

SolarRoof™ using Chemical Anchor Stud

Code-Compliant Planning and Installation Guide V 1.1
Complying with AS/NZS1170.2-2011 AMDT 2-2016



Introduction

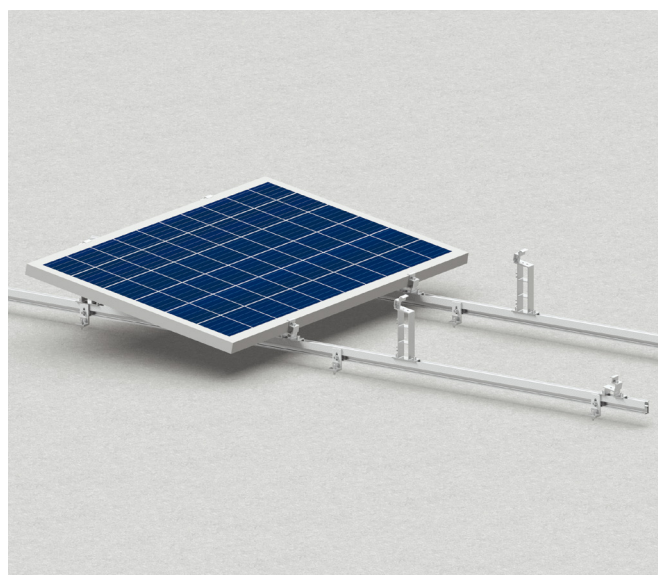
Chemical Anchor Studs are made from quality Grade 5.8 carbon steel to get the most out of adhesive tensile capacities and meets Australian Standards. Assembly with Clenergy Tin Interfaces and Tilt Legs, PV-ezRack® SolarRoof™ using Chemical Anchor Stud offers easy and fast PV installation on concrete roofs.

Please review this manual thoroughly before installing PV-ezRack® SolarRoof™ using Chemical Anchor Stud. This manual provides:

1) Supporting documentation for building permit applications relating to PV-ezRack® SolarRoof™ using Chemical Anchor Stud Universal PV Module Mounting System.

2) Planning and installation instructions.

The PV-ezRack® SolarRoof™ using Chemical Anchor Stud parts, when installed in accordance with this guide, will be structurally sound and will meet the AS/NZS1170.2:2011 Amdt 2- 2016 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 obtain by contacting Clenergy Australia via email at tech@clenergy.com.au or contacting your local distributor in Australia.



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The installer is solely responsible for:

- Complying with all applicable local or national building codes, including any that may supersede this manual.
- Ensuring that PV-ezRack and other products are appropriate for the installation and the surrounding environment.
- Using only PV-ezRack parts and installer-supplied parts as specified by the PV-ezRack 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.
- Ensure that there are no less than two professionals working on panel installation.
- Ensure 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 PV-ezRack® SolarRoof™ components as required in AS/NZS 5033-2014 AMDT 2 2-2018.
- Ensuring that the roof can support the array under building live load conditions.
- Ensuring that screws to fix interfaces have adequate pull-out strength and shear capacities as installed.
- Maintaining the waterproof integrity of the roof, including the 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 between structures, fasteners and PV modules, as detailed in AS/NZS 5033: 2014.
- 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 Concrete Compressive Strength

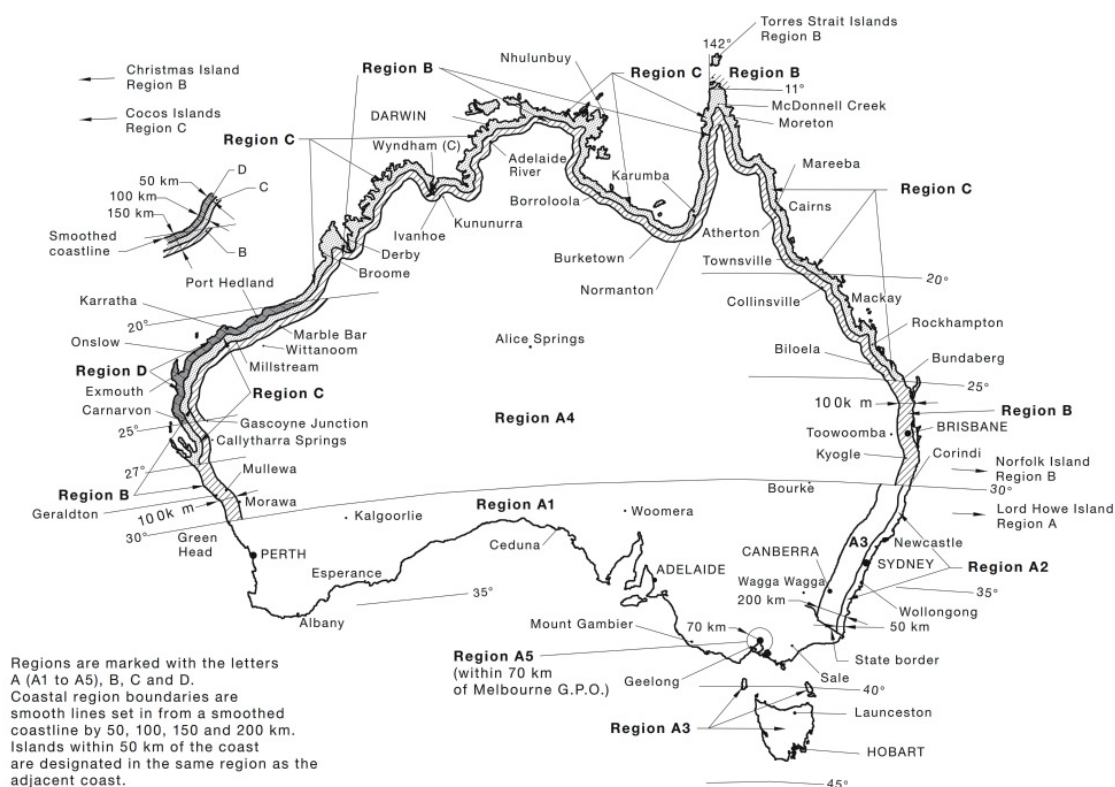
The minimum concrete compressive strength of the roof slab to be 20MPa.

Determine Anchor Stud Specifications

The minimum pull-out capacity of the anchor studs should be 6.1kN to withstand the forces on the mounting system. The corresponding anchor stud embedment to achieve this capacity should be determined from manufacturer's datasheet.

For instance, when using Ramset™ Chemical Anchor Stud, a minimum embedment of 80mm into the concrete slab is required to achieve 6.1kN minimum pull-out capacity.

Determine the Wind Region of your Installation Site



Region Definition:

Wind regions are pre-defined for the whole of Australia by the Australian Standard 1170.2. The Wind Region is an independent factor of surrounding topography or buildings.

- Most of Australia is designated Region A which indicates a Regional Wind Velocity of 45 m/s with wind average recurrence of 500 years.
- Some areas are designated Region B (57 m/s). Local authorities will advise if this applies in your area.
- Region C areas (69 m/s) are generally referred to as Cyclonic and are generally limited to northern coastal areas. Most Region C zones end 100km inland.
- Region D (88 m/s) is Australia's most extreme Cyclonic Region, located between the town of Carnarvon and Pardoo Station in Western Australia.

Determine the Terrain Category

You will need to determine the terrain category to ensure the installation meets the required standard.

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 1.5m to 5m, 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 3m to 10m. 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 larger, high (10m to 30m tall) and closely-spaced constructions buildings, such as large city centers 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 the corrosivity category of the installation site to determine appropriate products and interface spacing. When standard products are installed in high corrosivity zones, like C4/C5, interface spacing reduction factor need to be applied. Please refer to the generic notes of the Certification Letter for the details.

Note: Clenergy provided screws for Tin interfaces are suitable for up to C3 corrosive environments only.

Determine the Installation Height, Installation Area and Maximum Interface Spacing

The installation height, area and interface spacing are equivalent to our standard solar roof systems. The accreditation letters of these solar roof systems, detail on these parameters.

Based on choice of mounting setup, the letters are appended in their corresponding installation manuals hyperlinked in the table below:

Product [Solar Roof System + Anchor Stud]	Accreditation Letters	Installation Manuals
Solar Roof Flush	CL-088-S-REV H [Tin and Tile Certificate]	PV-ezRack® SolarRoof™
Solar Roof Tilt – Adjustable Tilt Legs	CL-530-S [Penetrative Tilt Certificate]	PV-ezRack® SolarRoof™ Tilt Legs
Solar Roof Tilt – Commercial Tilt	00150-REVB [Penetrative Commercial Tilt Certificate]	PV-ezRack® SolarRoof™ ComT™

Verify Maximum Rail End Overhang

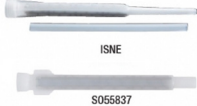
It is the distance between the last interface and panel edge on the rail. This should not be more than 40% of the last pair of installed interfaces spacing.

Acquire PV Modules Clamping Zone Information

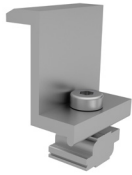
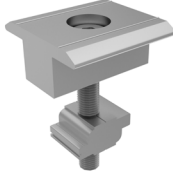
It is recommended to acquire PV modules clamping zone info. from PV modules manufacturer, which can help to plan interfaces positions on the roof and rails orientation and positions.

Tools and Components

Tools

				
Screw Driver (for M8 and M10 Hexagon Socket Screw)	Torque Spanner	Spanner	5m Tape	String & Marker Pen
				
Anchoring Kit	Mixing Nozzles			

Components (Manufacturer: Clenergy)

				
ER-EC-ST End Clamp	ER-IC-ST Inter Clamp	C-U/30/46-G Universal Clamp with Grounding Clip	C-U/30/46 Universal 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	ER-I-05 Tin Interface	ER-I-05/CM Tin Interface with Click Module

Components (Manufacturer: Clenergy)

				
ER-I-05A/EZC/ECO ECO Rail	ER-TL-10/15/PS ER-TL-15/30/PS Adjustable Tilt legs, preassembly	TL-10/15/L/PS TL-15/30/L/PS Adjustable Tilt Legs with L-feet, preassembly	ER-TL-5/PS ER-TL-10/PS Fixed Tilt Legs, preassembly	FL-COMT/Z/G/10 Front Leg Assembly, 10°, with Z-Module and Grounding Pins
				
RL-COMT/Z/G/10 Rear Leg Assembly, 10°, with Z-Module and Grounding Pins	S-MT/240 MT-Rail Support, 240mm	EZ-GC-ST Grounding Clip	EZ-GL-ST/UC Grounding Lug with U-Shape Copper Channel	EZ-RB-ST Rubber Pad

Components (Manufacturer: Non-Clenergy*)

	
Chemical Anchor Stud* [M8 or M10] * x l * mm	Anchoring Adhesive*

*Non-Clenergy components are to be sourced externally.

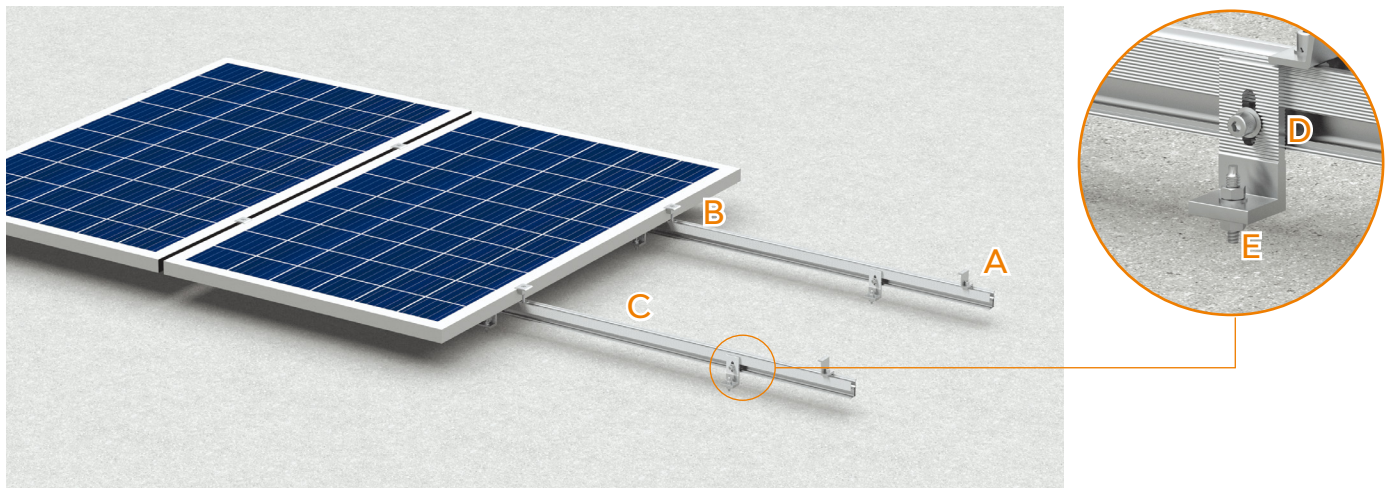
*Anchor Stud gauge [M8 or M10] and length, l, depends on the following parameters to meet the Clenergy accredited minimum pull out capacity of 6.1kN:

- I. Required height of interface over concrete roof surface, as per installer's requirements at site
- II. Required manufacturer embedment into concrete membrane, for the above-mentioned rod capacity

System Overview

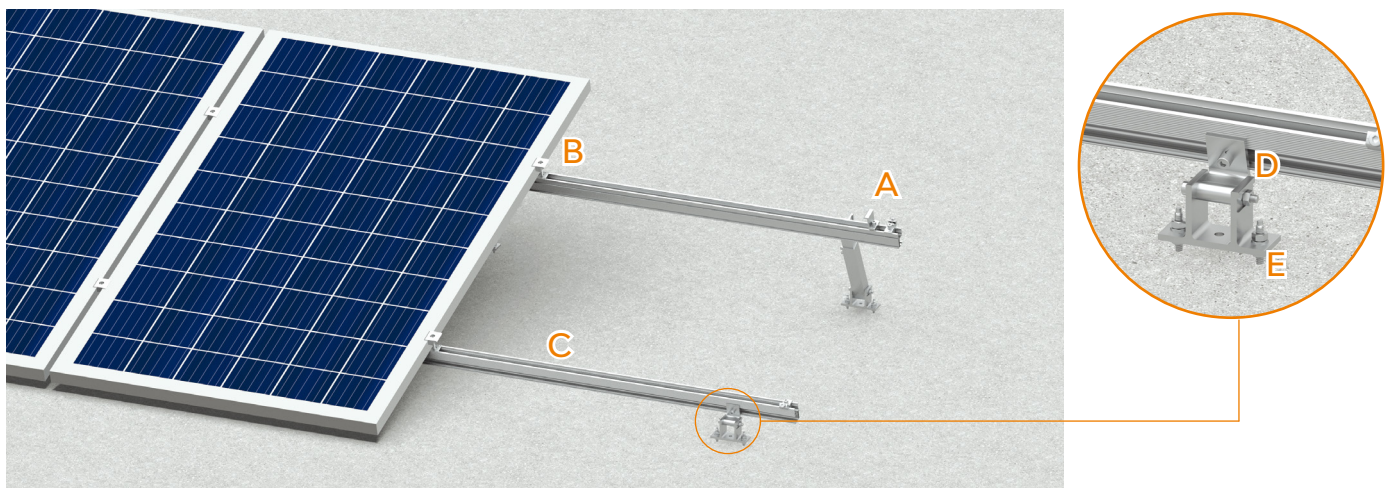
PV-ezRack SolarRoof on Concrete Roofs

With Tin Interface



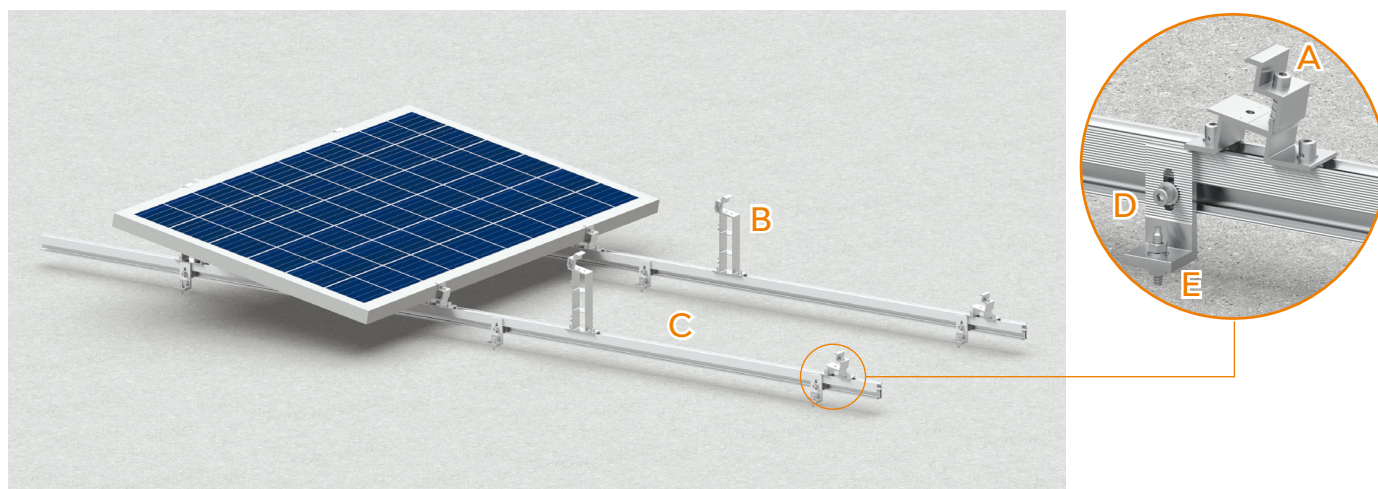
A. End Clamp B. Inter Clamp C. ECO Rail D. Tin Interface E. Anchor Stud

With Tilt Legs



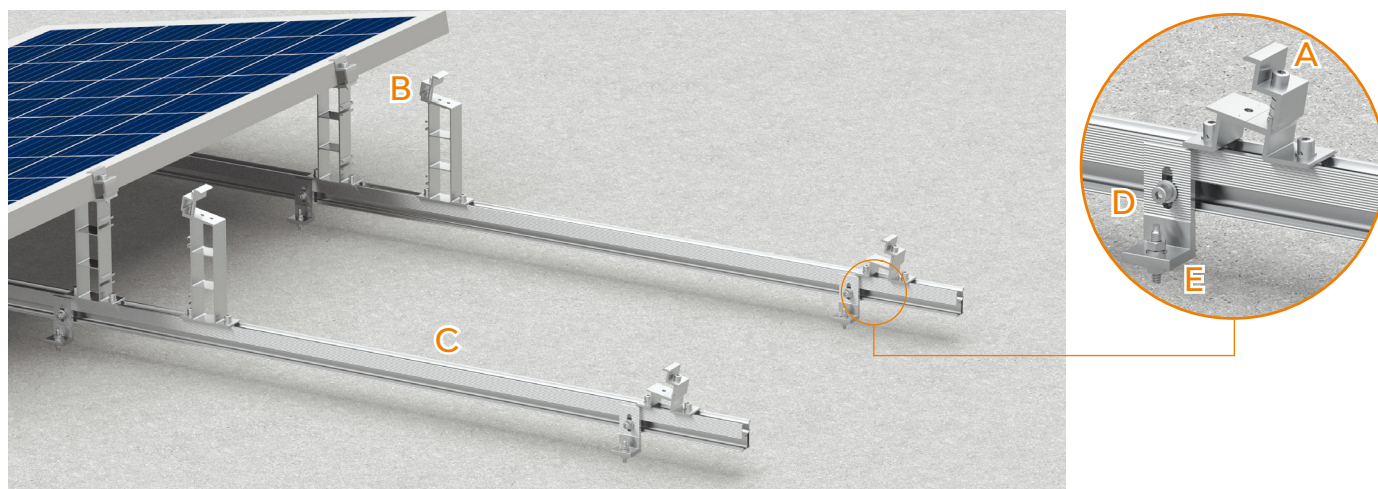
A. End Clamp B. Inter Clamp C. ECO Rail D. Adjustable Tilt Legs E. Anchor Stud

With ComT



A. Front Leg Assembly B. Rear Leg Assembly C. ECO Rail D. Tin Interface E. Anchor Stud

With ComT East-West



A. Front Leg Assembly B. Rear Leg Assembly C. ECO Rail D. Tin Interface E. Anchor Stud

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. When fixing mid and end clamps, if the torques range specified by the panel manufacturer is different, it should be used instead. 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.

Installation Instructions

The installation instructions vary based on the mounting system setup for the PV system.

Please refer to the navigation guide below for corresponding to the relevant sections of the installation process:

I. Chemical Anchor Stud Installation

This step is common for any PV mounting system setup, explained in [P11](#).

II. Choice of Mounting System Interface + Anchor Stud

This varies based on the panel orientation of the PV system as follows:

- a. Solar Roof Flush [detailed in [P12](#)]
Panels are flush to the roof surface.
Tin Interfaces and Anchor Studs are utilised for this setup.
- b. Solar Roof Adjustable Tilt [detailed in [P12](#)]
Panels are tilted to the roof surface using adjustable tilt legs.
Tilt legs and Anchor Studs are utilised for this setup.
- c. Solar Roof ComT [also detailed in [P12](#)]
Panels are tilted to the roof surface using commercial tilt legs.
Commercial Tilt [ComT] legs and Anchor Studs are utilised for this setup.

III. Rail, Clamps and PV Module Installation

Based on the chosen interface, the rail installation to interface varies:

- a. Flush systems – Please refer to our [PV-ezRack® SolarRoof™](#) manual for details.
- b. Adjustable Tilt Leg systems - Please refer to our [PV-ezRack® SolarRoof™ Tilt Legs](#) manual for details.
- c. Commercial Tilt systems – Please refer to our [PV-ezRack® SolarRoof™ ComT™](#) manual for details.

System Grounding

Please refer to our [PV-ezRack® Grounding System](#) manual for information on our mounting system grounding process.

1. Chemical Anchor Stud Installation

1) Source anchor stud based on installation plan and Clenergy accredited rod pull out capacity of 6.1kN. Drill a hole to manufacturer's requirements.

2) Remove dust and debris by brushing and blowing as necessary, shown in Figure 5.1A (If hole is wet or flooded, remove excess water with wet/dry vacuum).

3) Apply anchoring adhesive as per manufacturer's guidelines, ensuring no air pockets form as shown in Figure 5.1B.



Figure 5.1A

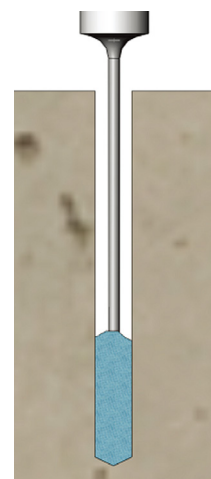


Figure 5.1B

4) Insert chemical Anchor Stud/rebar to bottom of hole while turning as shown in Figure 5.1C.

5) Wait until adhesive has fully cured before loading as shown in Figure 5.1C.

Please refer to manufacturer's manual for instructions on adhesive cooling temperatures and waiting times.

Load should not be applied to anchor until the adhesive has sufficiently cured as specified in manufacturer's manual.

Waterproofing

The adhesives form waterproof fixing points once cured. For more information, please contact chemical anchor stud manufacturer.

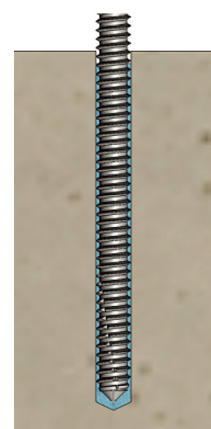


Figure 5.1C

2. Tin Interface + Anchor Stud Installation

[for both Solar Roof Flush and ComT mounting systems]

Connect and adjust tin foot position on the anchor stud.
Tighten with washer and nut as per manufacturer's instruction.

Clenergy recommended torque for M8*12 bolt is 16~20 N·m.

Uneven roof surfaces

The bottom nut base can have a maximum installation height of 8mm using a M8 gauge anchor stud. In this case, interface base should be double fastened with bolts and washers, as shown in Figure 5.2B.

The clearance can be increased to 12mm by using a M10 gauge anchor stud.
This would require predrilling the interface base to fit the rod.

For installing at a higher height, please refer to [section 4 \(P14\)](#).

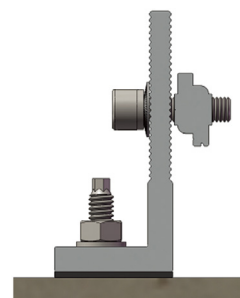


Figure 5.2A

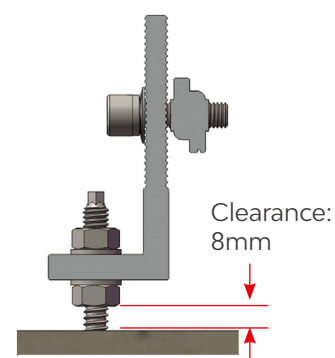


Figure 5.2B

3. Adjustable Tilt Legs + Anchor Stud Installation

1) Front Leg Installation

Connect and adjust front tilt leg position on the anchor stud, as shown in Figures 5.3A and 5.3B.
Tighten with washer and nut as per manufacturer's instructions.
Clenergy recommended torques for M8*12 bolts are 16~20 N·m.

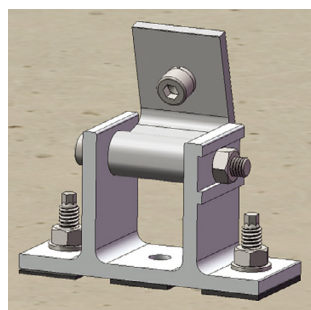


Figure 5.3A

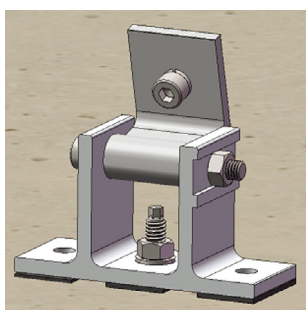


Figure 5.3B

2) Rear Leg Installation

According to the installation plan, after confirming the length L of the Rear Leg, fasten washer, nut and M8*12 bolts as shown in Figures 5.3C and 5.3D.

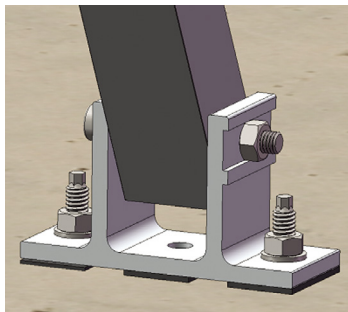


Figure 5.3C

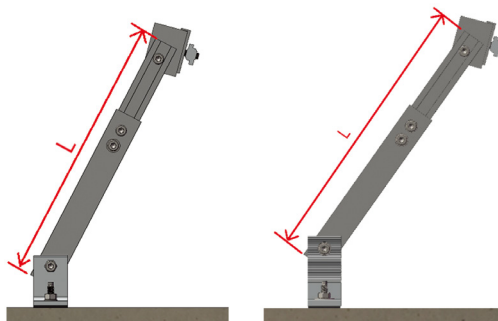


Figure 5.3D

Two Chemical Anchor Studs are used to install rear leg. Recommended torques for M8*12 bolts are 16~20 N·m.

Uneven roof surfaces:

The bottom nut bases of front and rear legs can have a maximum installation height of 8mm using a M8 gauge anchor stud. In this case, interface base should be double fastened with bolts and washers, as shown in Figure 5.3E and 5.3F.

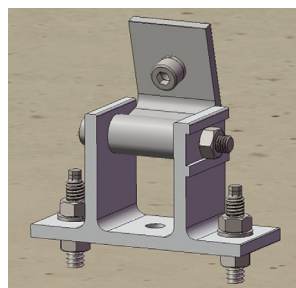


Figure 5.3E

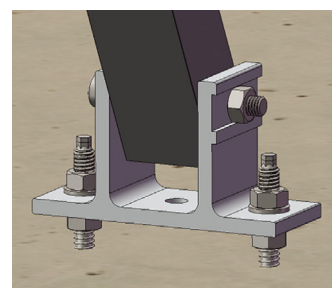


Figure 5.3F

The clearance can be increased to 12mm by using a M10 gauge anchor stud. This would require predrilling the interface base to fit the rod.

For installing at a higher height, please refer to [section 4 \(P14\)](#).

4. Substructure Clearance

For further clearances between interfaces and concrete roof, we can use the MT rail substructure to achieve 122mm max clearance.

This is achieved by stacking 40mm high MT rails, on top of each other, as shown in Figures 5.4A to 5.4C.

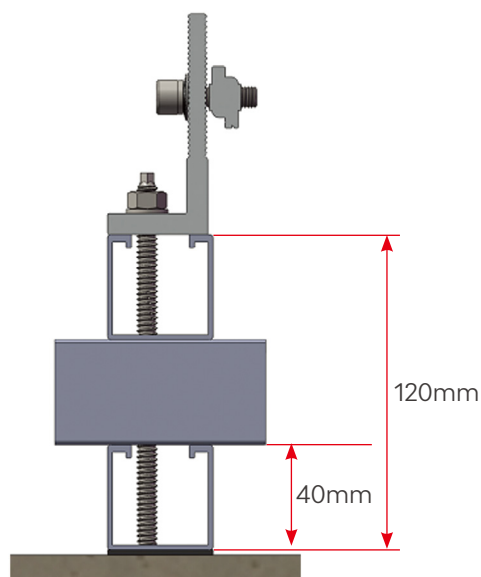


Figure 5.4A

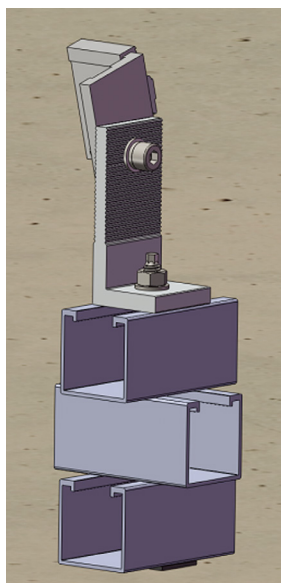


Figure 5.4B

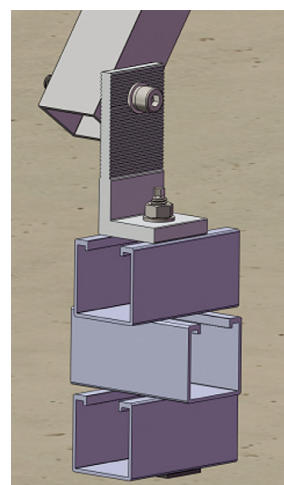


Figure 5.4C

Product Warranty

As the manufacturer of quality solar mounting systems, Clenergy Australia provides a warranty for all PV-ezRack® products it supplies in Australia and New Zealand ("Products"). The warranty provided by Clenergy Australia is subject to the conditions contained in this document ("Warranty"). No other warranty provision implied or otherwise is to be assumed. Your Warranty coverage is in accordance with this document. Based on choice of mounting setup, the letters are appended in their corresponding installation manuals hyperlinked in the table below:

Product Warranty Table for Installations in Corrosivity Category 1, 2, 3, 4 and 5 (ISO 9223)

Product		Material	Standard or Customized Product	Product Warranty		
				Corrosivity Category 1, 2 and 3	Corrosivity Category 4	Corrosivity Category 5
1	Aluminium Components	6005CL-T5 mill finish	Standard	10 years	10 years*	
		6005-T5 anodized to 10 microns				
		6005-T5 anodized to 15 microns	Customized		10 years	10 years*
		6005-T5 anodized to 20 microns				10 years
2	Galvanized Steel Components	Galvanized Steel at 85 microns in average	Standard			Not warranted
3	Stainless Steel Components	SUS304	Standard			10 years
4	Fasteners (bolts/ nuts/washers)	SUS304	Standard			
		SUS316	Customized			
5	Screws for Tile Interface	Carbon Steel SAE 1022 with Climaseal C3 Rated Finish	Standard		10 years**	
6	Screws for Tin Interface	Carbon Steel with C3 Rated Finish	Standard		Not warranted	
		Carbon Steel with C5 Rated Finish		30 years		

* Subject to interface spacing reduction as advised by Clenergy Australia. Please contact us for more details.

** The screws under tile interface are assumed to be installed in category 1, 2 or 3 micro-climate within the roof structure.

Warranty Scope

Your solar mounting Product has been manufactured to high standards, however, should any manufacturing defect arise, please contact Clenergy Australia. We will arrange for an inspection of the affected Product(s) to determine the extent of the problem.

Details are provided below as to the extent of your Warranty coverage and any exclusions that may apply. Please read these provisions carefully to ensure you receive the appropriate assistance and support in a timely manner. Please also contact Clenergy Australia if any part of this Warranty is unclear, or you wish to discuss your rights and remedies under this Warranty.

If your Product fails during the Warranty periods set out in the Warranty table above due to a defect in:

- (a) materials and/or workmanship on and from the date of the Product's delivery; or
- (b) structural integrity on and from the date of the Product's installation,

Clenergy Australia will at its election either repair or resupply the defective Product provided that:

- The Product was installed correctly by a Clean Energy Council ("CEC") accredited or equivalent accreditation installer, following the Clenergy installation manual provided at time of purchase.
- The Product has been maintained correctly in accordance with section "Care of your Product" below.

Warranty Conditions

- Any and all costs for repair or replacement outside the Warranty period are the responsibility of the customer.
- Where Clenergy attends a site and finds that the Product is not faulty, the costs for the visit will be payable by the customer.
- Defective Products shall be uninstalled and/or reinstalled at the customer's expense and risk.
- Under certain conditions, the Warranty can be extended to more than 10 years at an extra cost, available upon request.

Warranty Exclusions

- Product finish (natural surface oxidation) or any natural impairment or surface corrosion that does not compromise the structural integrity.
- Products sold or installed outside of Australia and New Zealand unless approved previously in writing by Clenergy Australia.
- Damage caused by transport, mishandling, incorrect storage, improper loading or willful conduct.
- Any Product not correctly installed in accordance with our installation manual, or any specific design instruction or special conditions as advised by Clenergy Australia.
- Damage caused by the Product being modified in any way unless previously agreed to in writing by Clenergy Australia.
- The use of the Product for purposes other than the mounting of PV solar panels.
- Installations where the environment is excluded in the "Products Warranty Table" above, and for galvanized steel ground system Products, where the pH level is outside the range of 6-8, unless agreed to in writing by Clenergy Australia prior to installation.
- Damage caused by extreme weather conditions or any other natural or man-made event outside of our control.
- Damage caused by attachments not designed or approved for connection to the Product.
- Damage caused by lightning strikes or excessive currents through the earthing/grounding clamps, clips or lugs.

Our Products may come with guarantees that cannot be excluded under the Australian Consumer Law. You may be entitled under statute to a replacement or refund for a major defect in the Products. You may also be entitled under statute to have the products repaired for any defect which does not amount to a major defect. The benefits given by this Warranty are in addition to any statutory rights and remedies you may have under Australian law.

Product Care

Clenergy Products are designed to be durable with minimal care, however it is important that you maintain your mounting Product in accordance with proper practices. This includes regular maintenance and inspection to avoid damage.

The aluminum components are made from either AL 6005CL-T5 or AL6005-T5 and may also have a clear anodization. The aluminum may undergo some surface oxidization in service. Please note that this is normal and part of the natural ageing process. The result may even be beneficial to the longevity of the Product, as the oxidization can provide additional protection against degradation by pollution and atmospheric corrosion.

- You should also ensure that if the Product is stored prior to installing that it is not contaminated by contact with rusty items or other impurities such as dirt and chemicals. Should this occur, you must clean the Product and make any repairs using approved methods such as galvanized paint and antirust treatments immediately before installation. Steel components should be inspected before and after installation and any damage to the galvanizing should be treated immediately to prevent rusting. It is normal for galvanized Products to develop a surface barrier (the 'patina'), which helps to protect the surface from contaminants in the atmosphere and does not adversely affect the Product.
- The torque values of fastener connections on mounting system must be checked annually and corrected if needed in accordance with Clenergy Australia's installation manual.
- Regular cleaning to remove any soil or other possible contaminants must also be performed. Cleaning should be performed in accordance with guidelines recommended by the Standards Association of Australia (AS 1231-2000) (for aluminium Products) and the Galvanizers Association of Australia (GAA) (for steel Products supplied in Australia) or the Galvanizers Association of New Zealand (GANZ) (for steel Products supplied in New Zealand) or any other similar organisations (as applicable). 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.

Certification



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

11 August 2021

Cleenergy Australia
1/10 Duerdin Street
Clayton, VIC 3168

CERTIFICATION LETTER – REV 3

MW Engineering Melbourne, being Structural Engineers within the meaning of Australian regulations, can confirm that Chemical anchor rod with a minimum pullout capacity of 6.1 kN for slab with a minimum 20MPa concrete compressive strength can be used in conjunction with all of the relevant existing generic certificates without any further spacing reductions.

Chemical anchor rod and anchor stud depths should be according to the manufacturer's installation manual.

Generic certificates:

Certificate Number	Description
CL-088-S-REV H	Tin and Tile certificate
00150-REVB	Penetrative Commercial tilt certificate
CL-530-S	Penetrative tilt certificate

Components shall be installed on uncracked slabs and installation shall be in accordance with the manufacturer's manual.

Maximum clearance allowed without a substructure between the nut below the tin interface and the concrete slab (Figure 1) to be as per the below table

Chemical anchor rod size	Clearance
M8	8 mm
M10	12 mm

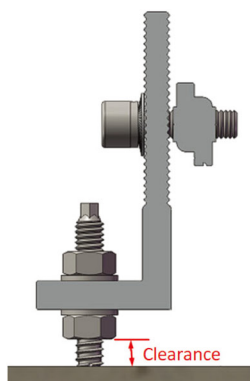


Figure 1. Clearance measure point (reference only)

August 2021



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

Maximum clearance allowed with a S-MT/240 substructure between the interface and the concrete slab to be 120 mm.

S-MT/240 rail shall be installed in between the tin interface and the concrete slab as per figure 2.

S-MT/240 can be cut in three (3) equal parts making each part 80 mm maximum.

S-MT/240 must be placed staggered on every adjacent leg.

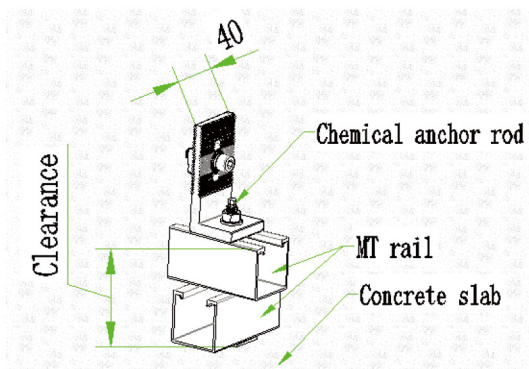


Figure 2. S-MT/240 installation – 80 mm (reference only)

Contact respective manufacturer to find the most suitable anchor studs for high corrosive environments.

Anchor stud required properties:

- Grade: 8.8 Carbon steel
- Minimum Tensile capacity (MPa): 830
- Minimum Yield capacity (MPa): 660

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,

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