125	1238	1026	1128	942	1046	876	963
B2	918	1010	842	926	735	808	637	700	597	657
C	873	960	716	788	650	715	607	668	567	624
D	531	584	488	536	418	460	378	416	358	394

ROOF ANGLE	$10^{\circ} < \alpha \leq 20^{\circ}$									
TC	2									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1462	1608	1418	1559	1345	1479	1330	1463	1286	1415
B1	1272	1399	1074	1182	979	1077	899	998	836	920
B2	877	965	804	884	702	772	608	669	570	627
C	833	916	684	752	621	683	580	637	542	596
D	507	557	466	512	399	439	361	397	342	376

PV-ezRack SolarRoof Interface spacing tables (Cont.)

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-01 (Tile Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)

ROOF ANGLE	$20^{\circ} < \alpha \leq 30^{\circ}$									
TC	3									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1615	1777	1567	1724	1486	1635	1470	1617	1422	1564
B1	1405	1546	1187	1306	1082	1191	994	1103	924	1016
B2	969	1066	888	977	775	853	672	739	630	693
C	921	1013	756	832	686	755	641	705	599	658
D	560	616	515	566	441	485	399	439	378	416

ROOF ANGLE	$20^{\circ} < \alpha \leq 30^{\circ}$									
TC	2.5									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1515	1667	1470	1617	1394	1534	1379	1517	1334	1467
B1	1318	1450	1114	1225	1015	1117	932	1035	867	953
B2	909	1000	833	917	727	800	630	693	591	650
C	864	950	709	780	644	708	601	661	561	618
D	525	578	483	531	414	455	374	412	355	390

ROOF ANGLE	$20^{\circ} < \alpha \leq 30^{\circ}$									
TC	2									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1446	1591	1403	1543	1330	1464	1316	1448	1273	1400
B1	1258	1384	1063	1169	969	1066	890	988	827	910
B2	868	954	795	875	694	764	602	662	564	620
C	824	907	677	744	614	676	573	631	536	589
D	501	551	461	507	395	434	357	393	338	372

PV-ezRack SolarRoof Interface spacing table

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-05 (Tin Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)

ROOF ANGLE	$0^\circ < \alpha \leq 10^\circ$									
TC	3									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1930	2201	1930	2201	1834	2087	1763	2003	1686	1913
B1	1682	1908	1682	1908	1600	1813	1540	1743	1474	1667
B2	1624	1841	1624	1841	1546	1750	1488	1683	1425	1610
C	1452	1641	1452	1641	1383	1562	1243	1503	1094	1439
D	1142	1460	1142	1460	989	1391	884	1265	778	1113

ROOF ANGLE	$0^\circ < \alpha \leq 10^\circ$									
TC	2.5									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1865	2123	1797	2044	1723	1957	1674	1899	1618	1833
B1	1626	1843	1569	1777	1506	1704	1464	1655	1416	1599
B2	1571	1779	1516	1715	1456	1645	1415	1599	1350	1545
C	1405	1587	1315	1532	1165	1470	1072	1429	970	1382
D	1036	1413	934	1338	828	1185	763	1091	691	987

ROOF ANGLE	$0^\circ < \alpha \leq 10^\circ$									
TC	2									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1805	2052	1686	1913	1628	1846	1596	1808	1556	1761
B1	1575	1784	1474	1667	1425	1610	1397	1578	1332	1538
B2	1522	1722	1425	1610	1376	1556	1298	1525	1204	1487
C	1330	1538	1094	1439	989	1391	934	1338	867	1241
D	944	1353	778	1113	704	1007	665	950	618	882

PV-ezRack SolarRoof Interface spacing tables (Cont.)

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-05 (Tin Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)

ROOF ANGLE	$10^\circ < \alpha \leq 20^\circ$									
TC	3									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1930	2201	1930	2201	1834	2087	1763	2003	1686	1913
B1	1682	1908	1682	1908	1600	1813	1540	1743	1474	1667
B2	1624	1841	1624	1841	1546	1750	1488	1683	1425	1610
C	1452	1641	1452	1641	1383	1562	1243	1503	1094	1439
D	1142	1460	1142	1460	989	1391	884	1265	778	1113

ROOF ANGLE	$10^\circ < \alpha \leq 20^\circ$									
TC	2.5									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1865	2123	1797	2044	1723	1957	1674	1899	1618	1833
B1	1626	1843	1569	1777	1506	1704	1464	1655	1416	1599
B2	1571	1779	1516	1715	1456	1645	1415	1599	1350	1545
C	1405	1587	1315	1532	1165	1470	1072	1429	970	1382
D	1036	1413	934	1338	828	1185	763	1091	691	987

ROOF ANGLE	$10^\circ < \alpha \leq 20^\circ$									
TC	2									
BUILDING HEIGHT (m)	≤ 5		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1805	2052	1686	1913	1628	1846	1596	1808	1556	1761
B1	1575	1784	1474	1667	1425	1610	1397	1578	1332	1538
B2	1522	1722	1425	1610	1376	1556	1298	1525	1204	1487
C	1330	1538	1094	1439	989	1391	934	1338	867	1241
D	944	1353	778	1113	704	1007	665	950	618	882

PV-ezRack SolarRoof Interface spacing tables (Cont.)

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-05 (Tin Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)

ROOF ANGLE	20° < α ≤ 30°									
TC	3									
BUILDING HEIGHT (m)	≤ 5		5<H≤10		10<H≤15		15<H≤20		20<H≤30	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1930	2201	1930	2201	1834	2087	1763	2003	1686	1913
B1	1682	1908	1682	1908	1600	1813	1540	1743	1474	1667
B2	1624	1841	1624	1841	1546	1750	1488	1683	1425	1610
C	1452	1641	1452	1641	1383	1562	1243	1503	1094	1439
D	1142	1460	1142	1460	989	1391	884	1265	778	1113

ROOF ANGLE	20° < α ≤ 30°									
TC	2.5									
BUILDING HEIGHT (m)	≤ 5		5<H≤10		10<H≤15		15<H≤20		20<H≤30	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1865	2123	1797	2044	1723	1957	1674	1899	1618	1833
B1	1626	1843	1569	1777	1506	1704	1464	1655	1416	1599
B2	1571	1779	1516	1715	1456	1645	1415	1599	1350	1545
C	1405	1587	1315	1532	1165	1470	1072	1429	970	1382
D	1036	1413	934	1338	828	1185	763	1091	691	987

ROOF ANGLE	20° < α ≤ 30°									
TC	2									
BUILDING HEIGHT (m)	≤ 5		5<H≤10		10<H≤15		15<H≤20		20<H≤30	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1805	2052	1686	1913	1628	1846	1596	1808	1556	1761
B1	1575	1784	1474	1667	1425	1610	1397	1578	1332	1538
B2	1522	1722	1425	1610	1376	1556	1298	1525	1204	1487
C	1330	1538	1094	1439	989	1391	934	1338	867	1241
D	944	1353	778	1113	704	1007	665	950	618	882

General Notes

Note 1. Tile roof interface spacing tables are based on a minimum depth into **F7 (Pine) timber of 25mm** (using two screws) whereas **Tin roof interface** spacing tables based on a minimum depth into **F7 (Pine) timber of 35mm** and **Steel Purlins G450 1.5mm thick** (using one screw)

Note 2. This engineering document was designed to cater for the most common installation scenarios however, it does not cater for all of them. Contact Clenergy if you are unable to comply with any of the installation specifications listed on this document or refer to the latest light commercial certificate.

Note 3. Standard screws shipped for tin and tile Roof Interfaces

Metal Purlins/Battens	Fasteners to be used
0.42 mm to 0.75 mm	Buildex- 14 - 11 x 70 Hex Head Zips with 16 mm Aluminium Bonded Washer on G550 Steel Battens or a screw that has an equal or a higher pullout capacity.
1.2 mm to 2.4 mm	Buildex- 14 - 11 x 70 Hex Head Zips with 16 mm Aluminium Bonded Washer or a screw that has an equal or a higher pullout capacity.
Wood Purlins and Rafters	Fasteners to be used
Timber F7 (Pine) and Timber 17 (Hardwood).	Tin Interface: Buildex- 14 - 11 x 70 Hex Head Zips with 16 mm Aluminium Bonded Washer or a screw that has an equal or a higher pullout capacity.
	Tile Interface: Buildex- 14 - 11 x 70 Hex Head Zips with 16 mm Aluminium Bonded Washer or a screw that has an equal or a higher pullout capacity or 14-10 x 50 Hex Head T17 with 16mm ABW Climaseal 3 or 14-10 x 65 Hex Head T17 Climaseal 3 or other screw of pullout value not less than screws above.

Note 4. The **Tin interface** increase, or reduction factors are listed below. These are depending on the type of tophat, purlin or batten as per the below table.

Purlin Material	Purlin thickness (mm)	Min. embedment (mm)	Spacing +/- (WR A)	Spacing +/- (WR B1)	Spacing +/- (WR B2)	Spacing +/- (WR C)	Spacing +/- (WR D)
Timber (Pine F7)	-	25	-25%	-35%	-35%	-35%	-35%
Timber (Pine F7)	-	30	-20%	-25%	-25%	-25%	-25%
Timber (Pine F7)	-	35	-	-	-	-	-
Timber (Hardwood F17)	-	25	-	-	-	5%	10%
Timber (Hardwood F17)	-	30	-	-	-	10%	15%
Timber (Hardwood F17)	-	35	-	-	-	10%	20%
Metal (G550)	0.42	-	-75%	-80%	-80%	-80%	-80%
Metal (G550)	0.48	-	-60%	-70%	-70%	-70%	-70%
Metal (G550)	0.55	-	-50%	-65%	-65%	-65%	-65%
Metal (G550)	0.75	-	-25%	-30%	-30%	-30%	-30%
Metal (G450)	1.2	-	-20%	-30%	-30%	-30%	-30%
Metal (G450)	1.5	-	-	-	-	-	-
Metal (G450)	1.9	-	-	-	-	5%	10%
Metal (G450)	2.4	-	-	-	-	5%	10%

Note 5. Minimum number of screws to be used when installing **tile** (ER-I-01) interface to be two (2) and when installing **tin** (ER-I-05) interface to be one (1).

Note 6. Spacings on tile interfaces will be reduced as follows:

Interface	% of Reduction
ER-I-01/CS, ER-I-51, ER-I-01/EZC/ECO & ER-I-71	-
ER-I-02	-50%
ER-I-04	-50%
ER-I-23	-28%
ER-I-26	-28%

Note 7. The more conservative spacing has to be used if one panel or panel row falls between two roof zones.

Note 8. The following components are satisfied for use according to AS/NZS 1664.1:1997-Amdt 1:1999 and AS/NZS 1170.2:2021

Components	Part No.	Description
ECO-Rail	ER-R-ECO/XXXX	ECO Rail
Splice	ER-SP-ECO	PV-ezRack Splice for ECO rail
Australian Made Mill Finish ECO Rail	R-ECO/XXXX/AUMF	PV-ezRack Australian Made Mill Finish ECO Rail
ST-Rail	ER-R-STXXXX	Standard Rail
Splice	ER-SP-ST	PV-ezRack Splice for Standard Rail 200mm
ECO Rail Black	ER-R-ECO/XXXX/BA	ECO Rail Black
Black Splice ECO Rail	ER-SP-ECO/BA	Splice ECO Rail Black
Inter Clamp	ER-IC-STXX	Inter Clamp = clamp + Z-Module + Bolt.
End Clamp	ER-EC-STXX	End Clamp = clamp + Z-Module + bolt
Clamp	C-U/30/46-G	Universal Clamp for Frame Height 30-46mm with Grounding Clip
Clamp	C-U/30/46	Universal Clamp for Frame Height 30-46mm
End Clamp	ER-EC-DU35/40	End Clamp dual 35 or 40mm
End Clamp	ER-EC-DU40/46	End Clamp dual 40 or 46mm
Inter Security Clamp	ER-IC-STXX/S	Inter Clamp = Clamp + Z-Module + Security Bolt
End Security Clamp	ER-EC-STXX/S	End Clamp = Clamp + Z-Module + Security Bolt
Interface	ER-I-01, 02, 04, 23, 26, 51 and 71	Tile Interface
Interface	ER-I-01/CS	Carbon Steel Tile Interface
Tile Interface with ezClick connection for ECO-Rail	ER-I-01/EZC/ECO	PV-ezRack SolarRoof, Tile Interface with ezClick connection for ECO-Rail
Interface	ER-I-05	Tin Interface
Black Interface	ER-I-05/BA	Black Tin Interface

Components	Part No.	Description
Interface	ER-I-05/CM	Tin Interface with Click Module
Interface	ER-I-05A/EZC/ECO	ezClick connection for ECO-Rail
Interface	ER-I-05/C5	Tin Interface with C5 rated Screw
Interface	ER-I-25	Tin Interface with curved Base for corrugated Roof
Black Interface	ER-I-25/BA	Black Tin Interface with curved Base for corrugated Roof
End Clamp (*)	EC-FL/GE/XX/XX	End Clamp for Frameless Module (glued EPDM)
Inter Clamp (*)	IC-FL/GE/XX/XX	Inter Clamp for Frameless Module (glued EPDM)
End Clamp (*)	ER-EC-FL/XX/XX	End Clamp for Frameless Module
Inter Clamp (*)	ER-IC-FL/XX/XX	Inter Clamp for Frameless Module
Black End Clamp (*)	EC-FL/GE/XX/XX/B	Black End Clamp for Frameless Module (glued EPDM)
Black Inter Clamp (*)	IC-FL/GE/XX/XX/B	Black Inter Clamp for Frameless Module (glued EPDM)
Adapter for Corrugated Roof	EZ-AD-C43	Adapted for Corrugated Iron Roof for Tin interface ER-I-05
Black Adapter for Corrugated Roof	EZ-AD-C43/BA	Black Adapted for Corrugated Iron Roof for Tin interface ER-I-05
Corrugated Adapter	EZ-AD-C110	PV-ezRack Adapter for Corrugated Iron Roof.
Roof Extender (Reduction Factor)	ER-RE-200	Roof Hook Extender, Suitable for ER-I-01,02,04,05,23,26, 51 and 01/CS
Connector Clamp	CRC-R/ECO-ZBW	Cross Connector Clamp for ECO-Rail
Hanger Bolt	ER-HB-10/200A	PV-ezRack, Hanger Bolt M10*200mm
Hanger Bolt	ER-HB-MP/8/150EP	PV-ezRack Hanger Bolt for metal purlin M8*150mm
Hanger Bolt	ER-HB-8/150	Hanger bolt without mounting plate M8x150. Fixed to timber purlin only
Mid Clamp XX Black	ER-IC-STXXB	Inter Clamp XX Black

Components	Part No.	Description
End Clamp XX Black	ER-EC-STXXB	End Clamp XX Black
Black Universal Clamp	C-U/30/46-BA	Black Universal Clamp
Black Universal Clamp	C-U/30/46-G-BA	Black Universal Clamp with grounding clip

(*) Subject to the panel manufacturer's installation guide.

Note 9. For Terrain Category (TC) definition, please refer to clause 4.2.1 of AS/NZS 1170.2:2021.

Note 10. For topographic Multiplier (Mt) more than 1.0 (installations on a mountain, hilly or sloped terrain) please refer to clause 4.4 of AS/NZS 1170.2:2021 to define appropriate Topographic multiplier value.

The below table provides a reduction factor applied for topographic multipliers greater than 1 (installation on a slope, hill on mountain). To achieve a more accurate and cost-effective design, please contact Clenergy Engineering department.

Mt	A, B1, B2	
	U.W & D. W	Central
1	1	1
1.01	1.00	1.00
1.02	1.00	1.00
1.03	0.92	0.94
1.04	0.92	0.94
1.06	0.92	0.88
1.08	0.85	0.88
1.09	0.85	0.81
1.1	0.85	0.81
1.2	0.69	0.69
1.3	0.54	0.56
1.4	0.46	0.50
1.5	0.38	0.44

Note 11. Shielding Multiplier (Ms) taken as 1.0. Refer to clause 4.3 of AS/NZS 1170.2:2021 for more information.

Note 12. Wind Direction Multiplier (Md) taken as 1.0. Refer to clause 3.3 of AS/NZS 1170.2:2021 for more information.

Note 13. This certificate cannot be used if the site is located on a hill, ridge or escarpment. Contact Clenergy if the aforementioned condition is met on site.

Note 14. From the date of publication onwards, any amendment made to any of the above-mentioned Standards will make this report outdated and a new one will have to be released, unless the amendment has no implications on this certificate.

Note 15. This certificate only covers the assessment of the Clenergy PV-ezRack mounting system, including the components listed on note 3 and 8. The assessment of the roof structure, PV panels and other fixings are to be checked by the installer/contractor, if necessary.

Note 16. Only hip and gable roofs installations are covered on this certificate. Contact Clenergy if you are planning to install on a different roof type such as curved, multi-span (pitched and saw-tooth), mansard, circular bin, silo, tank, pitched free, troughed free, hyper free, canopy, awning and cantilvered roof.

Note 17. No consideration has been taken on the effect of snow loads. In case the roof is located in a snow prone area, a special design must be made.

Note 18. No consideration has been taken on the effect of earthquake loads.

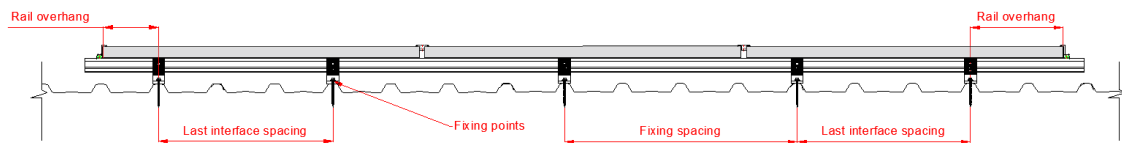
Note 19. This Engineering report is based on 2 m x 1 m panels and two rails per panel. However, a percentage increase could be applied on all interface spacings as shown on the following table.

Number of rails per panel	Panel length (mm)	Spacing +/- W.R – A & B1	Spacing +/- W.R –B2 C & D
2 rails	≤ 1700	+ 6 %	+ 10 %
3 rails	≤ 1700	+ 12 %	+ 18 %
4 rails	≤ 1700	+ 15 %	+ 20 %
2 rails	≤ 1800	+ 4 %	+ 7 %
3 rails	≤ 1800	+ 12 %	+ 18 %
4 rails	≤ 1800	+ 15 %	+ 20 %
2 rails	≤ 1900	0 %	+ 5 %
3 rails	≤ 1900	+ 10 %	+ 15 %
4 rails	≤ 1900	+ 12 %	+ 18 %
2 rails	≤ 2000	0 %	0 %
3 rails	≤ 2000	+ 10 %	+ 15 %
4 rails	≤ 2000	+ 12 %	+ 18 %

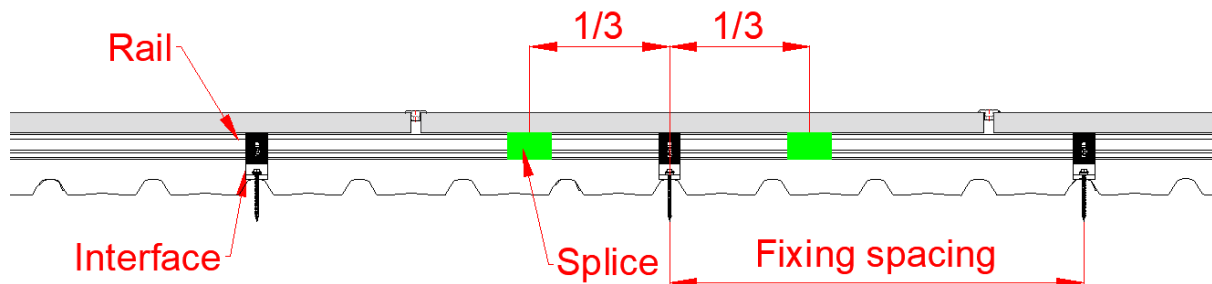
2 rails	≤ 2100	- 10 %	- 6 %
3 rails	≤ 2100	+ 10 %	+ 15 %
4 rails	≤ 2100	+ 12 %	+ 18 %
2 rails	≤ 2200	- 18 %	- 12 %
3 rails	≤ 2200	+ 7 %	+ 12 %
4 rails	≤ 2200	+ 12 %	+ 18 %
2 rails	≤ 2300	- 20 %	- 12 %
3 rails	≤ 2300	+ 5 %	+ 12 %
4 rails	≤ 2300	+ 10 %	+ 15 %
2 rails	≤ 2400	- 25 %	- 15 %
3 rails	≤ 2400	+ 5 %	+ 10 %
4 rails	≤ 2400	+ 8 %	+ 12 %

Note 20. Panel width cannot exceed 1.20 m for any of the above panel length dimensions and panel weight cannot exceed 15 kg/m².

Note 21. Rail overhang ends where the panel finishes, and it should be less than 40% of the last installed interface spacing.



Note 22. ER-R-ECO rail splice can only be installed within 1/3 of the fixing spacing (centre to centre) from the nearest interface when fixing spacing is over 1700 mm.



Note 23. ER-R-ECO rail splice cannot be installed on rail overhangs.

Note 24. Neither Clenergy nor MW Engineering Melbourne are responsible for external factors leading to compression of the tile interfaces.

Note 25. All components from Clenergy must be installed according to manufacturer's specification and the instructions shown in the relevant installation manual. Please check the Clenergy Australia website or contact them for access to the most recent installation manuals.

Note 26. Capacities checked and compared against testing data from Clenergy Australia and MTS (NATA certified).

Note 27. General conditions

Note 27.1 Minimum steel purlin strength of 450 MPa and 550 MPa for tophats.

Note 27.2 Timber Grade members: F7 (Pine) and F17 (Hardwood).

Note 27.3 If any of the screws of the interfaces go into pre-existing holes, they will have to be one size up compared to the screws that were previously installed. This is to ensure that the pullout capacity remains the same or higher.

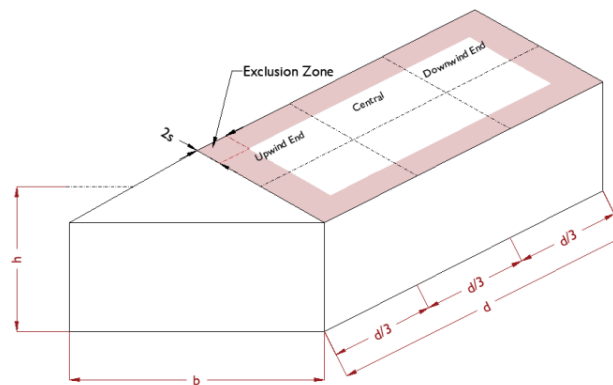
Note 28. Clamping zone of the PV panels should be according to the manufacturer's specifications.

Note 29. When using Roof Extender (ER-RE-200), reduce interface spacings by 15% on Wind Region A and B1 and 30% on Wind Region B2, C and D.

Note 30. Please refer to AS 4312 to find out about corrosion categories.

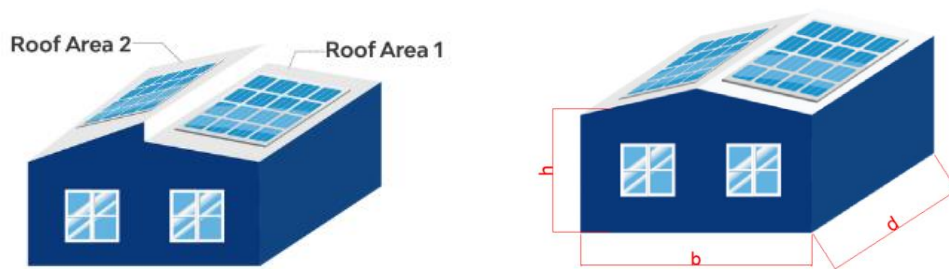
Note 31. Conditions for flush mounted systems installed on flat and pitched roofs are according to the B6 Appendix of the AS/NZS 1170.2:2021. Where the following conditions need to be met:

- Roof pitch to be between 1° and 30°.
- $h/d \leq 0.5$ and $h/b \leq 0.5$. Being h= height, b= width and d= length of the building as per the below picture.
- Gap between the underside of the panel and the roof to be no less than 50mm and no more than 300mm.



Note 32. Exclusion zone for flush installation to be the minimum distance from the edge of the roof "2 x s", where "s" is the gap between the underside of the panel and the roof.

Note 33. Refer to the latest light commercial certificate when the conditions from Note 31 and 32 doesn't meet the conditions on section B6 part (d) of the AS/NZS 1170.2:2021 standard for roof angle is between 1° to 30°.



Note 34. For Hanger Bolt installation on either tin or tile roof, the spacing to apply with a minimum embedment depth of 25mm into F17 (Hardwood) timber or fixing to metal purlin with 1.5 mm thickness is the same as the tin roof interface spacing (ER-I-05). The Hanger Bolts for wood purlin/rafter installation are ER-HB-8/150 and ER-HB-10/200A. The Hanger Bolt for metal purlin/rafter is ER-HB-MP/8/150EP. Contact Clenergy if your project doesn't meet the above requirements.

Note 35. Neither Clenergy nor MW Engineering Melbourne will be responsible for the integrity of the roof tiles when using hanger bolts for the solar installation. It will be the clients' responsibility to check the hanger bolt installation feasibility.

Example

Roof Type: Tin roof

Wind Region: A

Terrain Category: 3

Building height: 5 m

Building dimensions: 90 x 30 m

Roof pitch: less than 10°

Panel dimension: 2 m x 1 m

Purlin spacing: 1800 mm.

Rail running perpendicular to purlins.

According to the spacing tables shown on this document:

- Central zone: 2201 mm
- Upwind & Downwind: 1930 mm

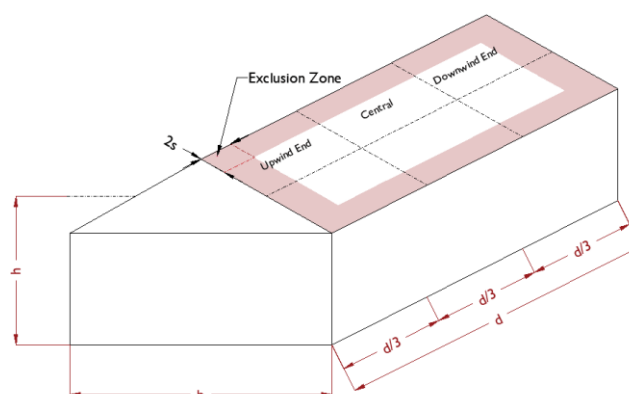
Installation to be done as per following fixing spacings:

- Central zone: 1800 mm
- Upwind & Downwind: 1800 mm

$$d = 90 \text{ m}$$

$$b = 30 \text{ m}$$

$$d/3 = 90/3 = 30$$



Tin and Tile Flush Installation Certification Letter

(Wind average recurrence of 500 years)



CIVIL & STRUCTURAL ENGINEERS
RESIDENTIAL - INDUSTRIAL - COMMERCIAL - PRODUCT DEVELOPMENT

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18 August 2023

Clenergy Australia
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Clayton, VIC 3168

CERTIFICATION LETTER

Clenergy PV ez-Rack Tin & Tile Certification – TC2, 2.5, 3 – Wind Region A, B1, B2 C & D.
Project No.: **CL-693-S-REV 3**. Internal REF: **00563**.

MW Engineering Melbourne, being Structural Engineers within the meaning of Australian regulations, have calculated the maximum spacings for the PV ez-Rack rail system for the following conditions:

- **Wind Loads to AS 1170.2-2021**
 - o Wind Terrain Category 2, 2.5 and 3
 - o Wind average recurrence of 500 years
 - o Wind Region A, B1, B2, C and D
- Solar panel length up to 2.4 m & Solar panel width up to 1 m

Attached are the tables showing the spacings according to Wind Region, roof pitch, and building height.

The values shown on these tables will be valid unless an amendment is issued on any of the following codes:

- | | |
|-----------------------------------|--------------------|
| - AS/NZS 1170.0- 2002 AMDT 4-2016 | General Principles |
| - AS/NZS 1170.1- 2002 AMDT 4-2016 | Imposed Loadings |
| - AS/NZS 1170.2- 2021 | Wind Loadings |
| - AS/NZS 1664.1- 1997 AMDT 1:1999 | Aluminium Code |

Should you have any queries, do not hesitate to contact us.

Best Regards,



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August 2023

STRUCTURAL DESIGN CERTIFICATION



Tin and Tile Interface spacing tables

Standard: AS/NZS 1170.2:2021

Terrain Category: 2, 2.5 & 3

Client: Clenergy Australia

REF: 00563

Date: AUGUST 2023

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REF: 00563

Client: Clenergy Australia

Internal reference: CL- 693-S- REV 2

Project: PV-ezRack SolarRoof Tin and Tile interface spacing tables

Australian Standards

AS/NZS 1170.0:2002 (R2016)

AS/NZS 1170.1:2002 (R2016)

AS/NZS 1170.2:2021

AS/NZS 1664.1:1997-Amdt 1:1999

General Principles

Imposed loadings

Wind Loadings

Aluminium

Wind Terrain Category: 2, 2.5 & 3

Wind average recurrence: 500 years

Designed: SM

Date: AUGUST 2023

Disclaimer: From the date of publication onwards, any amendment made to any of the above-mentioned Standards will make this report outdated and a new one will have to be released, unless the amendment has no implications on this certificate.

PV-ezRack SolarRoof Interface spacing table

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-01 (Tile Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	2

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	800	880	776	854	736	810	728	801	704	774
B1	584	642	536	590	480	528	437	485	381	419
B2	520	572	480	528	400	440	312	343	277	305
C	376	414	347	381	305	336	270	297	244	269
D	229	252	213	235	198	217	172	189	156	172

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	700	770	679	747	644	708	637	701	616	678
B1	511	562	469	516	420	462	382	424	334	367
B2	455	501	420	462	350	385	273	300	243	267
C	329	362	303	334	267	294	237	260	214	235
D	200	220	187	205	173	190	150	165	137	150

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	600	660	582	640	552	607	546	601	528	581
B1	438	482	402	442	360	396	328	364	286	315
B2	390	429	360	396	300	330	234	257	208	229
C	282	310	260	286	229	252	203	223	183	202
D	172	189	160	176	148	163	129	142	117	129

PV-ezRack SolarRoof Interface spacing tables (Cont.)

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-01 (Tile Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	2

Roof Angle - $30^{\circ} < \alpha \leq 60^{\circ}$

Wind Region	Building Height (m)																			
	H ≤ 5				5 < H ≤ 10				10 < H ≤ 15				15 < H ≤ 20				20 < H ≤ 30			
	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner
A	300	200	150	100	279	186	140	93	258	172	129	86	187	125	93	62	173	115	87	58
B1	196	131	98	65	173	115	87	58	157	105	78	52	126	84	63	42	114	76	57	38
B2	162	108	81	54	150	100	75	50	127	85	63	42	100	67	50	33	90	60	45	30
C	150	100	75	50	110	73	55	37	100	67	50	33	69	46	35	23	65	43	32	22
D	90	60	45	30	56	37	28	19	50	33	25	17	45	30	23	15	42	28	21	14

PV-ezRack SolarRoof Interface spacing table

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-01 (Tile Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	2.5

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	900	990	873	960	828	911	819	901	792	871
B1	657	723	603	663	540	594	491	545	429	472
B2	585	644	540	594	450	495	351	386	312	343
C	423	465	390	429	343	378	304	335	275	302
D	257	283	240	264	222	245	193	212	176	193

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	800	880	776	854	736	810	728	801	704	774
B1	584	642	536	590	480	528	437	485	381	419
B2	520	572	480	528	400	440	312	343	277	305
C	376	414	347	381	305	336	270	297	244	269
D	229	252	213	235	198	217	172	189	156	172

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	690	759	669	736	635	698	628	691	607	668
B1	504	554	462	509	414	455	377	418	329	362
B2	449	493	414	455	345	380	269	296	239	263
C	324	357	299	329	263	289	233	257	211	232
D	197	217	184	202	170	187	148	163	135	148

PV-ezRack SolarRoof Interface spacing tables (Cont.)

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-01 (Tile Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	2.5

Roof Angle - $30^{\circ} < \alpha \leq 60^{\circ}$

Wind Region	Building Height (m)																			
	H ≤ 5				5 < H ≤ 10				10 < H ≤ 15				15 < H ≤ 20				20 < H ≤ 30			
	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner
A	400	267	200	133	372	248	186	124	344	229	172	115	249	166	125	83	231	154	115	77
B1	262	174	131	87	231	154	115	77	209	139	105	70	168	112	84	56	152	101	76	51
B2	215	144	108	72	200	133	100	67	169	113	85	56	133	89	67	44	120	80	60	40
C	200	133	100	67	147	98	73	49	133	89	67	44	92	61	46	31	86	57	43	29
D	120	80	60	40	74	49	37	25	66	44	33	22	60	40	30	20	56	37	28	19

PV-ezRack SolarRoof Interface spacing table

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-01 (Tile Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	3

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1000	1100	970	1067	920	1012	910	1001	880	968
B1	730	803	670	737	600	660	546	606	477	524
B2	650	715	600	660	500	550	390	429	347	381
C	470	517	433	477	381	419	338	372	306	336
D	286	315	267	293	247	272	215	236	195	215

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	900	990	873	960	828	911	819	901	792	871
B1	657	723	603	663	540	594	491	545	429	472
B2	585	644	540	594	450	495	351	386	312	343
C	423	465	390	429	343	378	304	335	275	302
D	257	283	240	264	222	245	193	212	176	193

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	800	880	776	854	736	810	728	801	704	774
B1	584	642	536	590	480	528	437	485	381	419
B2	520	572	480	528	400	440	312	343	277	305
C	376	414	347	381	305	336	270	297	244	269
D	229	252	213	235	198	217	172	189	156	172

PV-ezRack SolarRoof Interface spacing tables (Cont.)

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-01 (Tile Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	3

Roof Angle - $30^{\circ} < \alpha \leq 60^{\circ}$

Wind Region	Building Height (m)																			
	H ≤ 5				5 < H ≤ 10				10 < H ≤ 15				15 < H ≤ 20				20 < H ≤ 30			
	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner
A	500	333	250	167	465	310	233	155	430	287	215	143	312	208	156	104	288	192	144	96
B1	327	218	163	109	288	192	144	96	262	174	131	87	210	140	105	70	190	127	95	63
B2	269	179	135	90	250	167	125	83	212	141	106	71	167	111	83	56	150	100	75	50
C	250	167	125	83	183	122	92	61	167	111	83	56	115	77	58	38	108	72	54	36
D	150	100	75	50	93	62	46	31	83	55	41	28	75	50	38	25	70	47	35	23

PV-ezRack SolarRoof Interface spacing table

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-05 (Tin Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	2

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1361	1497	1266	1392	1170	1358	1102	1323	1021	1225
B1	890	1089	785	1021	712	854	572	703	517	646
B2	817	1000	623	810	561	673	447	550	409	511
C	681	817	499	649	454	544	313	407	293	357
D	408	490	252	320	225	281	204	265	191	238

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1251	1376	1163	1280	1076	1248	1013	1216	938	1126
B1	818	1001	722	938	654	785	525	646	475	594
B2	751	919	573	744	515	618	411	506	376	470
C	626	751	459	596	417	500	288	374	269	328
D	375	450	231	294	206	258	188	244	175	219

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1051	1156	977	1075	904	1048	851	1022	788	946
B1	687	841	606	788	550	660	441	543	399	499
B2	631	772	481	625	433	520	345	425	316	395
C	526	631	385	501	350	420	242	314	226	276
D	315	378	194	247	173	217	158	205	147	184

PV-ezRack SolarRoof Interface spacing tables (Cont.)

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-05 (Tin Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	2

Roof Angle - $30^{\circ} < \alpha \leq 60^{\circ}$

Wind Region	Building Height (m)																			
	H ≤ 5				5 < H ≤ 10				10 < H ≤ 15				15 < H ≤ 20				20 < H ≤ 30			
	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner
A	800	533	400	267	744	496	372	248	688	459	344	229	498	332	249	166	462	308	231	154
B1	523	349	262	174	462	308	231	154	418	279	209	139	336	224	168	112	304	203	152	101
B2	480	320	240	160	366	244	183	122	330	220	165	110	263	175	131	88	240	160	120	80
C	400	267	200	133	293	196	147	98	267	178	133	89	184	123	92	61	172	115	86	57
D	240	160	120	80	148	99	74	49	132	88	66	44	120	80	60	40	112	75	56	37

PV-ezRack SolarRoof Interface spacing table

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-05 (Tin Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	2.5

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1451	1596	1349	1484	1248	1448	1175	1410	1088	1306
B1	949	1161	837	1088	759	911	609	750	551	689
B2	871	1066	664	863	598	717	477	587	436	545
C	726	871	532	692	484	580	334	434	312	381
D	435	522	268	341	239	299	218	283	203	254

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1321	1453	1229	1351	1136	1318	1070	1284	991	1189
B1	864	1057	762	991	691	829	555	682	502	627
B2	793	970	605	786	544	653	434	534	397	496
C	661	793	484	630	440	528	304	395	284	346
D	396	476	244	310	218	272	198	258	185	231

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1201	1321	1117	1229	1033	1198	973	1167	901	1081
B1	785	961	693	901	628	754	504	620	456	570
B2	721	882	550	715	495	594	395	486	361	451
C	601	721	440	572	400	480	276	359	258	315
D	360	432	222	282	198	248	180	234	168	210

PV-ezRack SolarRoof Interface spacing tables (Cont.)

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-05 (Tin Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	2.5

Roof Angle - $30^{\circ} < \alpha \leq 60^{\circ}$

Wind Region	Building Height (m)																			
	H ≤ 5				5 < H ≤ 10				10 < H ≤ 15				15 < H ≤ 20				20 < H ≤ 30			
	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner
A	900	600	450	300	837	558	419	279	774	516	387	258	561	374	280	187	519	346	260	173
B1	588	392	294	196	519	346	260	173	471	314	235	157	378	252	189	126	342	228	171	114
B2	540	360	270	180	412	275	206	137	371	247	185	124	296	197	148	99	270	180	135	90
C	450	300	225	150	330	220	165	110	300	200	150	100	207	138	104	69	194	129	97	65
D	270	180	135	90	167	111	83	56	149	99	74	50	135	90	68	45	126	84	63	42

PV-ezRack SolarRoof Interface spacing table

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-05 (Tin Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	3

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1501	1651	1396	1536	1291	1497	1216	1459	1126	1351
B1	981	1201	866	1126	785	942	630	775	570	713
B2	901	1102	687	893	618	742	493	607	451	564
C	751	901	550	715	500	600	345	449	323	394
D	450	540	278	353	248	310	225	293	210	263

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1431	1574	1331	1464	1231	1428	1159	1391	1073	1288
B1	936	1145	826	1073	749	898	601	739	544	680
B2	859	1051	655	851	589	707	470	578	430	537
C	716	859	525	682	477	572	329	428	308	375
D	429	515	265	336	236	295	215	279	200	250

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central	UW & DW	Central
A	1311	1442	1219	1341	1127	1308	1062	1274	983	1180
B1	857	1049	756	983	686	823	551	677	498	623
B2	787	963	600	780	540	648	431	530	394	492
C	656	787	481	625	437	524	302	392	282	344
D	393	472	243	308	216	270	197	256	184	229

PV-ezRack SolarRoof Interface spacing tables (Cont.)

Type of Rail	ER-R-ECO (Refer to Note 8 for other compatible rails)
Type of Interface	ER-I-05 (Tin Interface)
Solar Panel Dimension	2 m x 1 m (Refer to Note 19 for other panel sizes)
Terrain Category	3

Roof Angle - $30^{\circ} < \alpha \leq 60^{\circ}$

Wind Region	Building Height (m)																			
	H ≤ 5				5 < H ≤ 10				10 < H ≤ 15				15 < H ≤ 20				20 < H ≤ 30			
	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner	Internal	Intermediate	Edge	Corner
A	1050	700	525	350	977	651	488	326	903	602	452	301	654	436	327	218	606	404	303	202
B1	687	458	343	229	606	404	303	202	549	366	275	183	441	294	221	147	399	266	200	133
B2	631	420	315	210	481	321	241	160	433	289	216	144	345	230	173	115	316	210	158	105
C	525	350	263	175	385	257	193	128	350	233	175	117	242	161	121	81	226	151	113	75
D	315	210	158	105	194	130	97	65	173	116	87	58	158	105	79	53	147	98	74	49

General Notes

Note 1. Tile roof interface spacing tables based on a minimum depth into **F7 (Pine) timber of 25mm** whereas **Tin roof interface** spacing tables based on a minimum depth into **F7 (Pine) timber of 35mm** and **Steel Purlins G450 1.5mm thick**.

Note 2. This engineering document was designed to cater for most common installation scenarios however, it does not cater for all of them. Contact Clenergy if you are unable to comply with any of the installation specifications listed on this document.

Importance level	Structure type examples	Annual probability of exceedance for a design working life of 25 years
1	Fences, utility posts, isolated minor facilities, minor temporary facilities and small ground mount installations (up to 20 kw).	1/100 - 100 years
2	Residential shed or garage, small isolated warehouses, isolated farm sheds, residential carports, medium ground mount installations (up to 100 kw) and one or double storey dwelling.	1/200 – 200 years
3	Buildings and facilities where a large group of people can congregate in one area (more than 300 people), commercial buildings, schools, aged cares, large office buildings, large commercial warehouses, large ground mount installations, multi-storey dwelling and churches.	1/500 – 500 years
4	Buildings and facilities designated as essential facilities such as medical emergency or surgery facilities, universities, police stations, emergency shelters, High rise buildings (more than 40 storeys) airports and government buildings.	1/1000 – 1000 years

Note 3. Standard screws shipped for tin and tile Roof Interfaces

Metal Purlins/Battens	Fasteners to be used
0.42 mm to 0.75 mm	Buildex- 14 - 11 x 70 Hex Head Zips with 16 mm Aluminium Bonded Washer on G550 Steel Battens or a screw that has an equal or a higher pullout capacity.
1.2 mm to 2.4 mm	Buildex- 14 - 11 x 70 Hex Head Zips with 16 mm Aluminium Bonded Washer or a screw that has an equal or a higher pullout capacity.
Wood Purlins and Rafters	Fasteners to be used
Timber F7 (Pine) and Timber 17 (Hardwood).	Tin Interface: Buildex- 14 - 11 x 70 Hex Head Zips with 16 mm Aluminium Bonded Washer or a screw that has an equal or a higher pullout capacity.
	Tile Interface: Buildex- 14 - 11 x 70 Hex Head Zips with 16 mm Aluminium Bonded Washer or a screw that has an equal or a higher pullout capacity or 14-10 x 50 Hex Head T17 with 16mm ABW Climaseal 3 or 14-10 x 65 Hex Head T17 Climaseal 3 or other screw of pullout value not less than screws above.

Note 4. Tin interface increase or reduction factors depending on the type of tophat, purlin or batten as per the below table

Purlin Material	Purlin thickness (mm)	Min. embedment (mm)	Spacing +/- (WR A)	Spacing +/- (WR B1)	Spacing +/- (WR B2)	Spacing +/- (WR C)	Spacing +/- (WR D)
Timber (Pine F7)	-	25	-25%	-35%	-35%	-35%	-35%
Timber (Pine F7)	-	30	-20%	-25%	-25%	-25%	-25%
Timber (Pine F7)	-	35	-	-	-	-	-
Timber (Hardwood F17)	-	25	-	-	-	5%	10%
Timber (Hardwood F17)	-	30	-	-	-	10%	15%
Timber (Hardwood F17)	-	35	-	-	-	10%	20%
Metal (G550)	0.42	-	-75%	-80%	-80%	-80%	-80%
Metal (G550)	0.48	-	-60%	-70%	-70%	-70%	-70%
Metal (G550)	0.55	-	-50%	-65%	-65%	-65%	-65%
Metal (G550)	0.75	-	-25%	-30%	-30%	-30%	-30%
Metal (G450)	1.2	-	-20%	-30%	-30%	-30%	-30%
Metal (G450)	1.5	-	-	-	-	-	-
Metal (G450)	1.9	-	-	-	-	5%	10%
Metal (G450)	2.4	-	-	-	-	5%	10%

Note 5. Minimum number of screws to be used when installing **tile** (ER-I-01) interface to be two (2) and when installing **tin** (ER-I-05) interface to be one (1).

Note 6. Spacings on tile interfaces will be reduced as follows:

Interface	% of Reduction
ER-I-01/CS, ER-I-51 & ER-I-01/EZC/ECO	-
ER-I-02	-50%
ER-I-04	-50%
ER-I-23	-28%
ER-I-26	-28%

Note 7. The most conservative spacing has to be used if one panel or panel row fall between two roof zones.

Note 8. The following components are satisfied for use according to AS/NZS 1664.1:1997-Amdt 1:1999 and AS/NZS 1170.2:2021

Components	Part No.	Description
ECO-Rail	ER-R-ECO/XXXX	ECO Rail
Splice	ER-SP-ECO	PV-ezRack Splice for ECO rail
Australian Made Mill Finish ECO Rail	R-ECO/XXXX/AUMF	PV-ezRack Australian Made Mill Finish ECO Rail
ST-Rail	ER-R-STXXXX	Standard Rail
Splice	ER-SP-ST	PV-ezRack Splice for Standard Rail 200mm
ECO Rail Black	ER-R-ECO/XXXX/BA	ECO Rail Black
Black Splice ECO Rail	ER-SP-ECO/BA	Splice ECO Rail Black
Inter Clamp	ER-IC-STXX	Inter Clamp = clamp + Z-Module + Bolt.
End Clamp	ER-EC-STXX	End Clamp = clamp + Z-Module + bolt
Clamp	C-U/30/46-G	Universal Clamp for Frame Height 30-46mm with Grounding Clip
Clamp	C-U/30/46	Universal Clamp for Frame Height 30-46mm
End Clamp	ER-EC-DU35/40	End Clamp dual 35 or 40mm
End Clamp	ER-EC-DU40/46	End Clamp dual 40 or 46mm
Inter Security Clamp	ER-IC-STXX/S	Inter Clamp = Clamp + Z-Module + Security Bolt
End Security Clamp	ER-EC-STXX/S	End Clamp = Clamp + Z-Module + Security Bolt
Interface	ER-I-01, 02, 04, 23, 26 and 51	Tile Interface
Interface	ER-I-01/CS	Carbon Steel Tile Interface
Tile Interface with ezClick connection for ECO-Rail	ER-I-01/EZC/ECO	PV-ezRack SolarRoof, Tile Interface with ezClick connection for ECO-Rail
Interface	ER-I-05	Tin Interface

Components	Part No.	Description
Black Interface	ER-I-05/BA	Black Tin Interface
Interface	ER-I-05/CM	Tin Interface with Click Module
Interface	ER-I-05A/EZC/ECO	ezClick connection for ECO-Rail
Interface	ER-I-25	Tin Interface with curved Base for corrugated Roof
Black Interface	ER-I-25/BA	Black Tin Interface with curved Base for corrugated Roof
End Clamp (*)	EC-FL/GE/XX/XX	End Clamp for Frameless Module (glued EPDM)
Inter Clamp (*)	IC-FL/GE/XX/XX	Inter Clamp for Frameless Module (glued EPDM)
End Clamp (*)	ER-EC-FL/XX/XX	End Clamp for Frameless Module
Inter Clamp (*)	ER-IC-FL/XX/XX	Inter Clamp for Frameless Module
Black End Clamp (*)	EC-FL/GE/XX/XX/B	Black End Clamp for Frameless Module (glued EPDM)
Black Inter Clamp (*)	IC-FL/GE/XX/XX/B	Black Inter Clamp for Frameless Module (glued EPDM)
Adapter for Corrugated Roof	EZ-AD-C43	Adapted for Corrugated Iron Roof for Tin interface ER-I-05
Black Adapter for Corrugated Roof	EZ-AD-C43/BA	Black Adapted for Corrugated Iron Roof for Tin interface ER-I-05
Corrugated Adapter	EZ-AD-C110	PV-ezRack Adapter for Corrugated Iron Roof.
Roof Extender (Reduction Factor)	ER-RE-200	Roof Hook Extender, Suitable for ER-I-01,02,04,05,23,26, 51 and 01/CS
Connector Clamp	CRC-R/ECO-ZBW	Cross Connector Clamp for ECO-Rail
Hanger Bolt	ER-HB-10/200A	PV-ezRack, Hanger Bolt M10*200mm
Hanger Bolt	ER-HB-MP/8/150EP	PV-ezRack Hanger Bolt for metal purlin M8*150mm
Hanger Bolt	ER-HB-8/150	Hanger bolt without mounting plate M8x150. Fixed to timber purlin only
Mid Clamp XX Black	ER-IC-STXXB	Inter Clamp XX Black

Components	Part No.	Description
End Clamp XX Black	ER-EC-STXXB	End Clamp XX Black
Black Universal Clamp	C-U/30/46-BA	Black Universal Clamp
Black Universal Clamp	C-U/30/46-G-BA	Black Universal Clamp with grounding clip

(*) Subject to the panel manufacturer's installation guide.

Note 9. For Terrain Category (TC) definition, please refer to clause 4.2.1 of AS/NZS 1170.2:2021.

Note 10. Topographic Multiplier (Mt) taken as 1.0. Refer to clause 4.4 of AS/NZS 1170.2:2021 for more information.

For topographic Multiplier (Mt) more than 1.0 (installations on a mountain, hilly or sloped terrain) please refer to clause 4.4 of AS/NZS 1170.2:2021 to define appropriate Topographic multiplier value.

The below table provides a reduction factor applied for topographic multipliers greater than 1 (installation on a slope, hill on mountain). To achieve a more accurate and cost-effective design, please contact Clenergy Engineering department.

Mt	A, B1, B2	
	U.W & D. W	Central
1	1	1
1.01	1.00	1.00
1.02	1.00	1.00
1.03	0.92	0.94
1.04	0.92	0.94
1.06	0.92	0.88
1.08	0.85	0.88
1.09	0.85	0.81
1.1	0.85	0.81
1.2	0.69	0.69
1.3	0.54	0.56
1.4	0.46	0.50
1.5	0.38	0.44

Note 11. Shielding Multiplier (Ms) taken as 1.0. Refer to clause 4.3 of AS/NZS 1170.2:2021 for more information.

Note 12. Wind Direction Multiplier (Md) taken as 1.0. Refer to clause 3.3 of AS/NZS 1170.2:2021 for more information.

Note 13. This certificate cannot be used if the site is located on a hill, ridge or escarpment. Contact Clenergy if the aforementioned condition is met on site.

Note 14. From the date of publication onwards, any amendment made to any of the above-mentioned Standards will make this report outdated and a new one will have to be released, unless the amendment has no implications on this certificate.

Note 15. This certificate only covers the assessment of the Clenergy PV mounting system, including the components listed on note 3 and 8. Assessment of the roof structure, PV panels and other fixings are to be checked by the installer/contractor, if necessary.

Note 16. Only hip and gable roofs installations are covered on this certificate. Contact Clenergy if you are planning to install on a different roof type such as curved, multi-span (pitched and saw-tooth), mansard, circular bin, silo, tank, pitched free, troughed free, hypar free, canopy, awning and cantilivered roof.

Note 17. No consideration has been taken on the effect of snow loads. In case the roof is located in a snow prone area, a special design must be made.

Note 18. No consideration has been taken on the effect of earthquake loads.

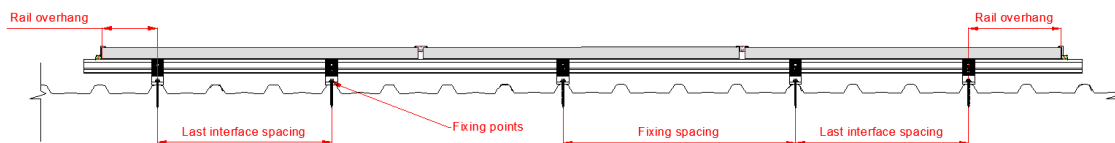
Note 19. This Engineering report is based on 2 m x 1 m panels and two rails per panel. However, a percentage increase or decrease could be applied on all interface spacings as shown on the following table.

Number of rails per panel	Panel length (mm)	Spacing +/- W.R – A & B	Spacing +/- W.R – C & D
2 rails	≤ 1700	+ 6 %	+ 10 %
3 rails	≤ 1700	+ 12 %	+ 18 %
4 rails	≤ 1700	+ 15 %	+ 20 %
2 rails	≤ 1800	+ 4 %	+ 7 %
3 rails	≤ 1800	+ 12 %	+ 18 %
4 rails	≤ 1800	+ 15 %	+ 20 %
2 rails	≤ 1900	0 %	+ 5 %
3 rails	≤ 1900	+ 10 %	+ 15 %
4 rails	≤ 1900	+ 12 %	+ 18 %
2 rails	≤ 2000	0 %	0 %
3 rails	≤ 2000	+ 10 %	+ 15 %
4 rails	≤ 2000	+ 12 %	+ 18 %

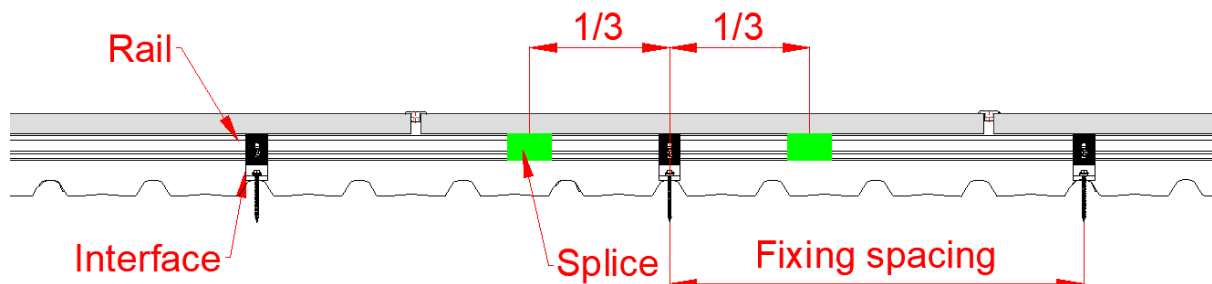
2 rails	≤ 2100	- 10 %	- 6 %
3 rails	≤ 2100	+ 10 %	+ 15 %
4 rails	≤ 2100	+ 12 %	+ 18 %
2 rails	≤ 2200	- 18 %	- 12 %
3 rails	≤ 2200	+ 7 %	+ 12 %
4 rails	≤ 2200	+ 12 %	+ 18 %
2 rails	≤ 2300	- 20 %	- 12 %
3 rails	≤ 2300	+ 5 %	+ 12 %
4 rails	≤ 2300	+ 10 %	+ 15 %
2 rails	≤ 2400	- 25 %	- 15 %
3 rails	≤ 2400	+ 5 %	+ 10 %
4 rails	≤ 2400	+ 8 %	+ 12 %

Note 20. Panel width cannot exceed 1.20 m for any of the above panel length dimensions and panel weight cannot exceed 15 kg/m².

Note 21. Rail overhang ends where the panel finishes and this should be less than 40% of the last installed interface spacing.



Note 22. ER-R-ECO rail splice can only be installed within 1/3 of the fixing spacing (centre to centre) from the nearest interface when fixing spacing is over 1700 mm.



Note 23. ER-R-ECO rail splice cannot be installed on overhangs.

Note 24. Neither Clenergy nor MW Engineering Melbourne are not to be responsible for external factors leading to compression of the tile interfaces.

Note 25. All components from Clenergy must be installed according to manufacturer's specification and the instructions shown in the relevant installation manual. Please check the Clenergy Australia website or contact them for access to the most recent installation manuals.

Note 26. Capacities checked and compared against testing data from Clenergy Australia and MTS (NATA certified).

Note 27. General conditions

Note 27.1 Minimum steel purlin strength of 450 MPa and 550 MPa for tophats.

Note 27.2 Timber Grade members: F7 (Pine) and F17 (Hardwood).

Note 27.3 If any of the screws of the interfaces go into pre-existing holes, they will have to be one size up compared to the screws that were previously installed. This is to ensure that the pullout capacity remains the same or higher.

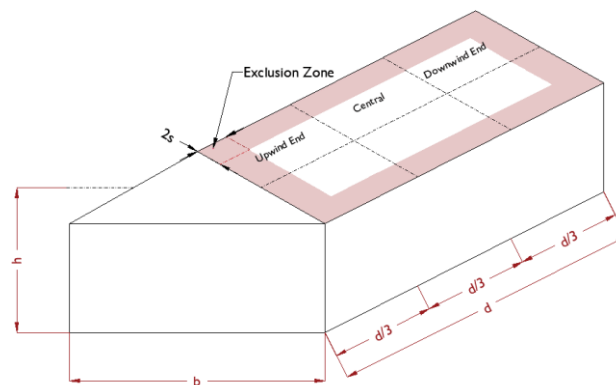
Note 28. Clamping zone of the PV panels should be according to the manufacturer's specifications.

Note 29. When using Roof Extender (ER-RE-200), reduce interface spacings by 15% on Wind Region A and B and 30% on Wind Region C and D.

Note 30. Please refer to AS 4312 to find out about corrosion categories.

Note 31. Conditions for flush mounted systems installed on flat and pitched roofs according to the B6 Appendix of the AS/NZS 1170.2:2021

- Roof pitch to be between 1° and 30°.
- $h/d \leq 0.5$ and $h/b \leq 0.5$. Being h = height, b = width and d = length of the building as per the below picture.
- Gap between the underside of the panel and the roof to be no less than 50mm and no more than 300mm.



Note 32. Exclusion zone for flush installation to be the minimum distance from the edge of the roof "2 x s", where "s" is the gap between the underside of the panel and the roof.

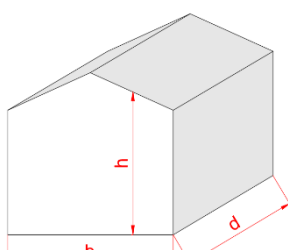
Note 33. Contact Clenergy if the installation doesn't meet the parameter on section B6 part (d) of the AS/NZS 1170.2:2021 standard for roof angle is between 1° to 30°.

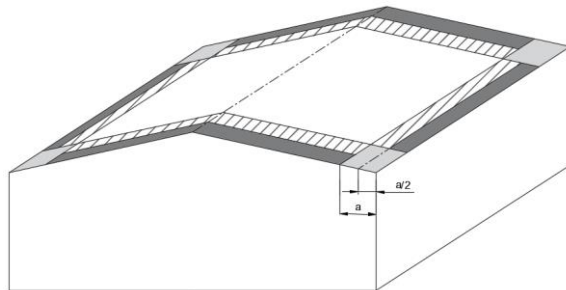
Note 34. For roof angle between 30° to 60°.

Step 1. Determine building height (h), width (b) and length (d).

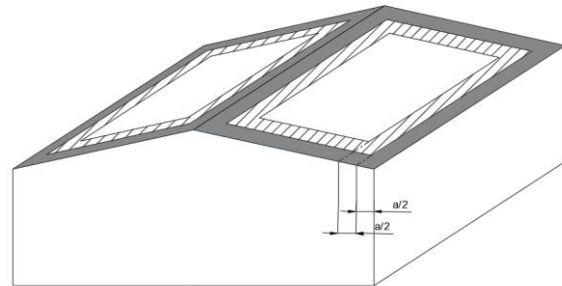
Step 2. Choose the lowest value between " h ", " $b \times 0.2$ " and " $d \times 0.2$ ".

Step 3. The lowest value on Step 2, equates to a .

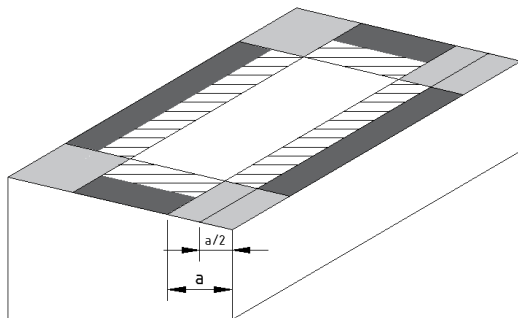




Roof Pitch $< 10^\circ$



Roof Pitch $\geq 10^\circ$



Flat/Mono

Legend:

	Internal
	Intermediate = "a/2"
	Edge = "a/2"
	Corner = "a"

Note 35. For Hanger Bolt installation on either tin or tile roof, the spacing to apply with a minimum embedment depth of 25mm into F17 (Hardwood) timber or fixing to metal purlin with 1.5 mm thickness is the same as the tin roof interface spacing (ER-I-05). The Hanger Bolts for wood purlin/rafter installation are ER-HB-8/150 and ER-HB-10/200A. The Hanger Bolt for metal purlin/rafter is ER-HB-MP/8/150EP. Contact Clenergy if your project doesn't meet the above requirements.

Note 36. Neither Clenergy nor MW Engineering Melbourne will be responsible for the integrity of the roof tiles when using hanger bolts for the solar installation. It will be the clients' responsibility to check the hanger bolt installation feasibility.

Adjustable Tile Interfaces Flush Installation Certification Letter

(Wind average recurrence of 200 years)



CIVIL & STRUCTURAL ENGINEERS
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29 September 2023

Clenergy Australia
1/10 Duerdin Street
Clayton, VIC 3168

CERTIFICATION LETTER

Clenergy PV-ezRack Solar Roof Certification – TC2, 2.5, 3 – Wind Region A, B1 and B2. Internal REF: **00428**. Project REF: **CL-563-S-REV2**.

MW Engineering Melbourne, being Structural Engineers within the meaning of Australian regulations, have calculated the maximum spacings for the PV ez-Rack rail system for the following conditions:

- **Wind Loads to AS 1170.2-2021**
 - o **Wind Terrain Category 2, 2.5 and 3**
 - o **Wind average recurrence of 200 years**
 - o **Wind Region A and B**
- **Solar panel length up to 2.1m**
- **Solar panel width up to 1.2m**

Attached are the tables showing the spacings according to Wind Region, roof pitch, and building height.

The values shown on these tables will be valid unless an amendment is issued on any of the following codes:

- | | |
|-----------------------------------|---------------------------|
| - AS/NZS 1170.0- 2002 AMDT 4-2016 | General Principles |
| - AS/NZS 1170.1- 2002 AMDT 4-2016 | Imposed Loadings |
| - AS/NZS 1170.2- 2021 | Wind Loadings |
| - AS/NZS 1664.1- 1997 AMDT 1:1999 | Aluminium Code |

Should you have any queries, do not hesitate to contact us.

Best Regards,

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September 2023

STRUCTURAL DESIGN CERTIFICATION



Adjustable Tile
Interface spacing tables
(ECO & ELITE RAILS)

Standard: AS/NZS 1170.2:2021

Terrain Category: 2, 2.5 & 3

Client: Clenergy Australia

REF: 00428

Date: SEPTEMBER 2023

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REF: 00428

Client: Clenergy Australia

Internal reference: CL- 563-S- REV 2

Project: PV-ezRack SolarRoof adjustable tile interface spacing tables

Australian Standards

AS/NZS 1170.0:2002 (R2016)

AS/NZS 1170.1:2002 (R2016)

AS/NZS 1170.2:2021

AS/NZS 1664.1:1997-Amdt 1:1999

General Principles

Imposed loadings

Wind Loadings

Aluminium

Wind Terrain Category: 2, 2.5 & 3

Wind average recurrence: 200 years

Designed: AE

Date: SEPTEMBER 2023

Disclaimer: From the date of publication onwards, any amendment made to any of the above-mentioned Standards will make this report outdated and a new one will have to be released, unless the amendment has no implications on this certificate.

PV-ezRack SolarRoof Interface spacing tables

Type of Rail	ER-R-ECO & ER-R-ELT (Refer to Note 4 for other compatible rails)
Type of Interface	ER-I-41/EZC/ECO (Rail running perpendicular to rafter, L-bracket facing back) – Note 30
Solar Panel Dimension	1.7 m x 1 m (Refer to Note 18 for other panel sizes)
Terrain Category	3

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	1016	1466	986	1422	935	1349	925	1334	821	1194
B1	693	1084	636	995	570	892	523	817	447	697
B2	524	820	481	753	431	674	395	618	338	528

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	996	1437	967	1394	916	1322	906	1308	805	1170
B1	679	1062	624	975	559	874	512	800	438	684
B2	467	731	429	671	384	601	352	551	301	470

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	986	1422	957	1379	907	1308	897	1294	797	1158
B1	672	1051	617	965	553	865	507	792	433	677
B2	410	642	377	589	337	528	309	483	265	413

Roof Angle - $30^\circ < \alpha \leq 60^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	966	1393	937	1351	888	1282	879	1268	781	1134
B1	659	1030	605	945	541	847	497	776	425	663
B2	353	552	324	507	290	454	266	416	228	356

PV-ezRack SolarRoof Interface spacing tables

Type of Rail	ER-R-ECO & ER-R-ELT (Refer to Note 4 for other compatible rails)
Type of Interface	ER-I-41/EZC/ECO (Rail running perpendicular to rafter, L-bracket facing back) – Note 30
Solar Panel Dimension	1.7 m x 1 m (Refer to Note 18 for other panel sizes)
Terrain Category	2.5

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	874	1236	848	1199	804	1137	795	1125	715	1043
B1	638	940	586	863	525	773	481	709	411	605
B2	510	751	468	689	419	618	384	566	328	483

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	857	1212	832	1175	788	1115	780	1103	701	1022
B1	625	921	574	846	514	758	472	694	403	593
B2	454	668	416	614	373	550	342	504	292	430

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	848	1200	823	1164	781	1104	772	1092	694	1012
B1	619	912	569	838	509	751	467	688	399	587
B2	398	586	365	538	327	482	300	441	256	377

Roof Angle - $30^\circ < \alpha \leq 60^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	830	1175	806	1139	764	1081	756	1069	679	991
B1	606	893	557	820	498	735	457	673	391	575
B2	342	503	314	462	281	414	258	379	220	324

PV-ezRack SolarRoof Interface spacing tables

Type of Rail	ER-R-ECO & ER-R-ELT (Refer to Note 4 for other compatible rails)
Type of Interface	ER-I-41/EZC/ECO (Rail running perpendicular to rafter, L-bracket facing back) – Note 30
Solar Panel Dimension	1.7 m x 1 m (Refer to Note 18 for other panel sizes)
Terrain Category	2

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	744	1064	722	1032	684	979	677	968	642	922
B1	456	777	419	713	375	639	344	585	294	500
B2	378	644	347	591	311	529	285	485	244	414

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	730	1043	708	1012	671	960	664	949	629	904
B1	447	762	411	699	368	627	337	574	288	490
B2	336	572	308	525	276	471	253	431	217	368

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	722	1032	701	1001	664	950	657	940	623	895
B1	443	754	406	692	364	620	334	568	285	485
B2	294	501	270	460	242	412	222	377	189	322

Roof Angle - $30^\circ < \alpha \leq 60^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	707	1011	686	981	650	930	643	920	610	876
B1	434	738	398	678	356	607	327	556	279	475
B2	252	429	231	394	207	353	190	323	162	276

PV-ezRack SolarRoof Interface spacing tables

Type of Rail	ER-R-ECO & ER-R-ELT (Refer to Note 4 for other compatible rails)
Type of Interface	ER-I-41/EZC/ECO (Rail running perpendicular to rafter, L-bracket facing front) or (Rail parallel to rafter) – Note 30
Solar Panel Dimension	1.7 m x 1 m (Refer to Note 18 for other panel sizes)
Terrain Category	3

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	766	1118	744	1084	705	1028	637	934	557	814
B1	559	803	514	737	460	660	376	534	321	465
B2	331	475	304	436	272	391	223	316	190	275

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	751	1096	729	1063	691	1008	624	915	546	798
B1	548	787	503	722	451	647	369	524	315	456
B2	285	409	262	376	234	337	192	272	164	237

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	743	1084	721	1052	684	998	618	906	541	790
B1	543	779	498	715	446	641	365	518	312	451
B2	239	343	220	315	197	282	161	228	137	199

Roof Angle - $30^\circ < \alpha \leq 60^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	728	1062	707	1030	670	977	605	887	530	774
B1	532	763	488	700	437	627	357	508	305	442
B2	216	310	198	285	178	255	145	207	124	180

PV-ezRack SolarRoof Interface spacing tables

Type of Rail	ER-R-ECO & ER-R-ELT (Refer to Note 4 for other compatible rails)
Type of Interface	ER-I-41/EZC/ECO (Rail running perpendicular to rafter, L-bracket facing front) or (Rail parallel to rafter) – Note 30
Solar Panel Dimension	1.7 m x 1 m (Refer to Note 18 for other panel sizes)
Terrain Category	2.5

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	687	996	667	966	632	916	526	797	495	725
B1	490	727	450	668	403	598	309	453	279	411
B2	305	453	280	416	251	373	193	283	174	256

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	673	976	653	947	619	898	515	781	485	711
B1	480	713	441	654	395	586	303	444	274	403
B2	262	389	241	357	216	320	166	243	149	220

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	667	967	647	938	613	889	510	773	480	704
B1	476	706	437	648	391	581	300	440	271	399
B2	219	325	201	299	180	268	138	203	125	184

Roof Angle - $30^\circ < \alpha \leq 60^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	653	946	633	918	600	870	499	757	470	689
B1	466	691	427	634	383	568	294	431	265	391
B2	198	293	182	269	163	241	125	183	113	166

PV-ezRack SolarRoof Interface spacing tables

Type of Rail	ER-R-ECO & ER-R-ELT (Refer to Note 4 for other compatible rails)
Type of Interface	ER-I-41/EZC/ECO (Rail running perpendicular to rafter, L-bracket facing front) or (Rail parallel to rafter) – Note 30
Solar Panel Dimension	1.7 m x 1 m (Refer to Note 18 for other panel sizes)
Terrain Category	2

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	580	827	563	802	534	760	433	626	406	583
B1	434	645	399	592	357	531	262	396	252	369
B2	280	416	257	382	230	342	169	255	162	238

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	569	810	552	786	523	746	425	613	398	572
B1	426	633	391	581	350	520	257	388	247	362
B2	240	356	220	327	197	293	145	219	139	204

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	563	802	547	778	518	738	420	607	394	566
B1	422	626	387	575	347	515	254	385	245	358
B2	200	297	184	273	164	244	121	182	116	170

Roof Angle - $30^\circ < \alpha \leq 60^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	551	785	535	762	507	723	412	595	386	554
B1	413	613	379	563	339	504	249	377	239	351
B2	180	267	165	245	148	220	109	164	104	153

PV-ezRack SolarRoof Interface spacing tables

Type of Rail	ER-R-ECO & ER-R-ELT (Refer to Note 4 for other compatible rails)
Type of Interface	ER-I-61/EZC/ECO (Rail running perpendicular or parallel to rafter)
Solar Panel Dimension	1.7 m x 1 m (Refer to Note 18 for other panel sizes)
Terrain Category	3

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	616	916	598	889	567	843	394	559	367	532
B1	462	682	424	626	380	561	229	323	196	284
B2	236	348	216	319	194	286	117	164	100	145

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	604	898	586	871	556	826	386	548	359	522
B1	453	669	416	614	372	550	225	316	192	279
B2	198	292	181	268	162	240	98	138	84	121

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	598	889	580	862	550	818	382	542	356	516
B1	448	662	412	608	368	544	222	313	190	276
B2	160	236	147	216	131	194	79	111	68	98

Roof Angle - $30^\circ < \alpha \leq 60^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	586	871	568	845	539	801	375	531	348	506
B1	439	648	403	595	361	533	218	307	186	270
B2	141	208	129	191	116	171	70	98	60	86

PV-ezRack SolarRoof Interface spacing tables

Type of Rail	ER-R-ECO & ER-R-ELT (Refer to Note 4 for other compatible rails)
Type of Interface	ER-I-61/EZC/ECO (Rail running perpendicular or parallel to rafter)
Solar Panel Dimension	1.7 m x 1 m (Refer to Note 18 for other panel sizes)
Terrain Category	2.5

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	562	824	545	799	517	758	369	524	344	499
B1	410	602	377	552	337	495	215	302	184	266
B2	220	322	202	296	181	265	115	162	98	143

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	551	808	535	784	507	743	362	513	337	489
B1	402	590	369	541	331	485	211	296	180	261
B2	184	269	169	247	151	222	96	135	82	119

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	545	800	529	776	502	736	358	508	333	484
B1	398	584	365	536	327	480	208	293	178	258
B2	148	216	135	199	121	178	77	109	66	96

Roof Angle - $30^\circ < \alpha \leq 60^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	534	783	518	760	491	720	351	497	326	474
B1	390	572	358	525	320	470	204	287	174	253
B2	130	190	119	175	107	156	68	96	58	84

PV-ezRack SolarRoof Interface spacing tables

Type of Rail	ER-R-ECO & ER-R-ELT (Refer to Note 4 for other compatible rails)
Type of Interface	ER-I-61/EZC/ECO (Rail running perpendicular or parallel to rafter)
Solar Panel Dimension	1.7 m x 1 m (Refer to Note 18 for other panel sizes)
Terrain Category	2

Roof Angle - $0^\circ < \alpha \leq 10^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	506	737	491	714	465	678	352	499	328	475
B1	369	538	339	494	304	442	205	288	175	254
B2	204	297	187	273	168	244	113	159	97	140

Roof Angle - $10^\circ < \alpha \leq 20^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	496	722	481	701	456	664	345	489	321	466
B1	362	527	332	484	298	434	201	283	172	249
B2	170	248	156	227	140	204	94	133	81	117

Roof Angle - $20^\circ < \alpha \leq 30^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	491	715	476	693	452	658	342	484	318	461
B1	358	522	329	479	295	429	199	280	170	246
B2	136	198	125	182	112	163	75	106	64	93

Roof Angle - $30^\circ < \alpha \leq 60^\circ$

Wind Region	Building Height (m)									
	$H \leq 5$		$5 < H \leq 10$		$10 < H \leq 15$		$15 < H \leq 20$		$20 < H \leq 30$	
	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central	U.W & D.W	Central
A	481	700	467	679	442	644	335	474	311	452
B1	351	511	322	469	288	420	195	274	166	241
B2	119	173	109	159	98	143	66	93	56	82

General Notes

Note 1. Tile Roof Interface Spacing tables based on a minimum depth into F7 (Pine) timber of 25mm.

Note 2. This engineering document was designed to cater for most common installation scenarios however, it does not cater for all of them. Contact Clenergy if you are unable to comply with any of the installation specifications listed on this document.

Note 3. Standard screws shipped for Tile Roof Interfaces

Wood Purlins and Rafters	Fasteners to be used
Timber F7 (Pine) and Timber 17 (Hardwood).	Buildex- 14 - 11 x 70 Hex Head Zips Climaseal 3 with 16 mm ABW or 14-10 x 50 Hex Head T17 with 16mm ABW Climaseal 3 or 14-10 x 65 mm Hex Head T17 Climaseal 3 or other screw of pullout value not less than screws above.

Note 4. The following components are satisfied for use according to AS/NZS 1664.1:1997-Amdt 1:1999 and AS/NZS 1170.2:2021

Components	Part No.	Description
Elite Rail	ER-R-ELT/XXXX	Elite Rail
ECO-Rail	ER-R-ECO/XXXX	ECO Rail
Splice	ER-SP-ECO	PV-ezRack Splice for ECO rail
Australian Made Mill Finish ECO Rail	R-ECO/XXXX/AUMF	PV-ezRack Australian Made Mill Finish ECO Rail
ST-Rail	ER-R-STXXXX	Standard Rail
Splice	ER-SP-ST	PV-ezRack Splice for Standard Rail 200mm
ECO Rail Black	ER-R-ECO/XXXX/BA	ECO Rail Black
Black Splice ECO Rail	ER-SP-ECO/BA	Splice ECO Rail Black
Inter Clamp	ER-IC-STXX	Inter Clamp = clamp + Z-Module + Bolt.

End Clamp	ER-EC-STXX	End Clamp = clamp + Z-Module + bolt
Clamp	C-U/30/46-G	Akashi Clamp for Frame Height 30-46mm with Grounding Clip
Clamp	C-U/30/46	Akashi Clamp for Frame Height 30-46mm
End Clamp	ER-EC-DU35/40	End Clamp dual 35 or 40mm
End Clamp	ER-EC-DU40/46	End Clamp dual 40 or 46mm
Inter Security Clamp	ER-IC-STXX/S	Inter Clamp = Clamp + Z-Module + Security Bolt
End Security Clamp	ER-EC-STXX/S	End Clamp = Clamp + Z-Module + Security Bolt
Interface	ER-I-41/EZC/ECO	Adjustable Tile Interface (Aluminium)
Interface	ER-I-61/EZC/ECO	Adjustable Tile Interface (Aluminium)
End Clamp (*)	EC-FL/GE/XX/XX	End Clamp for Frameless Module (glued EPDM)
Inter Clamp (*)	IC-FL/GE/XX/XX	Inter Clamp for Frameless Module (glued EPDM)
End Clamp (*)	ER-EC-FL/XX/XX	End Clamp for Frameless Module
Inter Clamp (*)	ER-IC-FL/XX/XX	Inter Clamp for Frameless Module
Black End Clamp (*)	EC-FL/GE/XX/XX/B	Black End Clamp for Frameless Module (glued EPDM)
Black Inter Clamp (*)	IC-FL/GE/XX/XX/B	Black Inter Clamp for Frameless Module (glued EPDM)
Mid Clamp XX Black	ER-IC-STXXB	Inter Clamp XX Black

End Clamp XX Black	ER-EC-STXXB	End Clamp XX Black
Black Akashi Clamp	C-U/30/46-BA	Black Akashi Clamp
Black Akashi Clamp	C-U/30/46-G-BA	Black Akashi Clamp with grounding clip

(*) Subject to the panel manufacturer's installation guide.

Note 5. For Terrain Category (TC) definition, please refer to clause 4.2.1 of AS/NZS 1170.2:2021

Note 6. Topographic Multiplier (Mt) taken as 1.0. Refer to clause 4.4 of AS/NZS 1170.2:2021 for more information.

For topographic Multiplier (Mt) more than 1.0 (installations on a mountain, hilly or sloped terrain) please refer to clause 4.4 of AS/NZS 1170.2:2021 to define appropriate Topographic multiplier value.

The below table provides a reduction factor applied for topographic multipliers greater than 1 (installation on a slope, hill on mountain). To achieve a more accurate and cost-effective design, please contact Clenergy Engineering department.

Mt	A, B1, B2	
	U.W & D. W	Central
1	1	1
1.01	1.00	1.00
1.02	1.00	1.00
1.03	0.92	0.94
1.04	0.92	0.94
1.06	0.92	0.88
1.08	0.85	0.88
1.09	0.85	0.81
1.1	0.85	0.81
1.2	0.69	0.69
1.3	0.54	0.56
1.4	0.46	0.50
1.5	0.38	0.44

Note 7. Shielding Multiplier (Ms) taken as 1.0. Refer to clause 4.3 of AS/NZS 1170.2:2021 for more information.

Note 8. Wind Direction Multiplier (Md) taken as 1.0. Refer to clause 3.3 of AS/NZS 1170.2:2021 for more information.

Note 9. The installed frame must comply with the clamping zone of the PV Panel.

Note 10. Capacities checked and compared against testing data from Clenergy Australia and MTS (NATA certified).

Note 11. For the definition of roof zones, refer to Appendix B6 of the AS/NZS 1170.2:2021 standard.

Note 12. From the date of publication onwards, any amendment made to any of the above-mentioned Standards will make this report outdated and a new one will have to be released, unless the amendment has no implications on this certificate.

Note 13. No consideration has been taken on the effect that the solar panel will have over the roof structure. It has been assumed that the roof will be able to resist the additional loadings imposed by the installation of the solar panels in conjunction with the Clenergy Mounting System.

Note 14. All components from Clenergy must be installed according to manufacturer's specification and the instructions shown in the relevant installation manual. Please check the Clenergy Australia website or contact them for access to the most recent installation manuals.

Note 15. No consideration has been taken on the effect of snow loads. In case the roof is located in a snow prone area, a special design must be made.

Note 16. No consideration has been taken on the effect of earthquake loads.

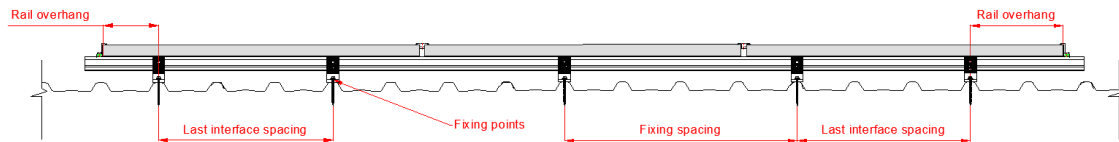
Note 17. This Engineering report is based on 1.7 m x 1 m panels and two rails per panel. However, a percentage increase or decrease could be applied on all interface spacings as shown on the following table.

Number of rails per panel	Panel length (mm)	Spacing +/-
2 rails	≤ 1700	0%
3 rails	≤ 1700	12%
4 rails	≤ 1700	17%
2 rails	≤ 2000	-10%
3 rails	≤ 2000	10%
4 rails	≤ 2000	15%
2 rails	≤ 2100	-12%
3 rails	≤ 2100	8%
4 rails	≤ 2100	12%

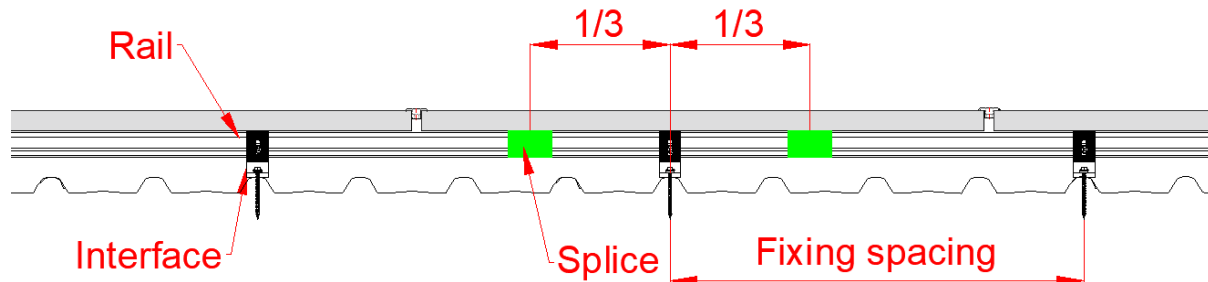
Note 18. Panel width cannot exceed 1.20 m for any of the above panel length dimensions and panel weight cannot exceed 15 kg/m².

Note 19. This document does not cover the building frame capacity. It has been assumed that the building frame will be able to resist the additional loadings imposed by the installation of the solar panels in conjunction with the Clenergy mounting system.

Note 20. Rail overhang ends where the panel finishes and this should be less than 40% of the last installed interface spacing.



Note 21. ER-R-ECO rail splice can only be installed within 1/3 of the fixing spacing (centre to centre) from the nearest interface when fixing spacing is over 1700 mm.



Note 22. ER-R-ECO rail splice cannot be installed on overhangs.

Note 23. Neither Clenergy nor MW Engineering Melbourne are to be responsible for external factors leading to compression of the tile interfaces.

Note 24. General conditions

Note 24.1 Timber Grade members: F7 (Pine) and F17 (Hardwood).

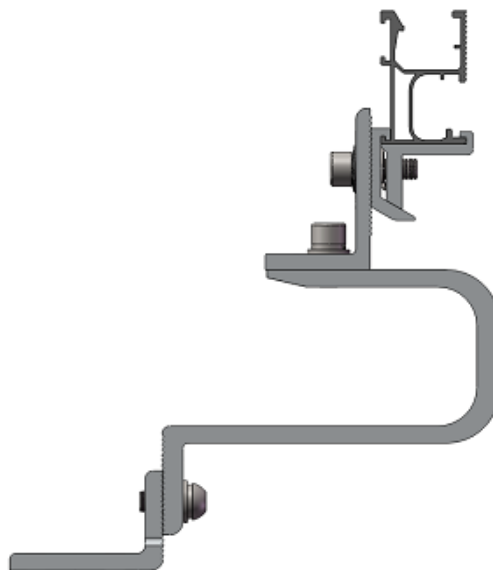
Note 24.2 If any of the screws of the interfaces go into pre-existing holes, they will have to be one size up compared to the screws that were previously installed. This is to ensure that the pullout capacity remains the same or higher.

Note 25. A minimum of two (2) screws per Tile Interface will be required for installation.

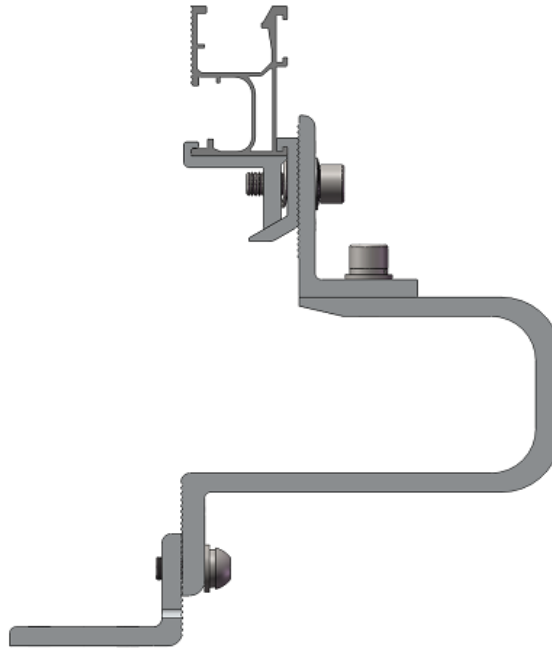
Note 26. Use the same spacing listed on the tables of this certificate for panels installed in landscape.

Note 27. Bracket orientation as per below pictures

Adjustable bracket (L-bracket facing back)

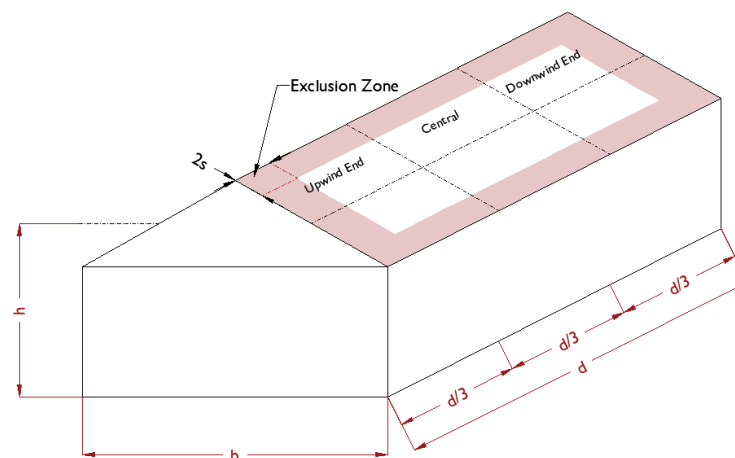


Adjustable bracket (L-bracket facing front)



Note 28. Conditions for flush mounted systems installed on flat and pitched roofs according to the B6 Appendix of the AS/NZS 1170.2:2021.

- Roof pitch to be between 1° and 30°.
- $h/d \leq 0.5$ and $h/b \leq 0.5$. Being h = height, b = width and d = length of the building as per the below picture.
- Gap between the underside of the panel and the roof to be no less than 50mm and no more than 300mm.



Note 29. Exclusion zone for flush installation to be the minimum distance from the edge of the roof "2s", where "s" is the gap between the underside of the panel and the roof.

Note 30. Please contact Clenergy if the installation doesn't meet the parameter on section B6 part (d) of the AS/NZS 1170.2:2021 standard for roof angle is between 1° to 30°.



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