PV-ezRACK®

# Penetrative Tilt Legs

## Code-Compliant Planning and Installation Guide V 6.1
## Complying with AS/NZS 1170.2:2021

SOLAR ROOF

Last Updated - Dec. 2023

# Introduction

The Clenergy PVezRack® SolarRoof Tilt Legs 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 Tilt Legs.
This manual provides:

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

2) Planning and installation instructions.

## List of contents



The PVezRack® SolarRoof Tilt Legs 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 sales@clenergy.com.au, or contacting your local distributor in Australia.

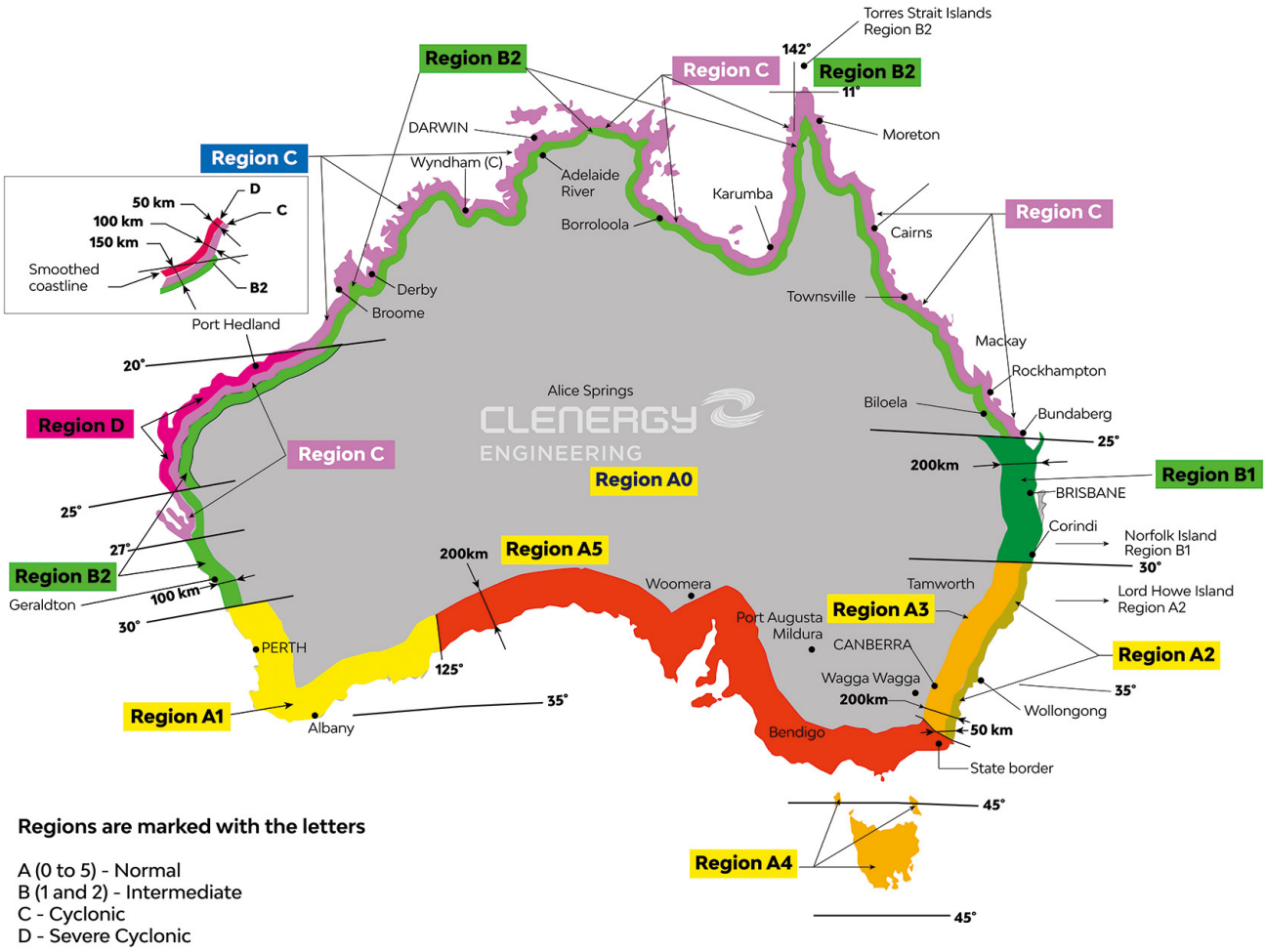
**Product Warranty:**
Please refer PVezRack® Product Warranty on our website.

## 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;
- 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;
- Veryfying 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 – Australia

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.

## 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 then 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.

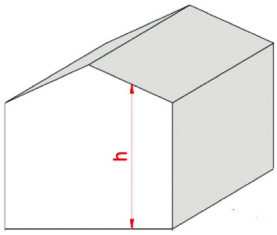
If your installation site is not at TC 2, 2.5 or 3, please contact Clenergy to obtain a project specific engineering certificate to support your installation.

## 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 PVezRack® SolarRoof system installation up to 30 meters building height (average roof height of structure above the ground, see the diagram below). If your building is more than 30 meters high, please contact Clenergy to obtain project specific engineering certificate to support your installation.

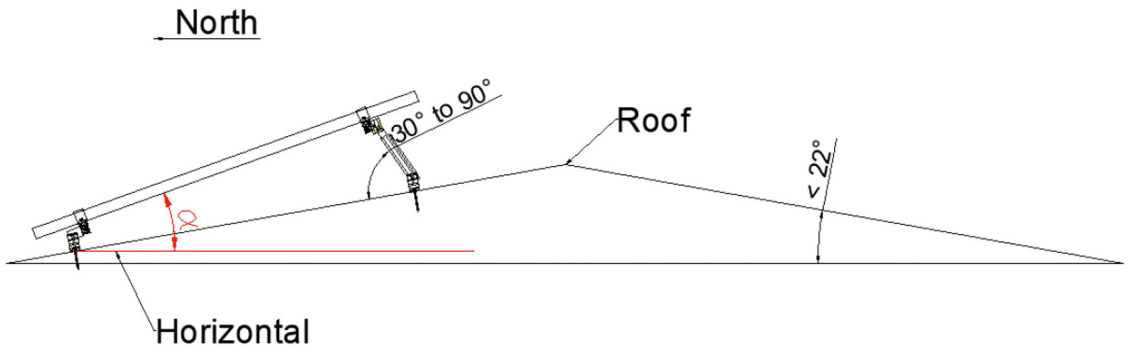



## Determine Roof slope and Tilt Leg Angle

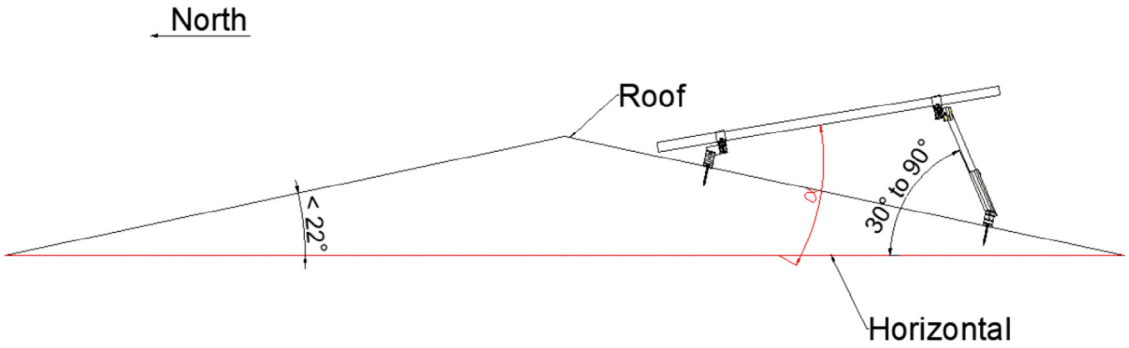
The PV-ezRack® SolarRoof Tilt Legs system is suitable for roof slope up to 22° for rails running perpendicular to the roof slope (including standard and reverse tilt), and up to 10° for rails running parallel to the roof slope. See the diagrams of 3 different scenarios below.

Please always keep back leg tilt within 30° - 90° from roof plane or horizontal depending on certain scenario.

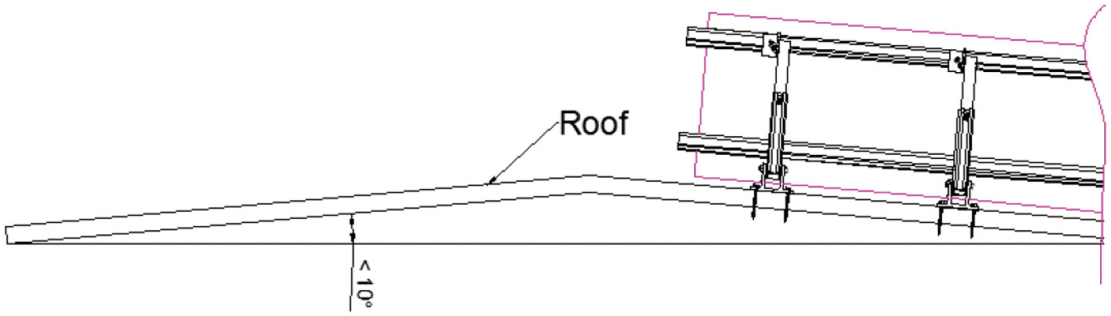
## Standard Tilt – Rails perpendicular to Roof Slope

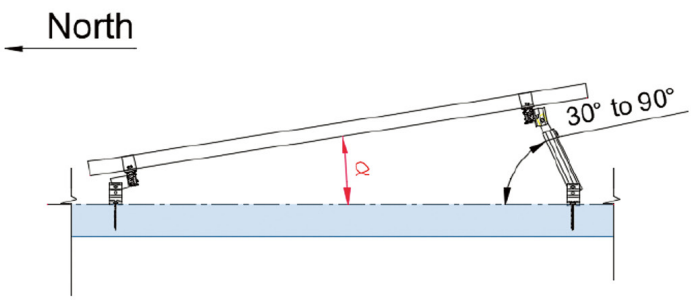



## Reverse Tilt – Rails perpendicular to Roof Slope




## Standard Tilt – Rails parallel to Roof Slope

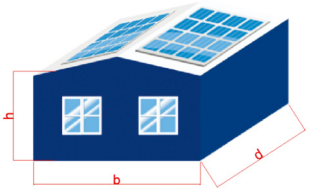


## Determine the Installation Area of Roof

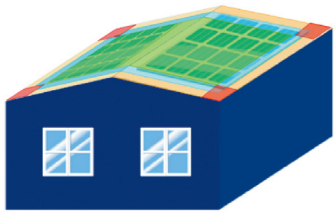
There are 4 different roof zones for tilt leg installation: Internal Zone, Intermediate Zone, Edge Zone and Corner Zone. Please see diagrams and steps below to define area of each zone.

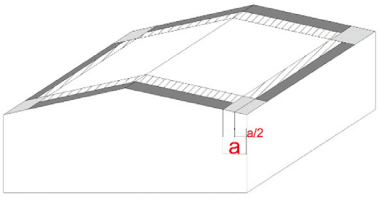
**Step 1.** Determine building height (h), width (b) and length (d)
**Step 2.** Check ratio of height to length/width (h/b and h/d)
If both h/b and h/d < 0.2, then a = 2h
**Step 3.** If h/b and h/d > 0.2 then a = the lowest value between 0.2b and 0.2d



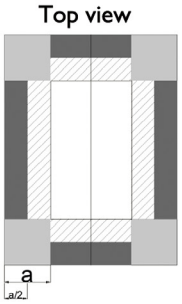

### Roof zone definition

Roof Pitch < 10°

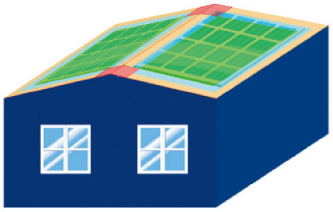


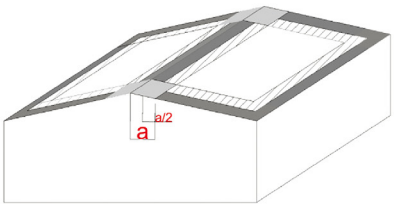


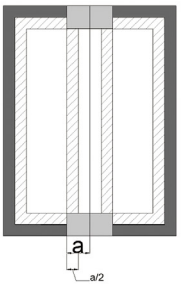

Top view



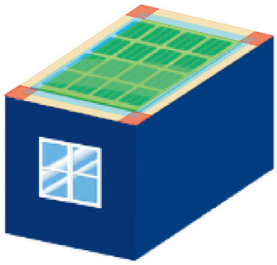

Flat/Mono – Slope Roof > 10°

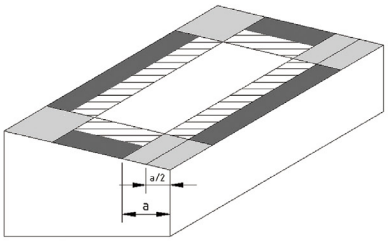


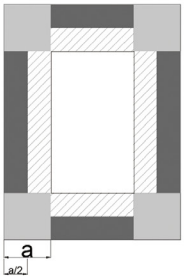


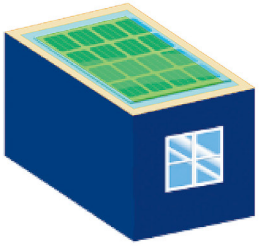

Flat/Mono – Slope Roof < 10°

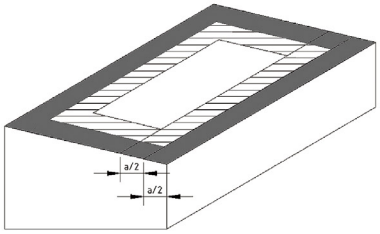


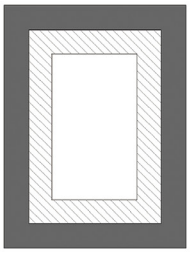


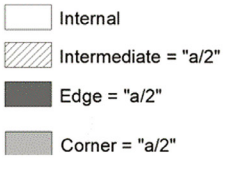




Flat/Mono – Slope Roof > 10°







## Verify Purlin Properties of Building

Please verify purlin properties of building, which could affect the interface spacing. Tilt legs spacing on in the certification letter is based on steel purlin G450 1.5 mm thick or 35 mm Timber F7 (Pine). For example, if the steel purlin is less than 1.5 mm thick, the corresponding reduction factor of interface spacing could be applied. Please refer to generic note of engineering letter for details.

## Determine Two Screws or One Screw Installations of Tilt Legs

There are options of using two screws or one screw for installations of adjustable and fixed tilt legs, depending on the project scenario, such as required interface spacing, purlin spacing, rib spacing of roof sheet and so on. Please find a note of engineering letter for details.

## Determine the Maximum Rail Support Spacing

Please refer to the Certification Letter and Tilt Legs 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 not be over 40% of the Tilt Legs spacing. For example, if the Tilt Legs spacing is 1500mm, the Rail end overhang can be up to 600mm only.

## The application of Adjustable Tilt Legs

Following the tilt angle rules of on the north or south facing roof, the actual panel tilt angles using the adjustable tilt legs installed at the different purlin spacing could be applicable or not. Please see the table and side view diagrams below.

**Application of Adjustable Tilt Legs**

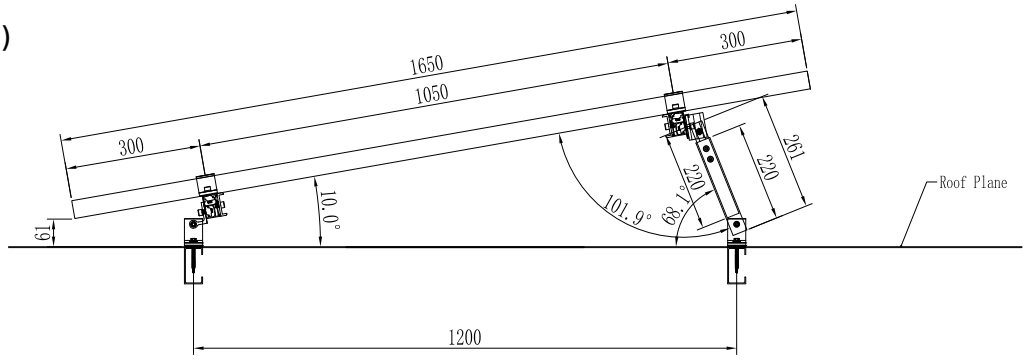
| Purlin spacing | | 1200 mm | | | | | 1400 mm | | | | | 1700 mm | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Product | 10° | 15° | 30° | 45° | 60° | 10° | 15° | 30° | 45° | 60° | 10° | 15° | 30° | 45° | 60° |
| 1650 mm panel in portrait | ER-TL-10/15 | √ (1) | √ (2) | × | × | × | √ (6) | × | × | × | × | × | × | × | × | × |
| | ER-TL-15/30 | × | × | × | × | × | × | √ (8) | × | × | × | × | × | × | × | × |
| | ER-TL-30/60 | × | × | √ (3) | √ (4) | × | × | × | √ (10) | √ (12) | × | × | × | √ (14) | × | × |
| 1960 mm panel in portrait | ER-TL-10/15 | × | × | × | × | × | √ (7) | × | × | × | × | × | × | × | × | × |
| | ER-TL-15/30 | × | × | × | × | × | × | √ (9) | × | × | × | × | × | × | × | × |
| | ER-TL-30/60 | × | × | × | √ (5) | × | × | × | √ (11) | √ (13) | × | × | × | √ (15) | × | × |

Note: √ indicates applicable; × indicates not applicable

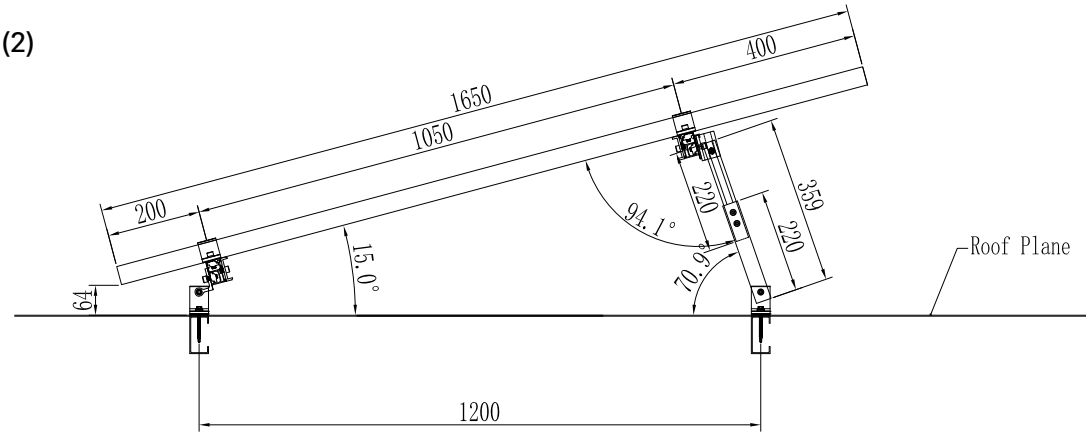
The table above is based on:

1. The panels are clamped within one quarter of panel length;
2. Rear leg adjustable range: ER-TL-10/15: 260-375 mm; ER-TL-15/30: 390-635 mm; ER-TL-30/60: 675-1205 mm;
**3. If the info. is different from the table and diagram, it could have different results. Please contact the Clenergy to confirm its applicability.**

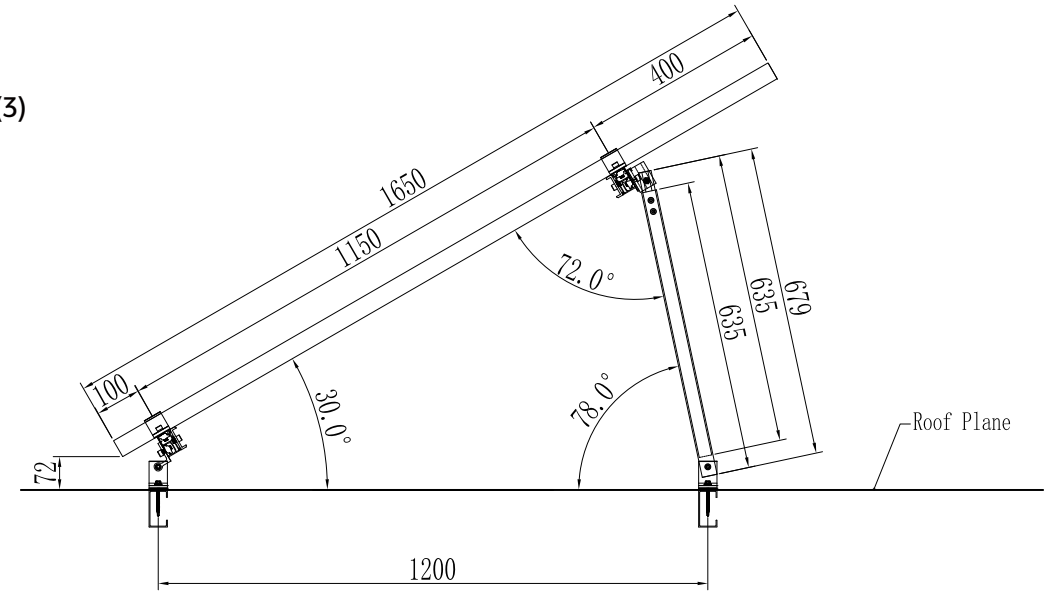
(1)


1650
1050
300
300
361
220
220
101.9°
88.1°
10.0°
61
Roof Plane
1200

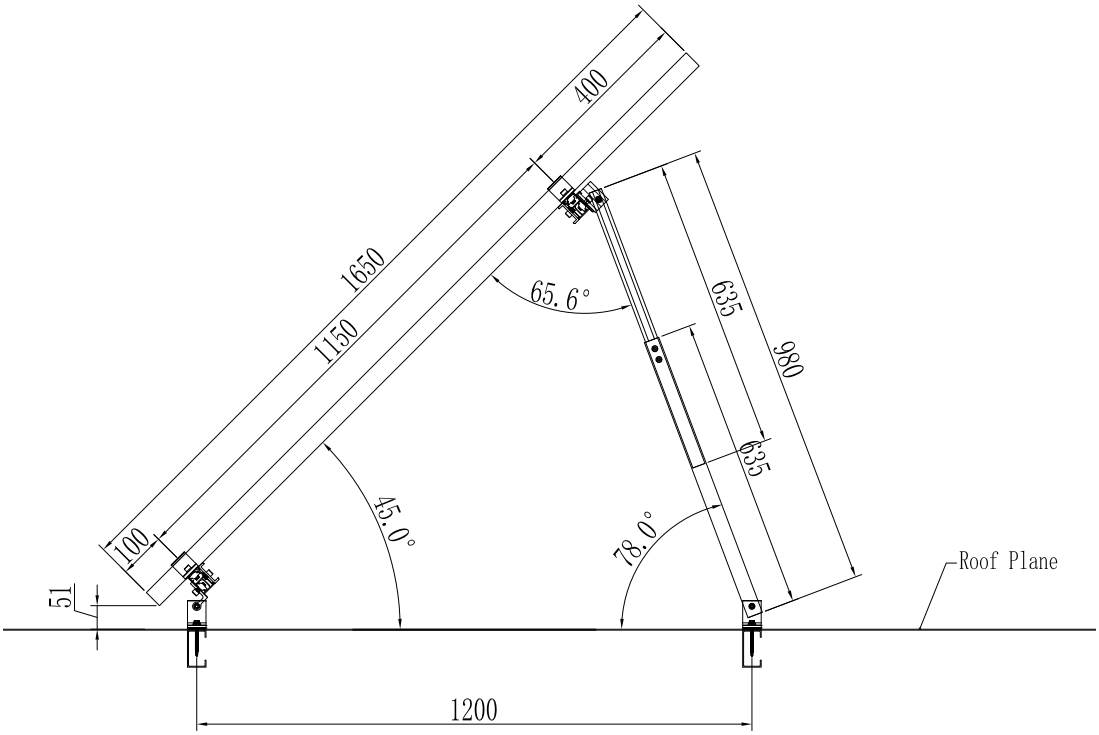
(2)


400
1650
1050
200
359
220
220
94.1°
70.9°
15.0°
64
Roof Plane
1200

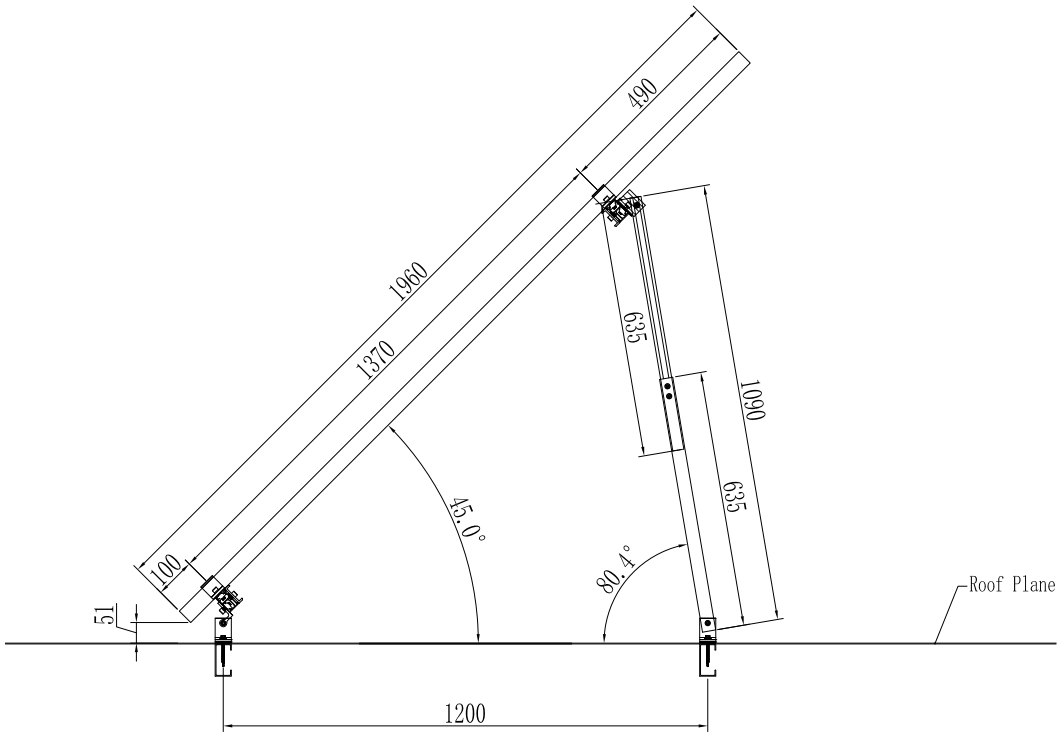
(3)


400
1650
1150
100
679
635
635
72.0°
78.0°
30.0°
72
Roof Plane
1200

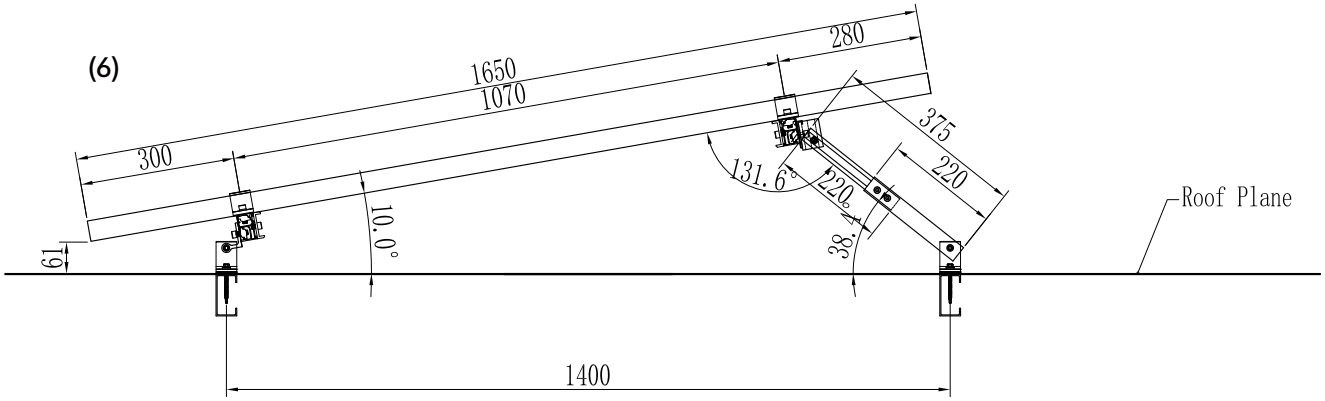
(4)


400
1650
1150
65.6°
635
980
635
45.0°
78.0°
100
51
Roof Plane
1200

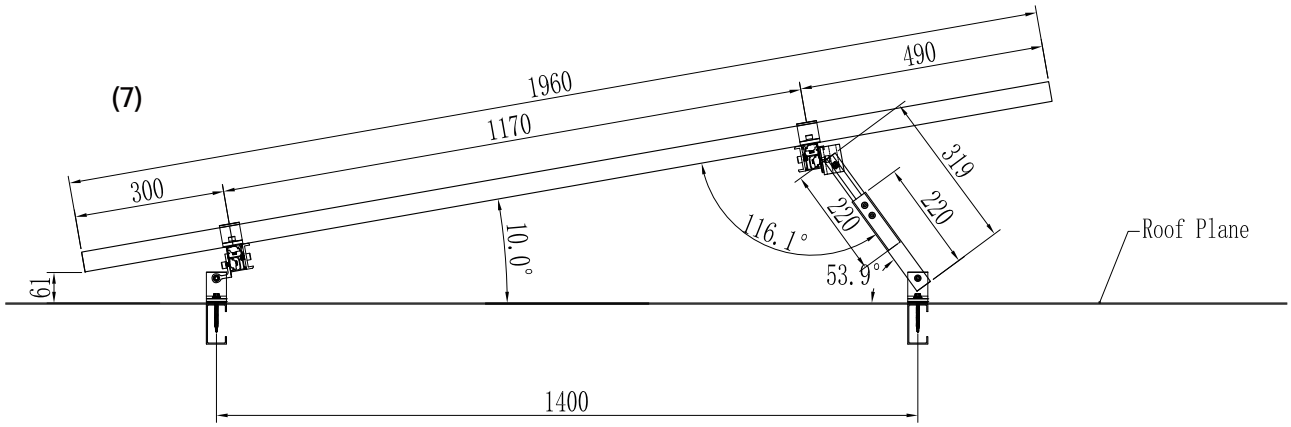
(5)


490
1960
1370
635
1090
635
45.0°
80.4°
100
51
Roof Plane
1200

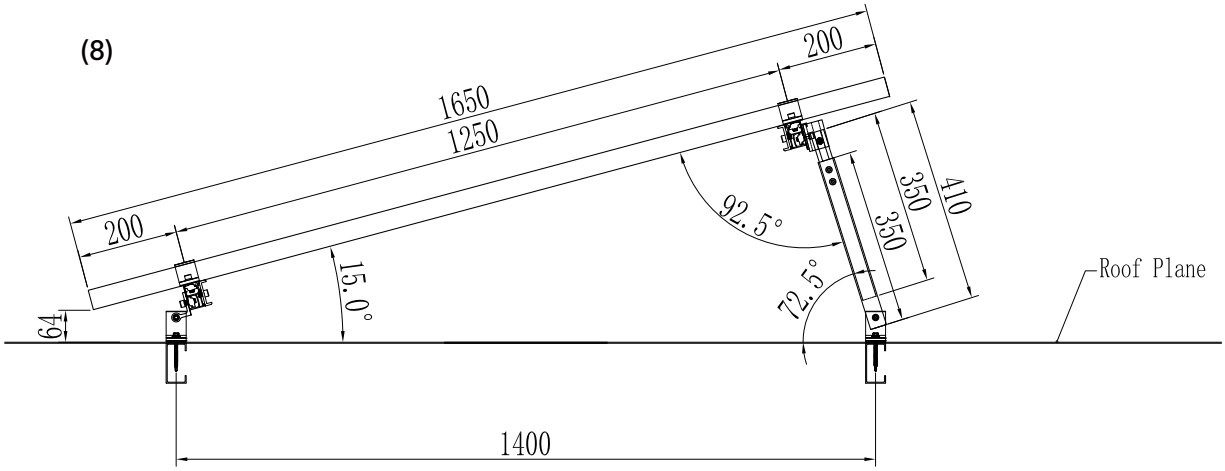
(6)


1650
1070
280
300
375
220
131.6°
220
38°
10.0°
61
Roof Plane
1400

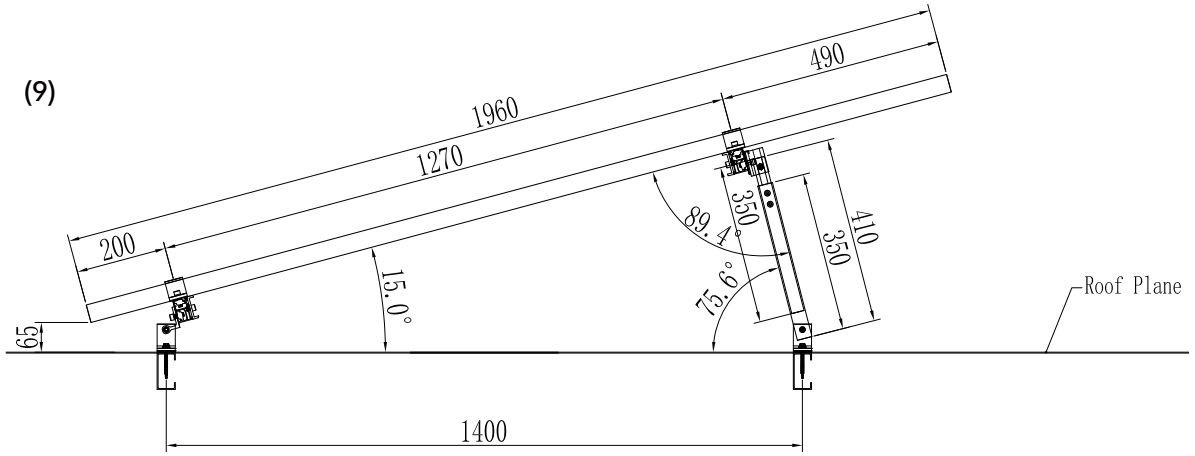
(7)


1960
1170
490
300
319
220
220
116.1°
53.9°
10.0°
61
Roof Plane
1400

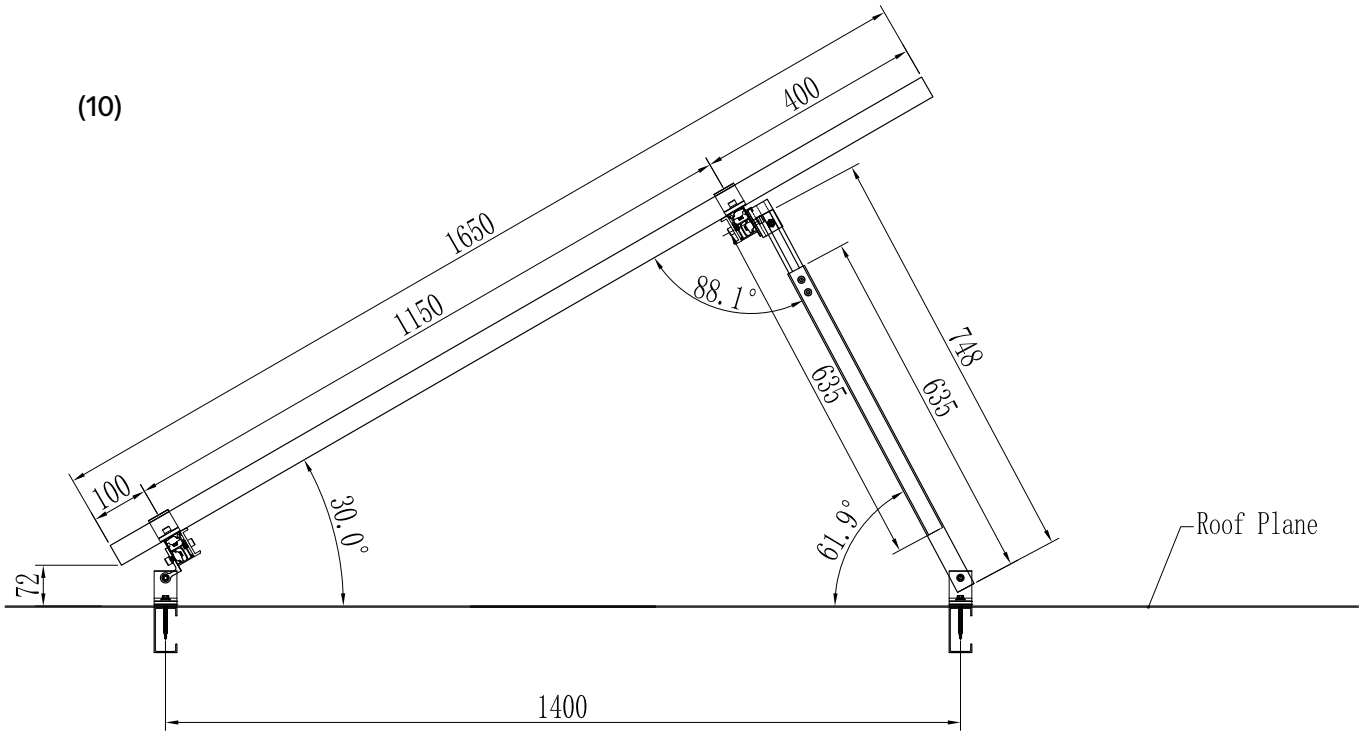
(8)


1650
1250
200
200
350
350
410
92.5°
72.5°
15.0°
64
Roof Plane
1400

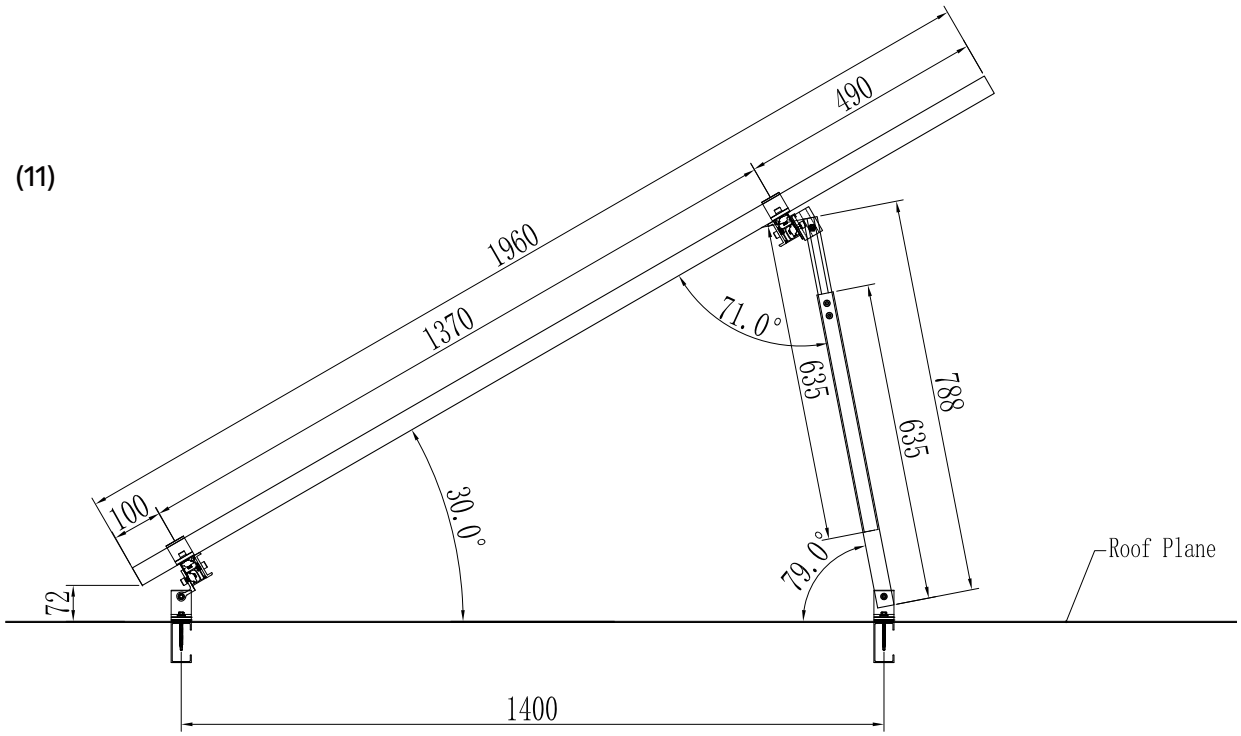
(9)


490
1960
1270
200
15.0°
89.4°
350
410
350
75.6°
65
Roof Plane
1400

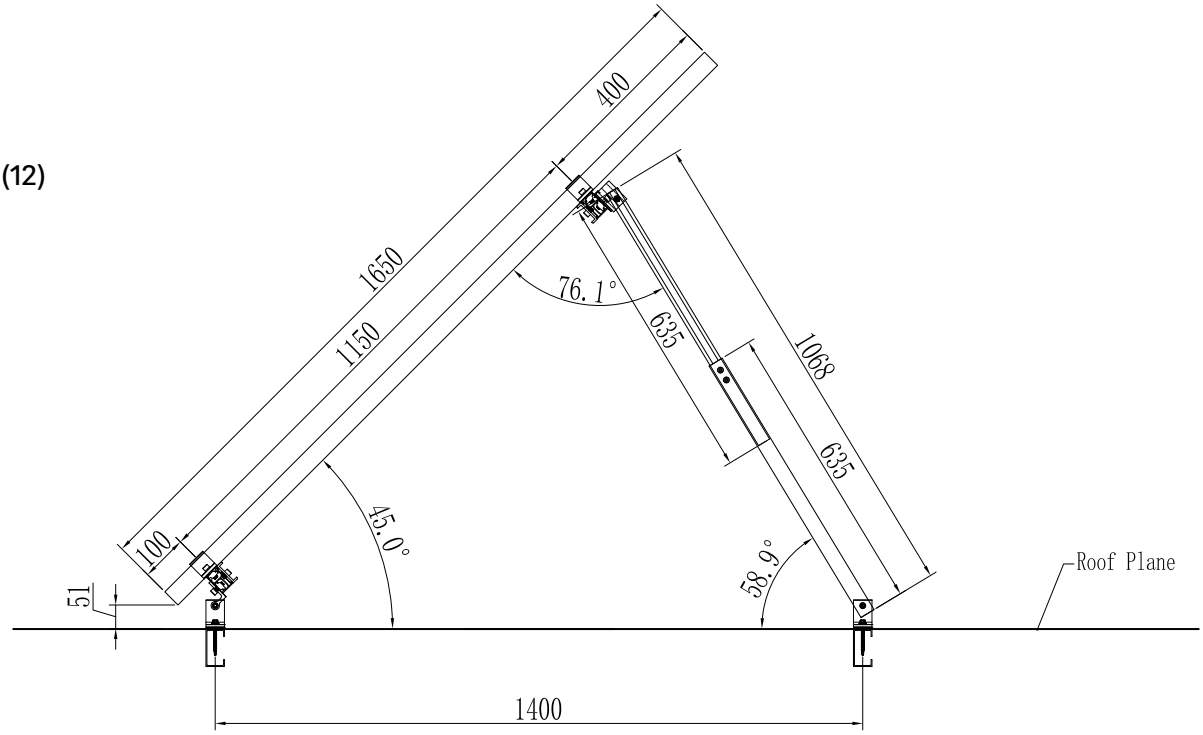
(10)


400
1650
1150
88.1°
748
635
635
100
30.0°
61.9°
72
Roof Plane
1400

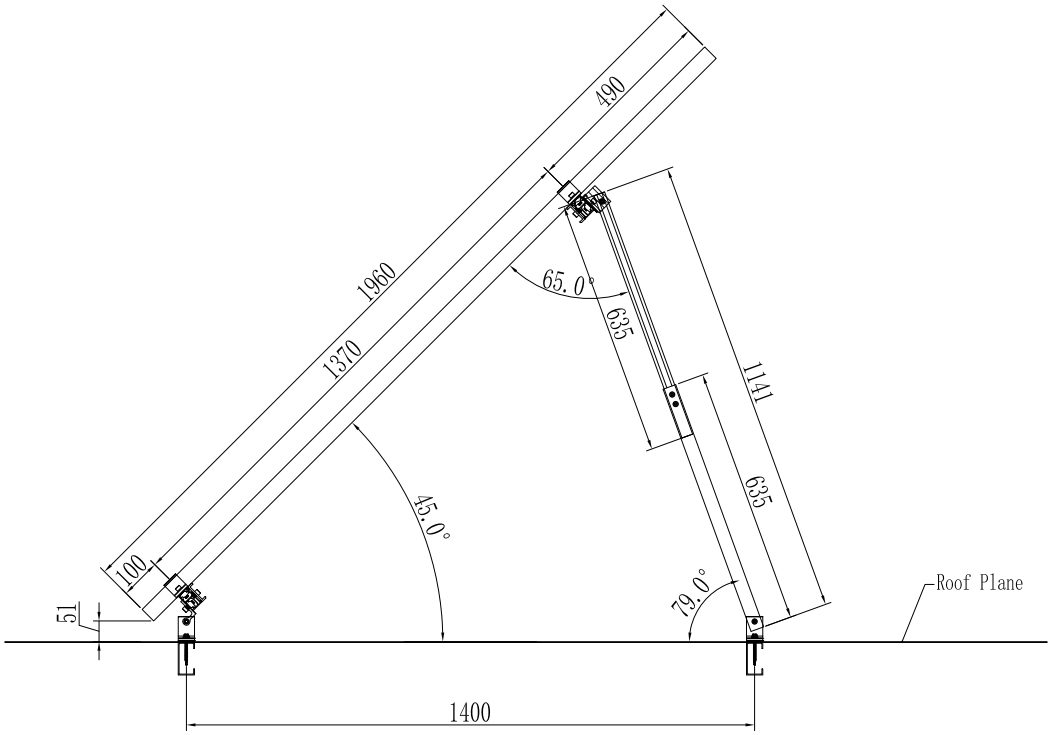
(11)


490
1960
1370
71.0°
635
788
635
100
30.0°
79.0°
Roof Plane
72
1400

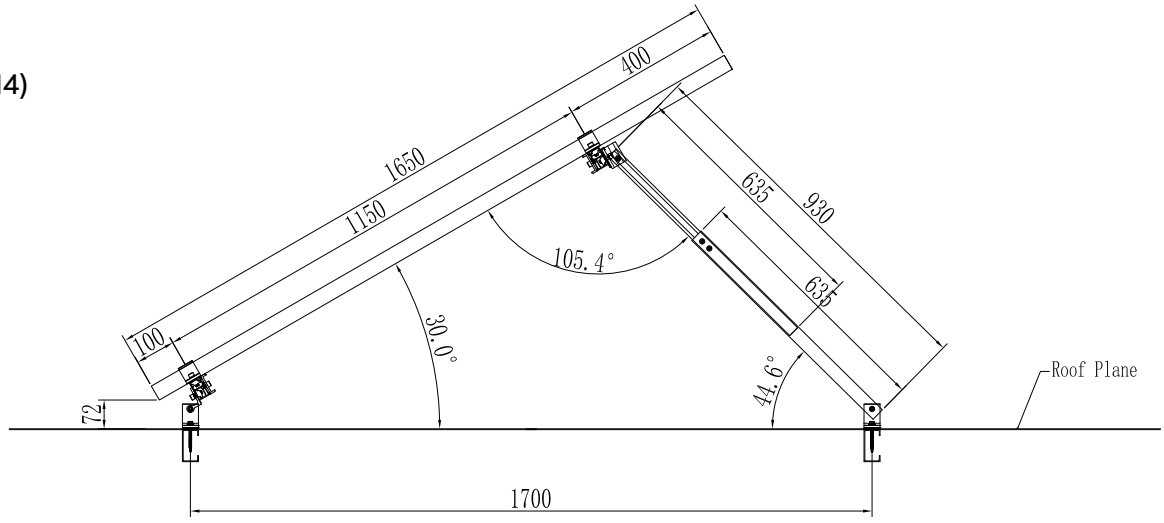
(12)


400
1650
1150
76.1°
635
1068
635
100
45.0°
58.9°
Roof Plane
51
1400

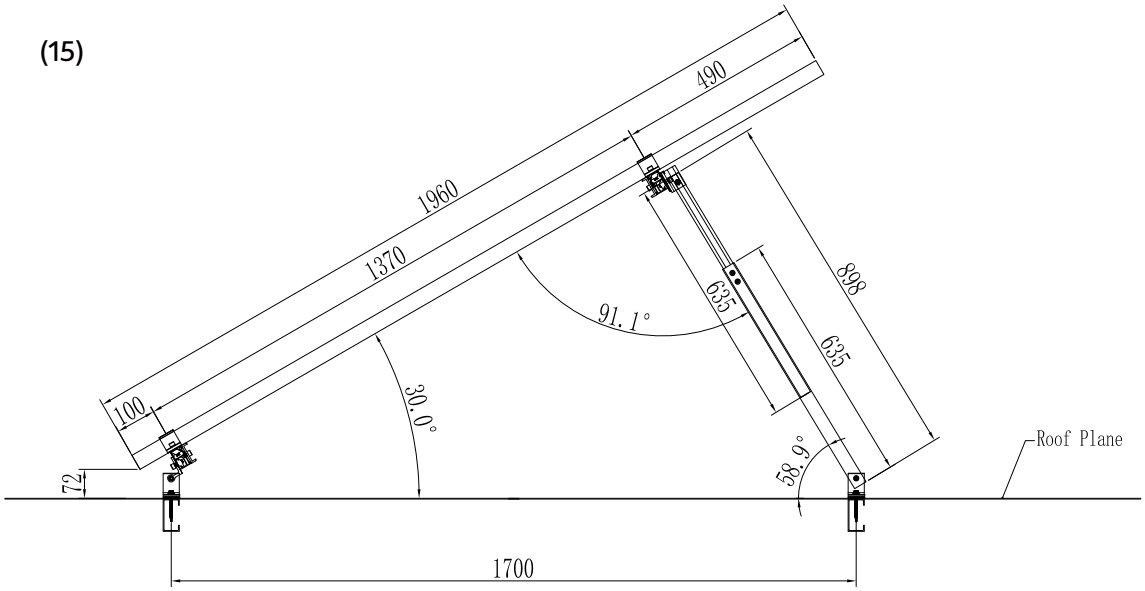
(13)


490
1960
1370
65.0°
635
1141
635
45.0°
100
51
79.0°
Roof Plane
1400

(14)


400
1650
1150
635
930
105.4°
635
100
30.0°
44.6°
Roof Plane
72
1700

(15)

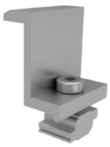
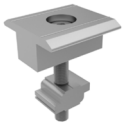


# Tools and Components

## Tools

| | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| Screw Driver (maximum torque≥34N·m) | Torque Spanner | Socket Wrench M8 | 5m Tape | String & Marker Pen |

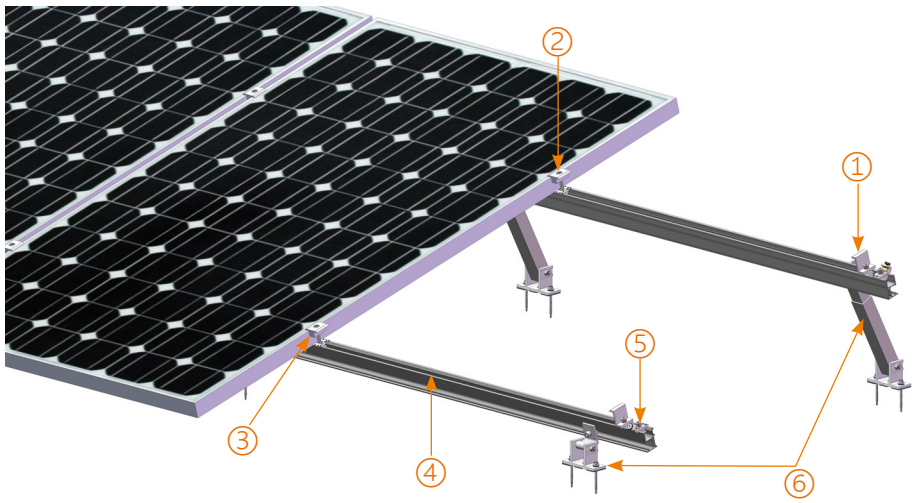
## Components

| | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| ER-EC-ST<br>End Clamp | ER-IC-ST<br>Inter Clamp | C-U/30/46<br>Akashi Clamp | C-U/30/46-G<br>Akashi Clamp | ER-TL-10/15<br>ER-TL-15/30<br>ER-TL-30/60<br>Adjustable Tilt legs, non-preassembly |
|  |  |  |  |  |
| ER-R-ECO<br>ECO-Rail | ER-SP-ECO<br>Splice for ECO-Rail | ER-TL-10/15/PS<br>ER-TL-15/30/PS<br>Adjustable Tilt legs, preassembly | TL-10/15/L/PS<br>TL-15/30/L/PS<br>Adjustable Tilt Legs with L-feet, preassembly | ER-TL-5/PS<br>ER-TL-10/PS<br>Fixed Tilt Legs, preassembly |

# System Overview

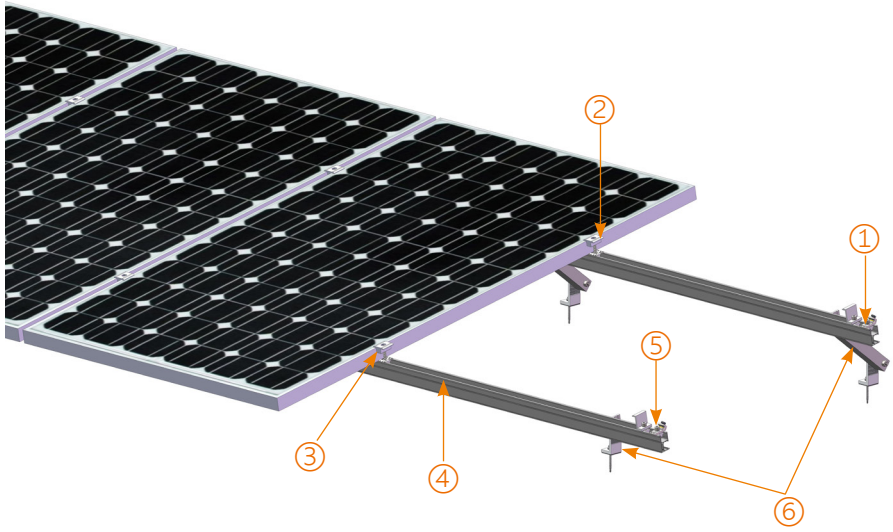
## Overview of PV-ezRack® SolarRoof Adjustable Tilt Legs

### Adjustable Tilt Legs



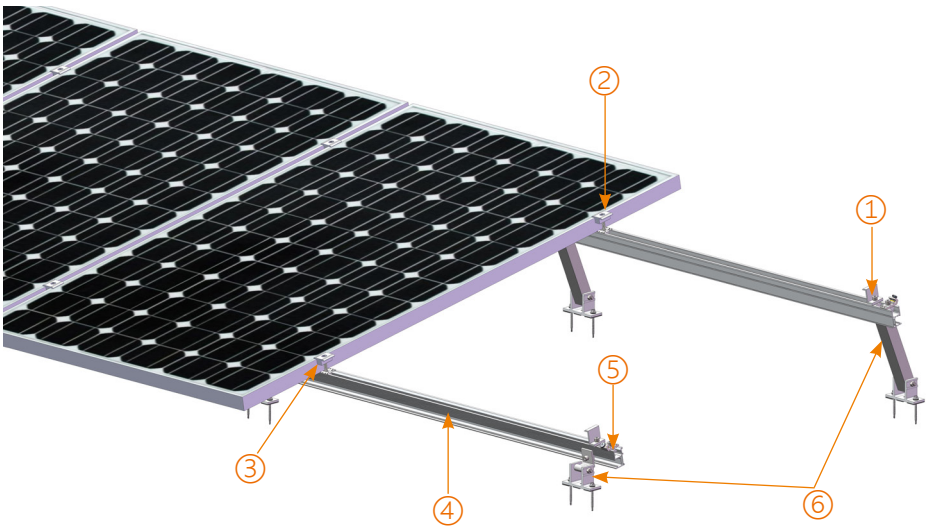

1. End Clamp 2. Inter Clamp 3. Grounding Clip 4. ECO-Rail 5. Grounding Lug 6. Adjustable Tilt Legs

### Adjustable Tilt Legs with L-feet




1. End Clamp 2. Inter Clamp 3. Grounding Clip 4. ECO-Rail 5. Grounding Lug 6. Adjustable Tilt Legs with L-feet

## Fixed Tilt Legs




1. End Clamp 2. Inter Clamp 3. Grounding Clip 4. ECO-Rail 5. Grounding Lug 6. Fixed Tilt Legs

# 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.

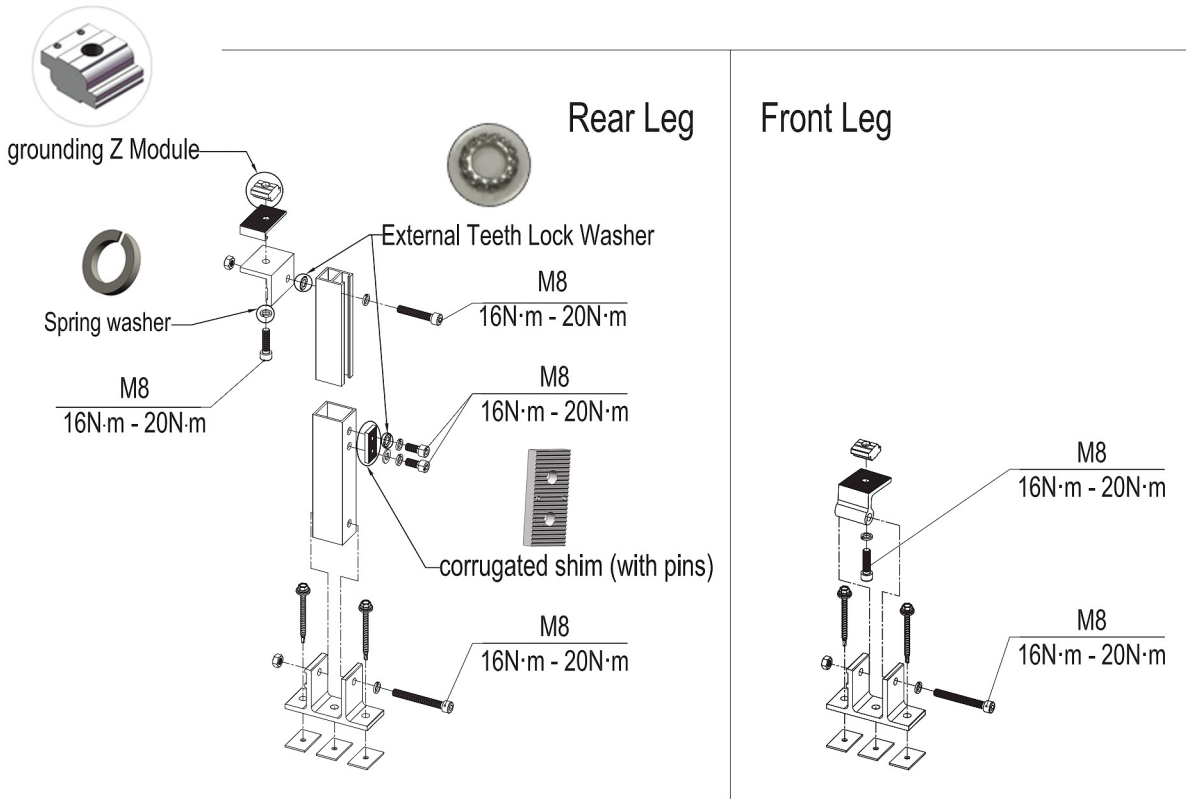
## General installation instructions:

(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

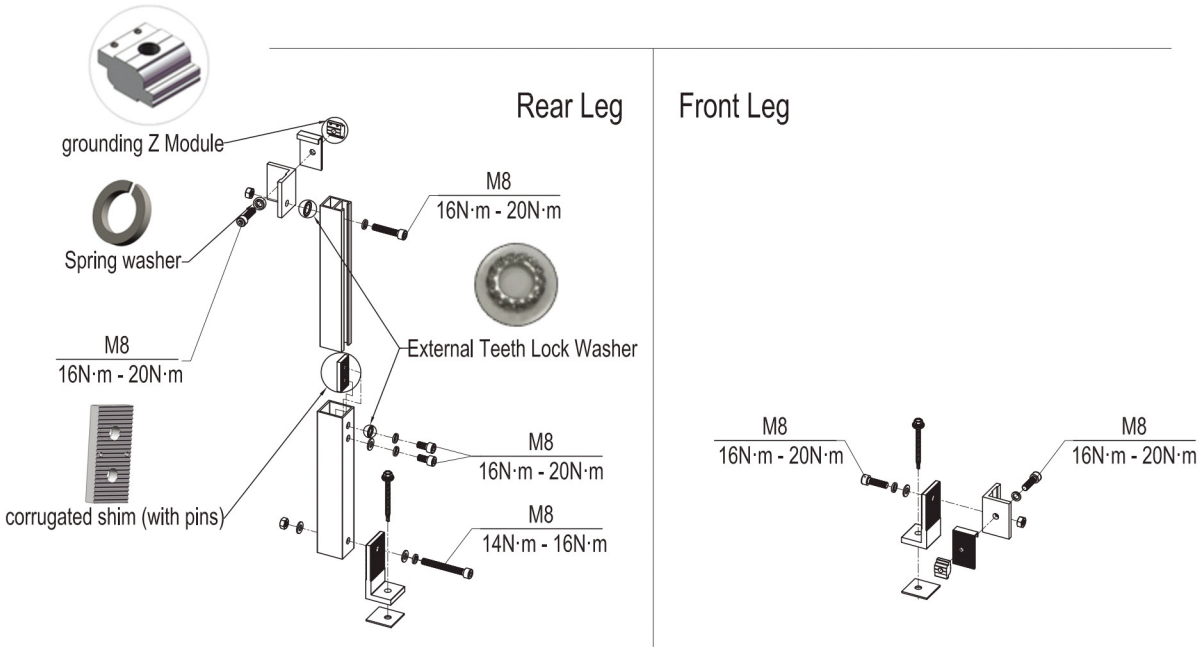
Please refer to safe torques defined in this guide as shown in the figure below. If power tools are required, Clenergy recommends the use of low speed only. High speed and impact drivers increase the risk of bolt galling (deadlock). If deadlock occurs and you need to cut fasteners, please make sure that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

**1) Adjustable Tilt Legs**



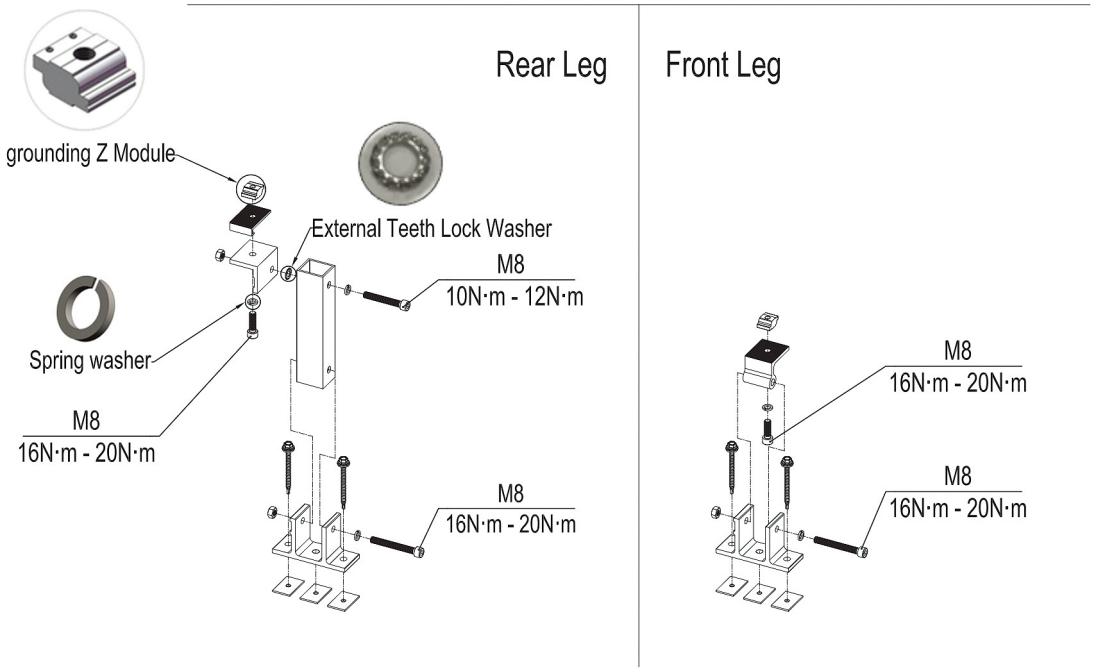

Note:
Grounding Z Module, External Teeth Lock Washers, Spring washer and corrugated shim (with pins) on the diagram above are to create the electrical continuity between rail and rear leg tubes.

### 2) Adjustable Tilt Legs with L-feet




Note:
Grounding Z Module, External Teeth Lock Washers, Spring washer and corrugated shim (with pins) on the diagram above are to create the electrical continuity between rail and rear leg tubes.

### 3) Fixed Tilt Legs




Note:
Grounding Z Module,External Teeth Lock Washer and Spring washer on the diagram above are to create the electrical continuity between rail and rear leg tubes.

# Installation Instructions

## Front & Rear Leg Installation

### Front Leg Installation

According to the installation plan, determine the mounting position and direction of the front legs. Either two screws or single screw (Buildex 14-11 x 70 Hex Head Zips screw) is required depending on the installation spacing requirement. See two screws and single screw options in Figures 1 and 2. Tin foot front leg installation is in Figure 3.

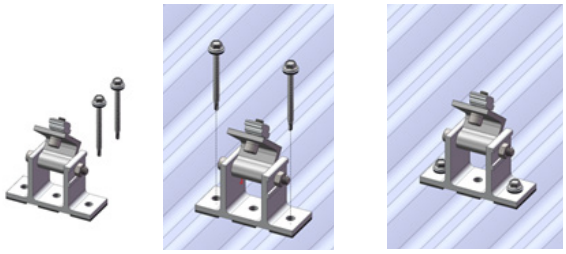


**Figure 1**
(Front Leg Installation with Two Screws)

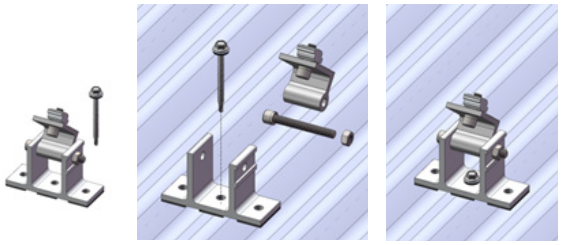


**Figure 2**
(Front Leg Installation with Single Screw)

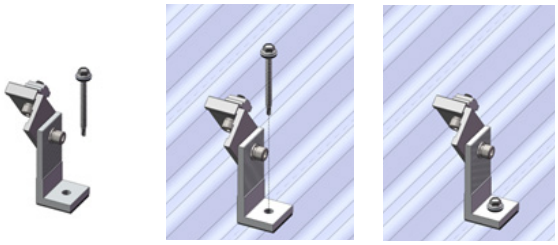
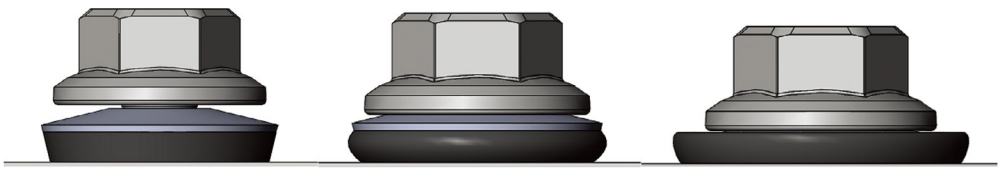


**Figure 3**
(Tin Foot Front Leg Installation)

Notes:
1. Two screws shall be installed through two side holes of front leg (as shown in Figure 1);
2. Single screw shall be installed through central hole only of front leg (as shown in Figure 2).

Please follow 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.



Under Tightened  Correctly Tightened  Over Tightened

## Rear Leg Installation

According to the installation plan, after confirming the length L of the Rear Leg, fasten two M8*12 bolts as shown in Figure 4.

Recommended torque for M8*12 bolts is 18~20 N·m

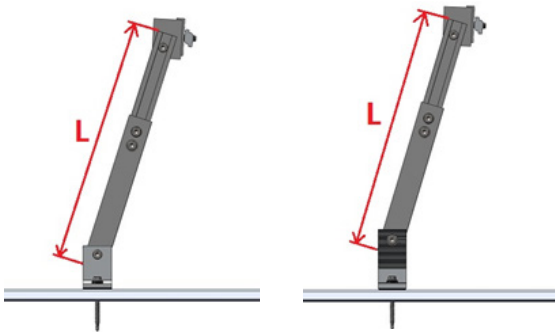



Figure 4

According to the installation plan, either two screws or single screw (Buildex 14-11 x 70 Hex Head Zips screw) is used to install rear leg. Using preassembly or non-preassembly rear legs will make installation steps a bit different as well. See the installation images in Figures 5-9.

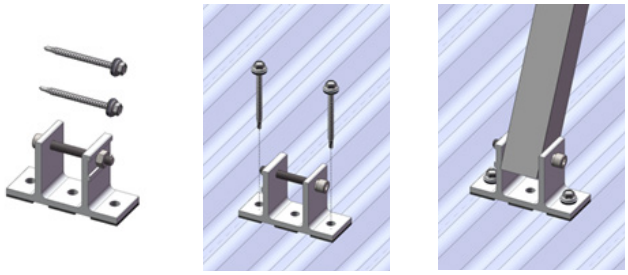


Figure 5
(Non-preassembly Rear Leg Installation with Two Screws)

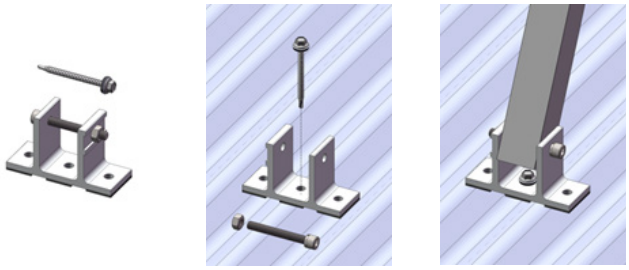


Figure 6
(Non-preassembly Rear Leg Installation with Single Screw)

Figure 7
(Preassembly Rear Leg Installation with Two Screws)

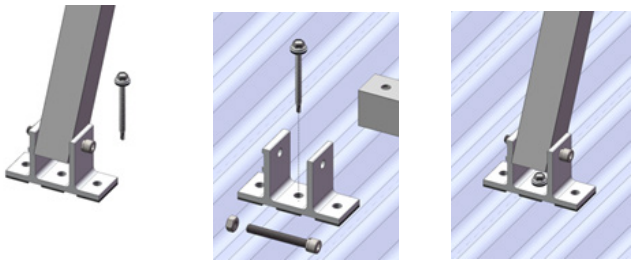


Figure 8
(Preassembly Rear Leg Installation with Single Screw)

Figure 9
(Tin Foot Rear Leg Installation)

Notes:
1. Two screws shall be installed through two side holes of rear leg (as shown in Figures 5 and 7);
2. Single screw shall be installed through central hole only of rear leg (as shown in Figures 6 and 8).

## Install the remaining Front and Rear Legs in Figure 10.

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 BUILDEX SCREWS.

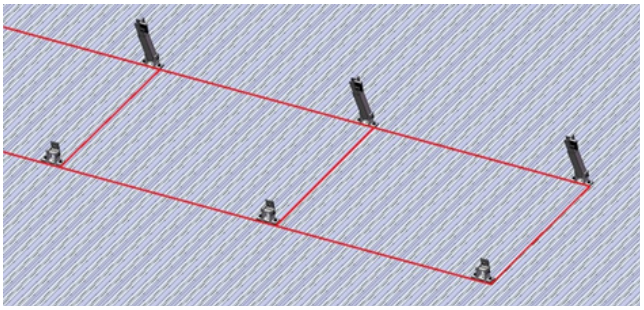


Figure 10

# Rail Installation

According to the installation plan, determine the mounting position of Rail.

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 as shown in Figure 11 and 12. 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.

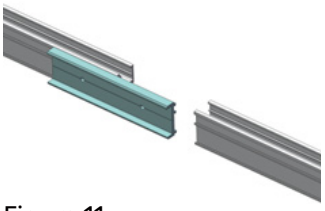


Figure 11

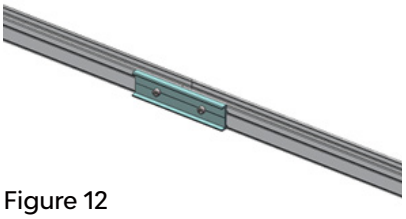


Figure 12

Recommended torque for M8 bolts is 10~12 N·m

After confirming the position of Rail, fasten the Front and Rear Leg, as shown in Figure 13, 14 and 15.

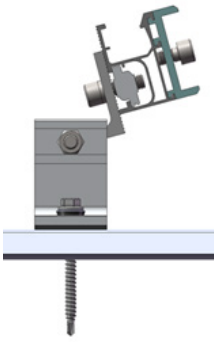


Figure 13

Recommended torque for M8 bolts is 18~20 N·m

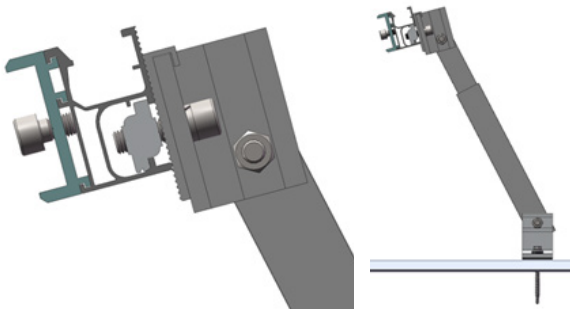


Figure 14

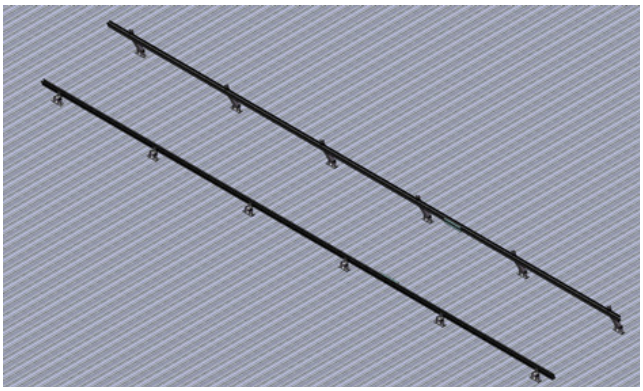


Figure 15

# PV Module Installation

1) Please refer PVezRack® 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 (P17)**".

# Certification

MW Engineering
Melbourne

CIVIL & STRUCTURAL ENGINEERS
RESIDENTIAL - INDUSTRIAL - COMMERCIAL - PRODUCT DEVELOPMENT
info@mwengineering.melbourne
Phone: 1300 MWENG-0 (1300 69364-0)
www.mwengineering.melbourne
ABN 37 605 815 585

28 August 2023

Clenergy Australia
1/10 Duerdin Street
Clayton, VIC 3168

**CERTIFICATION LETTER**

Clenergy PV ez-Rack penetrative tilt Certification – TC2, 2.5, 3 – Wind Region A, B1, B2 C, D. Project No.: **CL-530-S-REV 3**. Internal REF: **00631.**

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 1170.2-2011 AMDT 4-2016**
  - **Wind Terrain Category 2, 2.5 and 3**
  - **Wind average recurrence of 200 years**
  - **Wind Region A, B1,B2, C and D**
- **Solar panel length up to 2.4 m**
- **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- 2011 AMDT 4-2016** **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
Civil/Structural Engineer
**BEng MIEAust NER**
PE 0003615
RPEQ 18759
BDC 3134
BPB (NT) 262228ES
BSP (TAS) 845530344
info@mwengineering.melbourne

August 2023

STRUCTURAL DESIGN CERTIFICATION

PV-ezRACK®

SOLAR ROOF

# Penetrative tilt interface spacing tables

Standard: AS/NZS 1170.2:2021

Terrain Category: 2, 2.5 & 3

**Client: Clenergy Australia**

**REF: 00631**

**Date: AUGUST 2023**



**Limitation: This report has been prepared for the exclusive use of Clenergy Australia and is subject to and issued in connection with the provisions of the agreement between MW Engineering Melbourne and Clenergy Australia. MW Engineering Melbourne accepts no liability or responsibility whatsoever for any use of or reliance upon this report by any third party other than Clenergy's clients.**

**Client reference: CL-530-S-REV3**

**Project: PV ez-Rack SolarRoof penetrative tilt 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/NZS1170.2:2021 only.

**Designed: AE**

**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 ez-Rack SolarRoof Interface spacing table for penetrative tilt legs

## 0° < α < 10°

Type of Rail ER-R-ECO (see Note 12 for other compatible rails)

Solar Panel Dimension 2 m x 1 m (see Note 25 for other panel sizes)

| ANGLE TO THE HORIZONTAL | 0° ≤ α < 10° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 3 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 2095 | 1676 | 1270 | 838 | 1907 | 1525 | 1156 | 763 | 1844 | 1475 | 1117 | 738 | 1540 | 1232 | 933 | 616 | 1485 | 990 | 743 | 495 |
| B1 | 1812 | 1246 | 944 | 623 | 1464 | 1171 | 887 | 585 | 1432 | 1146 | 868 | 573 | 1214 | 972 | 736 | 486 | 1093 | 729 | 546 | 364 |
| B2 | 1746 | 1202 | 911 | 563 | 1411 | 1130 | 856 | 529 | 1382 | 1107 | 784 | 518 | 1172 | 939 | 664 | 439 | 1055 | 697 | 494 | 330 |
| C | 1354 | 1083 | 821 | 542 | 1115 | 892 | 676 | 446 | 1068 | 854 | 647 | 427 | 783 | 627 | 475 | 313 | 686 | 458 | 343 | 229 |
| D | 1041 | 833 | 631 | 417 | 937 | 750 | 568 | 375 | 664 | 531 | 402 | 266 | 625 | 500 | 379 | 250 | 547 | 364 | 273 | 182 |

| ANGLE TO THE HORIZONTAL | 0° ≤ α < 10° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2.5 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 2011 | 1609 | 1219 | 805 | 1830 | 1464 | 1109 | 732 | 1770 | 1416 | 1073 | 708 | 1478 | 1183 | 896 | 591 | 1426 | 950 | 713 | 475 |
| B1 | 1739 | 1196 | 906 | 598 | 1405 | 1124 | 851 | 562 | 1375 | 1100 | 833 | 550 | 1166 | 933 | 707 | 466 | 1049 | 699 | 525 | 350 |
| B2 | 1677 | 1155 | 839 | 540 | 1355 | 1085 | 768 | 508 | 1327 | 1063 | 753 | 497 | 1126 | 879 | 639 | 422 | 1013 | 631 | 474 | 317 |
| C | 1300 | 1040 | 788 | 520 | 1070 | 856 | 649 | 428 | 1025 | 820 | 621 | 410 | 752 | 601 | 456 | 301 | 659 | 439 | 329 | 220 |
| D | 1000 | 800 | 606 | 400 | 900 | 720 | 545 | 360 | 637 | 510 | 386 | 255 | 600 | 480 | 364 | 240 | 525 | 350 | 262 | 175 |

| ANGLE TO THE HORIZONTAL | 0° ≤ α < 10° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1959 | 1567 | 1187 | 784 | 1783 | 1426 | 1080 | 713 | 1724 | 1379 | 1045 | 690 | 1440 | 1152 | 873 | 576 | 1388 | 926 | 694 | 463 |
| B1 | 1694 | 1165 | 882 | 582 | 1368 | 1095 | 829 | 547 | 1339 | 1071 | 812 | 536 | 1135 | 908 | 688 | 454 | 1022 | 681 | 511 | 341 |
| B2 | 1634 | 1125 | 797 | 526 | 1320 | 1047 | 749 | 495 | 1294 | 967 | 734 | 484 | 1097 | 820 | 622 | 411 | 987 | 616 | 462 | 308 |
| C | 1266 | 1013 | 767 | 506 | 1042 | 834 | 632 | 417 | 998 | 799 | 605 | 399 | 732 | 586 | 444 | 293 | 642 | 428 | 321 | 214 |
| D | 974 | 779 | 590 | 389 | 876 | 701 | 507 | 335 | 621 | 497 | 376 | 248 | 584 | 467 | 354 | 234 | 511 | 341 | 256 | 170 |

# PV ez-Rack SolarRoof Interface spacing table for penetrative tilt legs

## 10° ≤ α < 15°

Type of Rail ER-R-ECO (see Note 12 for other compatible rails)

Solar Panel Dimension 2 m x 1 m (see Note 25 for other panel sizes)

| ANGLE TO THE HORIZONTAL | 10° ≤ α < 15° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 3 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1869 | 1525 | 1156 | 763 | 1716 | 1373 | 1040 | 686 | 1602 | 1281 | 971 | 641 | 1351 | 1081 | 819 | 541 | 1251 | 834 | 626 | 417 |
| B1 | 1355 | 1084 | 821 | 542 | 1152 | 922 | 698 | 461 | 976 | 781 | 591 | 390 | 951 | 761 | 577 | 381 | 799 | 532 | 399 | 266 |
| B2 | 1308 | 1013 | 742 | 490 | 1112 | 861 | 631 | 417 | 942 | 705 | 534 | 353 | 919 | 688 | 521 | 344 | 764 | 481 | 362 | 241 |
| C | 1201 | 961 | 695 | 459 | 854 | 683 | 517 | 341 | 645 | 516 | 391 | 258 | 554 | 443 | 336 | 222 | 429 | 286 | 215 | 143 |
| D | 974 | 709 | 537 | 354 | 663 | 530 | 402 | 265 | 380 | 304 | 230 | 152 | 438 | 351 | 266 | 175 | 351 | 234 | 176 | 117 |

| ANGLE TO THE HORIZONTAL | 10° ≤ α < 15° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2.5 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1794 | 1464 | 1109 | 732 | 1647 | 1318 | 998 | 659 | 1538 | 1230 | 932 | 615 | 1297 | 1038 | 786 | 519 | 1201 | 801 | 601 | 400 |
| B1 | 1301 | 1041 | 788 | 520 | 1106 | 885 | 670 | 442 | 937 | 749 | 568 | 375 | 913 | 731 | 554 | 365 | 767 | 511 | 383 | 256 |
| B2 | 1256 | 940 | 712 | 471 | 1068 | 799 | 606 | 400 | 905 | 677 | 513 | 339 | 861 | 660 | 501 | 330 | 692 | 462 | 347 | 232 |
| C | 1153 | 881 | 635 | 419 | 820 | 656 | 497 | 328 | 620 | 496 | 376 | 248 | 532 | 426 | 323 | 213 | 412 | 275 | 206 | 137 |
| D | 935 | 663 | 494 | 327 | 636 | 509 | 385 | 254 | 365 | 292 | 221 | 146 | 421 | 337 | 255 | 168 | 337 | 225 | 169 | 112 |

| ANGLE TO THE HORIZONTAL | 10° ≤ α < 15° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1747 | 1426 | 1080 | 713 | 1604 | 1284 | 972 | 642 | 1497 | 1198 | 908 | 599 | 1264 | 1011 | 766 | 505 | 1170 | 780 | 585 | 390 |
| B1 | 1267 | 1014 | 768 | 507 | 1077 | 862 | 653 | 431 | 912 | 730 | 553 | 365 | 890 | 712 | 539 | 356 | 747 | 498 | 373 | 249 |
| B2 | 1224 | 915 | 694 | 459 | 1030 | 778 | 591 | 390 | 824 | 660 | 500 | 330 | 803 | 643 | 488 | 323 | 675 | 450 | 338 | 226 |
| C | 1123 | 817 | 619 | 408 | 798 | 639 | 484 | 319 | 603 | 483 | 366 | 241 | 518 | 415 | 314 | 207 | 402 | 268 | 201 | 134 |
| D | 870 | 604 | 450 | 298 | 619 | 451 | 341 | 225 | 355 | 284 | 215 | 142 | 410 | 328 | 248 | 164 | 329 | 219 | 164 | 110 |

# PV ez-Rack SolarRoof Interface spacing table for penetrative tilt legs

## 15° ≤ α < 20°

Type of Rail ER-R-ECO (see Note 12 for other compatible rails)

Solar Panel Dimension 2 m x 1 m (see Note 25 for other panel sizes)

| ANGLE TO THE HORIZONTAL | 15° ≤ α < 20° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 3 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1686 | 1442 | 1092 | 721 | 1478 | 1182 | 895 | 591 | 1442 | 1153 | 874 | 577 | 1277 | 1022 | 774 | 511 | 1183 | 788 | 591 | 394 |
| B1 | 1223 | 978 | 741 | 489 | 917 | 734 | 556 | 367 | 856 | 685 | 519 | 342 | 720 | 576 | 437 | 288 | 636 | 424 | 318 | 212 |
| B2 | 1181 | 884 | 670 | 442 | 886 | 663 | 502 | 332 | 816 | 619 | 469 | 310 | 650 | 521 | 395 | 261 | 574 | 383 | 288 | 192 |
| C | 1121 | 804 | 599 | 396 | 728 | 583 | 441 | 291 | 641 | 513 | 388 | 256 | 473 | 379 | 287 | 189 | 364 | 243 | 182 | 121 |
| D | 826 | 572 | 427 | 284 | 681 | 520 | 394 | 260 | 477 | 381 | 289 | 191 | 409 | 327 | 248 | 163 | 320 | 213 | 160 | 107 |

| ANGLE TO THE HORIZONTAL | 15° ≤ α < 20° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2.5 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1695 | 1384 | 1048 | 692 | 1418 | 1135 | 860 | 567 | 1384 | 1107 | 839 | 554 | 1226 | 981 | 743 | 490 | 1135 | 757 | 568 | 378 |
| B1 | 1174 | 939 | 711 | 469 | 880 | 704 | 533 | 352 | 822 | 657 | 498 | 329 | 692 | 553 | 419 | 277 | 610 | 407 | 305 | 203 |
| B2 | 1134 | 848 | 643 | 425 | 808 | 637 | 483 | 319 | 742 | 594 | 451 | 297 | 625 | 500 | 380 | 250 | 552 | 368 | 276 | 184 |
| C | 1027 | 730 | 544 | 360 | 699 | 559 | 424 | 280 | 615 | 492 | 373 | 246 | 455 | 364 | 275 | 182 | 350 | 233 | 175 | 117 |
| D | 788 | 520 | 389 | 257 | 654 | 469 | 351 | 232 | 458 | 366 | 277 | 183 | 392 | 314 | 238 | 157 | 307 | 205 | 154 | 102 |

| ANGLE TO THE HORIZONTAL | 15° ≤ α < 20° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1576 | 1348 | 1021 | 674 | 1382 | 1105 | 837 | 553 | 1348 | 1029 | 780 | 515 | 1194 | 955 | 724 | 478 | 1106 | 737 | 553 | 369 |
| B1 | 1143 | 914 | 693 | 457 | 857 | 686 | 520 | 343 | 800 | 640 | 485 | 320 | 674 | 539 | 408 | 269 | 594 | 396 | 297 | 198 |
| B2 | 1057 | 826 | 627 | 414 | 774 | 620 | 470 | 310 | 723 | 579 | 439 | 290 | 609 | 488 | 369 | 245 | 538 | 359 | 270 | 180 |
| C | 953 | 666 | 497 | 329 | 681 | 520 | 375 | 248 | 599 | 458 | 347 | 229 | 443 | 354 | 268 | 177 | 341 | 227 | 170 | 114 |
| D | 718 | 475 | 354 | 235 | 579 | 392 | 293 | 194 | 446 | 324 | 246 | 162 | 382 | 306 | 232 | 153 | 299 | 200 | 150 | 100 |

# PV ez-Rack SolarRoof Interface spacing table for penetrative tilt legs

## 20° ≤ α < 25°

Type of Rail — ER-R-ECO (see Note 12 for other compatible rails)

Solar Panel Dimension — 2 m x 1 m (see Note 25 for other panel sizes)

| ANGLE TO THE HORIZONTAL | 20° ≤ α < 25° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 3 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1570 | 1265 | 968 | 633 | 1349 | 1037 | 793 | 519 | 1316 | 1012 | 774 | 506 | 1108 | 852 | 652 | 426 | 1022 | 681 | 511 | 341 |
| B1 | 1103 | 848 | 649 | 424 | 827 | 636 | 486 | 318 | 772 | 594 | 454 | 297 | 621 | 478 | 365 | 239 | 526 | 350 | 263 | 175 |
| B2 | 1014 | 767 | 586 | 384 | 761 | 575 | 440 | 288 | 697 | 537 | 411 | 269 | 561 | 432 | 331 | 217 | 475 | 317 | 238 | 158 |
| C | 930 | 660 | 492 | 327 | 665 | 511 | 391 | 256 | 621 | 477 | 365 | 239 | 412 | 317 | 242 | 159 | 332 | 222 | 166 | 111 |
| D | 713 | 471 | 352 | 233 | 622 | 435 | 332 | 217 | 435 | 335 | 256 | 167 | 404 | 311 | 238 | 155 | 280 | 187 | 140 | 93 |

| ANGLE TO THE HORIZONTAL | 20° ≤ α < 25° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2.5 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1579 | 1215 | 929 | 607 | 1295 | 996 | 762 | 498 | 1263 | 972 | 743 | 486 | 1064 | 818 | 626 | 409 | 981 | 654 | 490 | 327 |
| B1 | 1059 | 814 | 623 | 407 | 794 | 611 | 467 | 305 | 741 | 570 | 436 | 285 | 596 | 459 | 351 | 229 | 505 | 336 | 252 | 168 |
| B2 | 956 | 736 | 563 | 369 | 717 | 552 | 423 | 277 | 669 | 515 | 395 | 258 | 539 | 415 | 317 | 208 | 456 | 305 | 229 | 152 |
| C | 893 | 601 | 447 | 297 | 638 | 491 | 375 | 245 | 596 | 437 | 335 | 219 | 396 | 304 | 233 | 152 | 319 | 213 | 160 | 106 |
| D | 647 | 428 | 319 | 212 | 543 | 386 | 289 | 191 | 418 | 321 | 235 | 153 | 388 | 285 | 218 | 142 | 269 | 179 | 134 | 90 |

| ANGLE TO THE HORIZONTAL | 20° ≤ α < 25° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1468 | 1129 | 864 | 565 | 1261 | 926 | 708 | 463 | 1230 | 860 | 658 | 430 | 1036 | 797 | 609 | 399 | 955 | 637 | 478 | 318 |
| B1 | 1031 | 757 | 579 | 378 | 773 | 595 | 455 | 297 | 722 | 555 | 425 | 278 | 581 | 447 | 342 | 223 | 491 | 328 | 246 | 164 |
| B2 | 931 | 684 | 524 | 342 | 698 | 538 | 411 | 269 | 653 | 502 | 384 | 252 | 525 | 404 | 309 | 202 | 445 | 297 | 222 | 149 |
| C | 830 | 547 | 408 | 271 | 622 | 435 | 332 | 217 | 580 | 406 | 306 | 203 | 385 | 296 | 227 | 148 | 311 | 207 | 155 | 104 |
| D | 590 | 391 | 292 | 194 | 487 | 322 | 242 | 161 | 407 | 285 | 218 | 142 | 378 | 264 | 202 | 132 | 262 | 174 | 131 | 87 |

# PV ez-Rack SolarRoof Interface spacing table for penetrative tilt legs

## 25° ≤ α < 30°

Type of Rail ER-R-ECO (see Note 12 for other compatible rails)

Solar Panel Dimension 2 m x 1 m (see Note 25 for other panel sizes)

| ANGLE TO THE HORIZONTAL | 25° ≤ α < 30° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 3 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1530 | 1177 | 900 | 588 | 1254 | 965 | 738 | 482 | 1224 | 941 | 720 | 471 | 1017 | 782 | 598 | 391 | 950 | 633 | 475 | 317 |
| B1 | 1001 | 770 | 589 | 385 | 700 | 539 | 412 | 269 | 700 | 539 | 412 | 269 | 564 | 434 | 332 | 217 | 520 | 347 | 260 | 173 |
| B2 | 921 | 696 | 532 | 348 | 644 | 487 | 372 | 244 | 632 | 487 | 373 | 244 | 509 | 392 | 300 | 197 | 470 | 314 | 235 | 157 |
| C | 927 | 648 | 492 | 324 | 602 | 463 | 354 | 232 | 562 | 432 | 331 | 216 | 373 | 287 | 220 | 144 | 325 | 217 | 163 | 108 |
| D | 662 | 471 | 352 | 233 | 546 | 420 | 321 | 210 | 382 | 294 | 225 | 147 | 328 | 252 | 193 | 126 | 268 | 178 | 134 | 89 |

| ANGLE TO THE HORIZONTAL | 25° ≤ α < 30° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2.5 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1468 | 1129 | 864 | 565 | 1204 | 926 | 708 | 463 | 1175 | 904 | 691 | 452 | 976 | 751 | 574 | 376 | 912 | 608 | 456 | 304 |
| B1 | 961 | 739 | 565 | 369 | 672 | 517 | 396 | 259 | 672 | 517 | 396 | 259 | 541 | 416 | 318 | 208 | 500 | 333 | 250 | 167 |
| B2 | 867 | 668 | 511 | 335 | 607 | 468 | 359 | 235 | 607 | 468 | 358 | 234 | 489 | 377 | 288 | 189 | 452 | 302 | 226 | 151 |
| C | 849 | 601 | 447 | 297 | 578 | 445 | 340 | 222 | 540 | 415 | 317 | 208 | 358 | 276 | 211 | 138 | 312 | 208 | 156 | 104 |
| D | 635 | 428 | 319 | 212 | 524 | 367 | 280 | 183 | 367 | 282 | 216 | 141 | 315 | 242 | 185 | 121 | 257 | 171 | 128 | 86 |

| ANGLE TO THE HORIZONTAL | 25° ≤ α < 30° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1430 | 1100 | 841 | 550 | 1173 | 902 | 690 | 451 | 1144 | 840 | 642 | 420 | 951 | 732 | 559 | 366 | 888 | 592 | 444 | 296 |
| B1 | 936 | 720 | 550 | 360 | 655 | 504 | 385 | 252 | 655 | 504 | 385 | 252 | 527 | 405 | 310 | 203 | 487 | 324 | 243 | 162 |
| B2 | 845 | 650 | 499 | 325 | 591 | 456 | 348 | 228 | 593 | 456 | 349 | 229 | 476 | 367 | 281 | 184 | 440 | 294 | 220 | 147 |
| C | 788 | 547 | 408 | 271 | 563 | 413 | 316 | 207 | 526 | 386 | 281 | 184 | 349 | 269 | 205 | 134 | 304 | 203 | 152 | 101 |
| D | 590 | 391 | 292 | 194 | 464 | 322 | 242 | 161 | 357 | 275 | 201 | 131 | 306 | 236 | 180 | 118 | 250 | 167 | 125 | 83 |

# PV ez-Rack SolarRoof Interface spacing table for penetrative tilt legs

## α = 30°

Type of Rail ER-R-ECO (see Note 12 for other compatible rails)

Solar Panel Dimension 2 m x 1 m (see Note 25 for other panel sizes)

| ANGLE TO THE HORIZONTAL | α = 30° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 3 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1372 | 1056 | 807 | 528 | 1125 | 866 | 662 | 433 | 1098 | 845 | 646 | 422 | 865 | 665 | 509 | 333 | 793 | 528 | 396 | 264 |
| B1 | 898 | 691 | 528 | 345 | 628 | 483 | 370 | 242 | 611 | 470 | 359 | 235 | 506 | 389 | 298 | 195 | 412 | 275 | 206 | 137 |
| B2 | 811 | 625 | 478 | 313 | 568 | 437 | 335 | 219 | 552 | 425 | 325 | 213 | 457 | 352 | 269 | 177 | 373 | 249 | 186 | 125 |
| C | 794 | 561 | 419 | 277 | 512 | 394 | 301 | 197 | 504 | 388 | 297 | 194 | 357 | 274 | 210 | 137 | 259 | 173 | 130 | 86 |
| D | 585 | 400 | 299 | 198 | 489 | 376 | 275 | 180 | 352 | 271 | 207 | 136 | 314 | 241 | 185 | 121 | 208 | 138 | 104 | 69 |

| ANGLE TO THE HORIZONTAL | α = 30° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2.5 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1317 | 1013 | 775 | 507 | 1080 | 831 | 635 | 416 | 1054 | 811 | 620 | 405 | 830 | 638 | 488 | 319 | 761 | 507 | 380 | 254 |
| B1 | 862 | 663 | 507 | 332 | 603 | 464 | 355 | 232 | 586 | 451 | 345 | 225 | 486 | 374 | 286 | 187 | 396 | 264 | 198 | 132 |
| B2 | 779 | 600 | 459 | 301 | 545 | 420 | 321 | 210 | 530 | 408 | 312 | 204 | 439 | 338 | 258 | 169 | 358 | 239 | 179 | 119 |
| C | 726 | 509 | 380 | 252 | 491 | 378 | 289 | 189 | 484 | 372 | 285 | 186 | 342 | 263 | 201 | 132 | 249 | 166 | 125 | 83 |
| D | 549 | 363 | 272 | 181 | 448 | 328 | 246 | 163 | 338 | 260 | 199 | 130 | 301 | 232 | 177 | 116 | 199 | 133 | 100 | 66 |

| ANGLE TO THE HORIZONTAL | α = 30° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1283 | 987 | 721 | 471 | 1052 | 809 | 591 | 386 | 1027 | 718 | 549 | 359 | 808 | 622 | 476 | 311 | 741 | 494 | 371 | 247 |
| B1 | 839 | 646 | 494 | 323 | 588 | 452 | 346 | 226 | 571 | 439 | 336 | 220 | 473 | 364 | 278 | 182 | 386 | 257 | 193 | 129 |
| B2 | 759 | 584 | 447 | 293 | 531 | 409 | 313 | 205 | 516 | 397 | 305 | 199 | 428 | 329 | 252 | 165 | 349 | 233 | 175 | 116 |
| C | 704 | 465 | 348 | 230 | 478 | 351 | 269 | 176 | 472 | 330 | 252 | 165 | 333 | 257 | 196 | 128 | 243 | 162 | 121 | 81 |
| D | 501 | 332 | 248 | 165 | 414 | 274 | 205 | 137 | 329 | 230 | 176 | 115 | 293 | 215 | 165 | 108 | 194 | 129 | 97 | 65 |

# PV ez-Rack SolarRoof Interface spacing table for penetrative tilt legs

## 30° < α ≤ 60°

Type of Rail ER-R-ECO (see Note 12 for other compatible rails)

Solar Panel Dimension 2 m x 1 m (see Note 25 for other panel sizes)

| ANGLE TO THE HORIZONTAL | 30° < α ≤ 60° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 3 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1557 | 1277 | 946 | 624 | 1527 | 1239 | 946 | 624 | 1417 | 1104 | 819 | 541 | 1410 | 985 | 732 | 484 | 1169 | 779 | 584 | 390 |
| B1 | 1191 | 860 | 641 | 423 | 1192 | 860 | 641 | 423 | 1133 | 746 | 555 | 368 | 962 | 641 | 481 | 321 | 784 | 522 | 392 | 261 |
| B2 | 1076 | 778 | 580 | 383 | 1076 | 778 | 580 | 383 | 1024 | 674 | 502 | 333 | 870 | 581 | 435 | 291 | 709 | 473 | 354 | 237 |
| C | 851 | 561 | 419 | 277 | 851 | 561 | 419 | 277 | 736 | 486 | 363 | 240 | 645 | 430 | 322 | 215 | 420 | 280 | 210 | 140 |
| D | 605 | 400 | 299 | 198 | 605 | 400 | 299 | 198 | 525 | 348 | 259 | 172 | 469 | 311 | 232 | 154 | 336 | 224 | 168 | 112 |

| ANGLE TO THE HORIZONTAL | 30° < α ≤ 60° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2.5 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1489 | 1157 | 859 | 567 | 1394 | 1042 | 774 | 511 | 1291 | 923 | 687 | 454 | 1226 | 849 | 632 | 418 | 1065 | 710 | 532 | 355 |
| B1 | 1140 | 781 | 582 | 384 | 1070 | 704 | 525 | 348 | 948 | 625 | 466 | 309 | 872 | 575 | 429 | 285 | 725 | 483 | 362 | 242 |
| B2 | 1030 | 707 | 526 | 349 | 967 | 637 | 475 | 315 | 857 | 565 | 422 | 279 | 789 | 521 | 389 | 257 | 655 | 437 | 328 | 218 |
| C | 772 | 509 | 380 | 252 | 696 | 460 | 343 | 228 | 617 | 408 | 306 | 203 | 568 | 376 | 281 | 187 | 388 | 258 | 194 | 129 |
| D | 549 | 363 | 272 | 181 | 496 | 329 | 246 | 163 | 440 | 292 | 218 | 145 | 405 | 269 | 201 | 133 | 310 | 207 | 155 | 103 |

| ANGLE TO THE HORIZONTAL | 30° < α ≤ 60° | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC | 2 | | | | | | | | | | | | | | | | | | | |
| BUILDING HEIGHT (m) | ≤ 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 | 1422 | 1054 | 782 | 517 | 1267 | 867 | 645 | 426 | 1193 | 784 | 584 | 386 | 1125 | 740 | 551 | 364 | 954 | 636 | 477 | 318 |
| B1 | 1082 | 712 | 530 | 351 | 889 | 587 | 438 | 290 | 804 | 531 | 396 | 263 | 759 | 502 | 375 | 248 | 660 | 440 | 330 | 210 |
| B2 | 978 | 644 | 480 | 318 | 804 | 531 | 396 | 263 | 728 | 481 | 359 | 238 | 687 | 454 | 339 | 225 | 597 | 399 | 299 | 190 |
| C | 704 | 465 | 348 | 230 | 580 | 384 | 287 | 190 | 525 | 348 | 259 | 172 | 496 | 329 | 246 | 163 | 370 | 247 | 185 | 123 |
| D | 501 | 332 | 248 | 165 | 414 | 274 | 205 | 137 | 375 | 249 | 186 | 124 | 354 | 235 | 175 | 117 | 296 | 198 | 148 | 99 |

## General Notes

**Note 1.** 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 2.** The spacing information in this document has been designed to be compliant with the capacity of the below items:

- Mounting system components, including the fixings, capacity and rail deflection.
- Buildex- 14 - 11 x 70 Hex Head Zips with 16 mm Aluminium Bonded Washer.

**Note 3.** This certificate only covers the assessment of the Clenergy PV mounting system, including the components listed on note 2 and 12. Assessment of the roof structure, PV panels and other fixings are to be checked by the installer/contractor, if necessary.

**Note 4.** Roof pitch between 0° and < 10° when rails run parallel to the roof pitch (Figure 1) and 0° and < 22° when rails run perpendicular to the roof pitch (Figure 2).

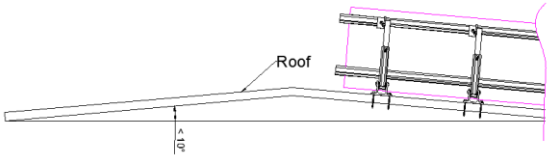



*Figure 1. Rails running parallel to roof pitch*

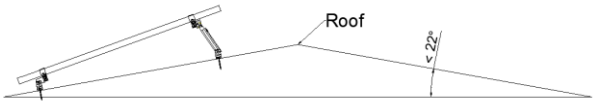



*Figure 2. Rails running perpendicular to roof pitch*

**Note 5.** Fixing spacings were calculated using **two screws** per tilt leg on Steel Purlins G450 1.5mm and 35 mm Timber F7 (Pine).

**Note 6.** Reduction factors using **one screw** per tilt leg and depending on the type of tophat, purlin or batten as per the below table. Screw must be located on central hole.

| 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 | -65% | -65% | -85% | Contact Clenergy | Contact Clenergy |
| Timber (Pine F7) | - | 30 | -40% | -40% | -75% | -75% | Contact Clenergy |
| Timber (Pine F7) | - | 35 | -20% | -25% | -50% | -50% | -85% |
| Timber (Hardwood F17) | - | 25 | -5% | -5% | -15% | -15% | -40% |
| Timber (Hardwood F17) | - | 30 | - | - | -5% | -5% | -20% |
| Timber (Hardwood F17) | - | 35 | - | - | -5% | -5% | -20% |
| Metal (G550) | 0.42 | | Contact Clenergy | Contact Clenergy | Contact Clenergy | Contact Clenergy | Contact Clenergy |
| Metal (G550) | 0.48 | | Contact Clenergy | Contact Clenergy | Contact Clenergy | Contact Clenergy | Contact Clenergy |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Metal (G550) | 0.55 | | Contact Clenergy | Contact Clenergy | Contact Clenergy | Contact Clenergy | Contact Clenergy |
| Metal (G550) | 0.75 | | -90% | Contact Clenergy | Contact Clenergy | Contact Clenergy | Contact Clenergy |
| Metal (G450) | 1.2 | | -75% | -80% | -90% | Contact Clenergy | Contact Clenergy |
| Metal (G450) | 1.5 | | -45% | -50% | -50% | -50% | -65% |
| Metal (G450) | 1.9 | | - | - | -5% | -5% | -20% |
| Metal (G450) | 2.4 | | - | - | -5% | -5% | -10% |

**Note 7.** Increase or reduction factors using **two screws** per tilt leg and 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 | - | -5% | -9% | -10% | -10% |
| Timber (Pine F7) | - | 30 | - | -5% | -9% | -10% | -10% |
| Timber (Pine F7) | - | 35 | - | - | - | - | - |
| Timber (Hardwood F17) | - | 25 | - | - | +10% | +5% | +4% |
| Timber (Hardwood F17) | - | 30 | - | - | +10% | +5% | +4% |
| Timber (Hardwood F17) | - | 35 | - | - | +20% | +10% | +5% |
| Metal (G550) | 0.42 | - | -80% | -80% | Contact Clenergy | Contact Clenergy | Contact Clenergy |
| Metal (G550) | 0.48 | - | -40% | -60% | -60% | -70% | -85% |
| Metal (G550) | 0.55 | - | -25% | -30% | -50% | -55% | -70% |
| Metal (G550) | 0.75 | - | -12% | -15% | -20% | -25% | -45% |
| Metal (G450) | 1.2 | - | -5% | -10% | -10% | -15% | -20% |
| Metal (G450) | 1.5 | - | - | - | - | - | - |
| Metal (G450) | 1.9 | - | - | - | +10% | +5% | +5% |
| Metal (G450) | 2.4 | - | - | - | +10% | +5% | +5% |

**Note 8**. 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 9.** The most conservative spacing has to be used if one panel or panel row fall between two roof zones.

**Note 10.** Minimum purlin steel grade to be G450 and timber grade members: F7 (Pine) and F17 (Hardwood).

**Note 11.** In case the installation is done with one screw and the purlin thickness differs from Note 6, a site-specific certificate shall be issued. Contact Clenergy for more information.

**Note 12.** 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 | R-ECO/XXXX/AUMF | PV-ezRack Australian Made Mill Finish ECO Rail |
| Black ECO-Rail | ER-R-ECO/XXXX/BA | Black ECO Rail |
| 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 |
| Tilt Legs | ER-TL-10/15 | 10°/15° Adjustable Tilt Legs |
| Tilt Legs | ER-TL-15/30 | 15°/30° Adjustable Tilt Legs |
| Tilt Legs | ER-TL-30/60 | 30°/60° Adjustable Tilt Legs |
| Tilt Legs | ER-TL-10/15/PS | 10°/15° Adjustable Tilt Legs, Preassembly |
| Tilt Legs | ER-TL-15/30/PS | 15°/30° Adjustable Tilt Legs, Preassembly |
| Tilt Legs | TL-10/15/L/PS | 10°/15° L Feet Adjustable Tilt Legs, Preassembly |
| Tilt Legs | TL-15/30/L/PS | 15°/30° L Feet Adjustable Tilt Legs, Preassembly |

| | | |
|---|---|---|
| Tilt Legs | ER-TL-5/PS | 5° Fixed Tilt Legs, Preassembly |
| Tilt Legs | ER-TL-10/PS | 10° Fixed Tilt Legs, Preassembly |
| Tilt Legs | ER-TL-FF | Front Foot of Tilt Legs |
| Black Tilt Legs | ER-TL-10/15/BA | Black 10°/15° Adjustable Tilt Legs |
| Black Tilt Legs | ER-TL-15/30/BA | Black 15°/30° Adjustable Tilt Legs |
| 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 |
| Adapter for tilt leg | EZ-AD-C110 | Adapter for tilt leg on corrugated roofs |
| 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 13.** For Terrain Category (TC) definition. Refer to clause 4.2.1 of AS/NZS 1170.2:2021 for more information.

**Note 14.** 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 or installations in wind region C and D, please contact Clenergy Engineering department.

| Mt | A, B1 & B2 | | | |
|---|---|---|---|---|
| | Internal | Intermediate | Edge | Corner |
| 1 | 1 | 1 | 1 | 1 |
| 1.01 | 0.93 | 1 | 0.86 | 1 |
| 1.02 | 0.93 | 1 | 0.86 | 1 |
| 1.03 | 0.93 | 0.89 | 0.86 | 1 |
| 1.04 | 0.93 | 0.89 | 0.86 | 1 |
| 1.06 | 0.86 | 0.89 | 0.86 | 1 |
| 1.08 | 0.86 | 0.89 | 0.86 | 1 |
| 1.09 | 0.79 | 0.78 | 0.71 | 0.75 |
| 1.1 | 0.79 | 0.78 | 0.71 | 0.75 |
| 1.2 | 0.64 | 0.67 | 0.57 | 0.75 |
| 1.3 | 0.57 | 0.56 | 0.57 | 0.50 |
| 1.4 | 0.50 | 0.44 | 0.43 | 0.50 |
| 1.5 | 0.43 | 0.44 | 0.43 | 0.50 |

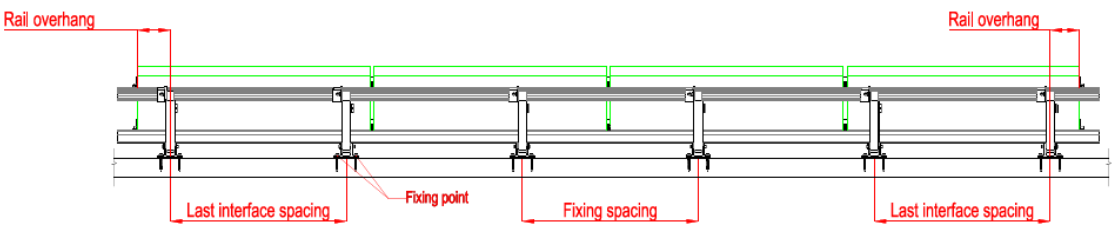
**Note 15.** Shielding Multiplier (Ms) taken as 1.0. Refer to clause 4.3 of AS/NZS 1170.2:2021 for more information.

**Note 16.** Wind Direction Multiplier (Md) taken as 1.0. Refer to clause 3.3 of AS/NZS 1170.2:2021 for more information.

**Note 17.** Clamping zone of the PV panels should be according to the manufacturer's specifications.

**Note 18.** Capacities checked and compared against testing data from Clenergy Australia and NATA certified testing.

**Note 19.** Rail overhang ends where the panel finishes and this should be less than 40% of the last installed interface spacing.



**Note 20.** 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 21.** 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 22**. 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 23.** No consideration has been taken on the effect of snow loads. In case the roof is located in a snow prone area, a project specific design must be completed.

**Note 24.** No consideration has been taken on the effect of earthquake loads.

**Note 25.** 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.

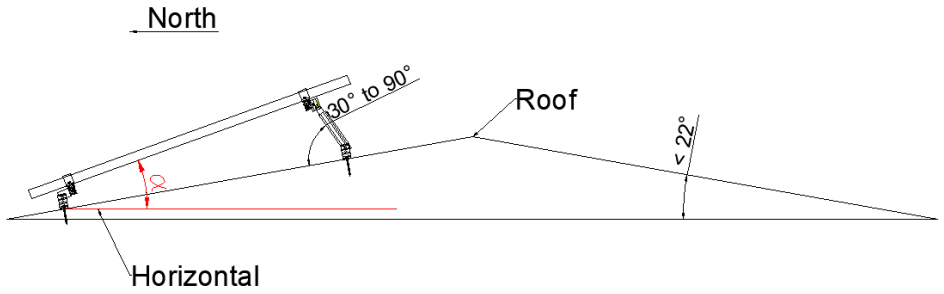
| Number of rails per panel | Panel length (mm) | Spacing +/- W.R – A & B1 | Spacing +/- W.R – B2, C & D |
|---|---|---|---|
| 2 rails | ≤ 1700 | + 6 % | + 10 % |
| 2 rails | ≤ 1800 | + 4 % | + 7 % |
| 2 rails | ≤ 1900 | 0 % | + 5 % |
| 2 rails | ≤ 2000 | 0 % | 0 % |
| 2 rails | ≤ 2100 | - 10 % | - 6 % |
| 2 rails | ≤ 2200 | - 18 % | - 12 % |
| 2 rails | ≤ 2300 | - 20 % | - 12 % |
| 2 rails | ≤ 2400 | - 25 % | - 15 % |

**Note 26.** Panel width cannot exceed 1.20 m for any of the above panel length dimensions and panel weight cannot exceed 15 kg/m$^2$.

**Note 27.** Please refer to AS 4312 to find out about corrosion categories.

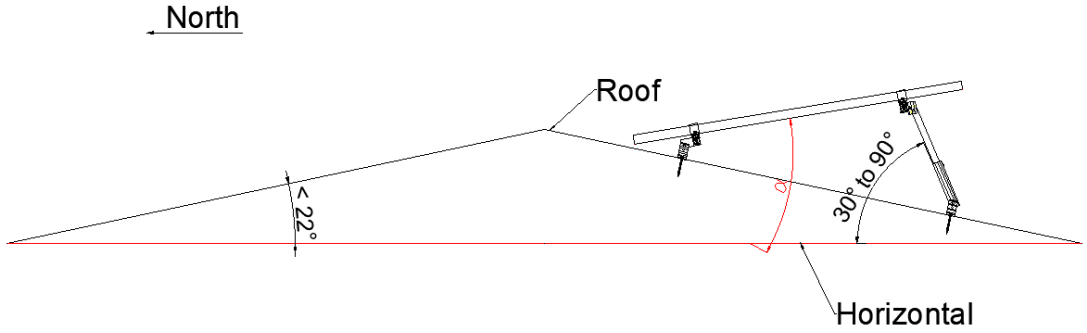
**Note 28.** Final tilt "α" identification as per below

**Standard tilt**



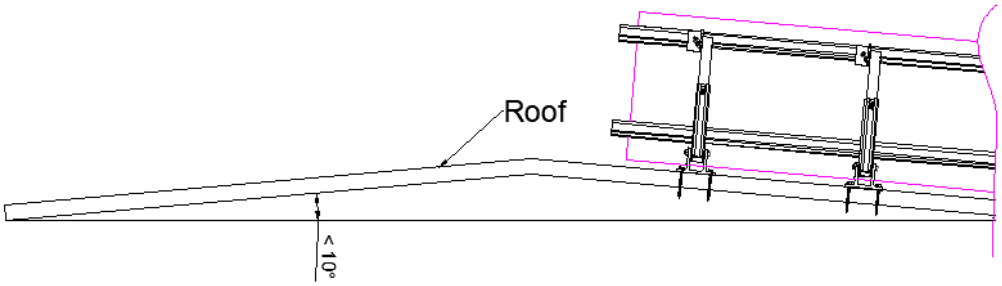

Back leg angle between 30° and 90°

**Reverse tilt**

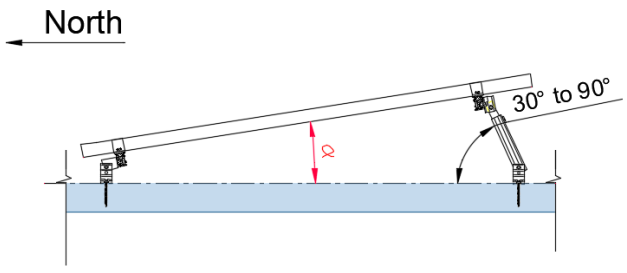



Back leg angle between 30° and 90°

**ECO – Rail parallel to ribs**



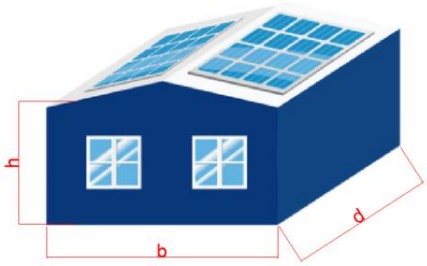

Back leg angle between 30° and 90°

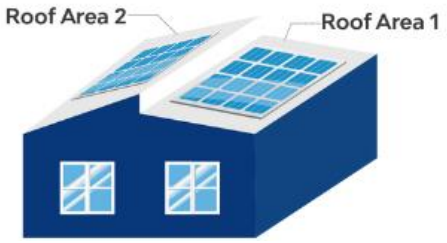


**Note 29**. This certificate can be used for the installation of tilt legs on uncracked concrete roofs using one Chemset per tilt leg. The minimum Chemset tensile capacity should be 6.1 kN and this should be confirmed by the manufacturer. As an example, installers can use M8 Chemset 101Plus by Ramset assuming a 20 MPa concrete strength and a depth of 80 mm. Please check that during the installation any reinforcement is not damaged.

**Note 30.** Roof Zone definition to be calculated as per below:

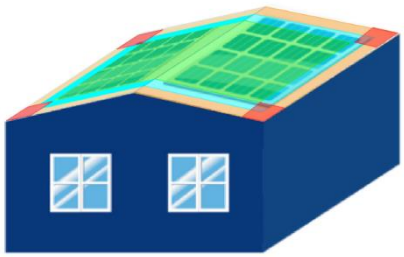
**Step 1.** Determine building height (h), width (b) and length (d).
**Step 2.** Check ratio of height to length/width (h/b and h/d)
If both h/b and h/d < 0.2, then a = 2h
**Step 3.** If h/b and h/d > 0.2 then a = the lowest value between 0.2b and 0.2d

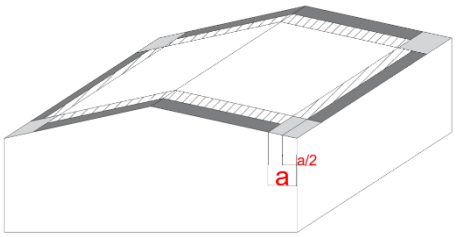


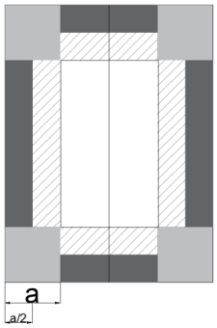
## Roof zone definition

Roof Pitch < 10°

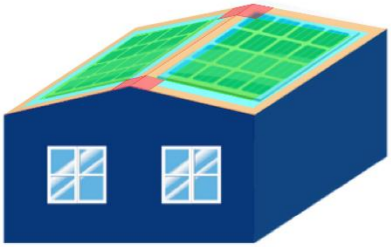


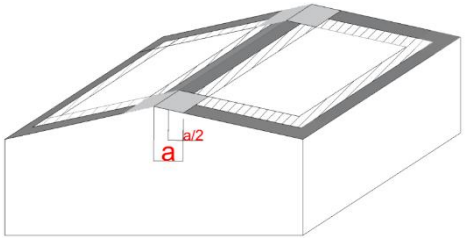


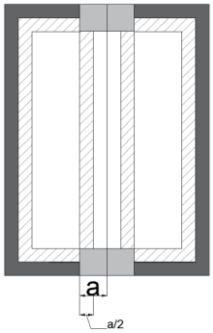

Top view



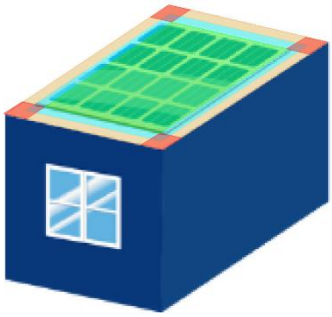

Flat/Mono – Slope Roof > 10°

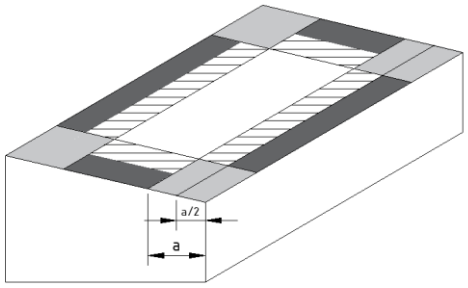


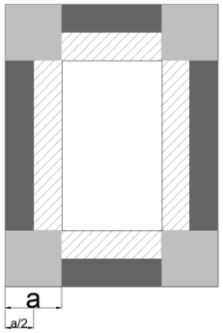



Flat/Mono – Slope Roof






Legend:

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

**Example 1:**

- Wind Region: A
- Terrain Category: 3
- Building Height: 6 m
- Roof Pitch: 3°
- Panel Tilt Angle: 5°
- Tilt Condition (Standard or Reverse): Standard
- No. of screws per tilt leg: 2 (refer to Note 11)
- Purlin type and thickness: 1.5 mm
- Panel Dimension: 2000mm x 1000mm

Fixing Spacing as per below (α=3°+5°=8°, see Note 28):

- Internal: 1907 mm
- Intermediate: 1525 mm
- Edge: 1156 mm
- Corner: 763 mm

**Example 2:**

- Wind Region: B1
- Terrain Category: 2
  Building Height: 12 m
- Roof Pitch: 5°
- Panel Tilt Angle: 20°
- Tilt Condition (Standard or Reverse): Reverse
- No. of screws per tilt leg: 2 (refer to Note 11)
- Purlin type and thickness: F7 Pine 30mm (Spacing -5%, refer to Note 7)
- Panel Dimension: 1750 mm x 1000 mm (Spacing +4%, refer to Note 25)

Fixing Spacing as per below (α=20°-5°= 15°, refer to Note 28):

- Internal: 790 mm
- Intermediate: 632 mm
- Edge: 479 mm
- Corner: 316 mm

PV-ezRACK®


## Clenergy

1/10 Duerdin St
Clayton VIC 3168
Australia

**Phone**: +61 3 9239 8088
**Email**: sales@clenergy.com.au
**Web**: www.clenergy.com.au

@ClenergyGlobal / @ClenergyClub / ClenergyAUS @Clenergy @ClenergyClub
@Clenergy_global @Clenergy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