

PV-ezRack[®] SolarTerraceIII-A[™]

Code-Compliant Planning and Installation V3.1

Complying with AS/NZS1170.2:2011 AMDT 2-2012



1. Introduction

Clenergy PV-ezRack® SolarTerrace III-A™ is a pre-assembled ground mount system suitable for large scale commercial and utility scale installations. PV-ezRack® SolarTerrace III-A has been developed to fit any PV module. The innovative and patented SolarTerrace III-A™ T-Rails simplify and improve the accuracy of the installation. Using high quality engineered components SolarTerrace III-A™ saves developers and installers, time and money when delivering large scale projects.

Please review this manual thoroughly before installing your SolarTerrace III-A™ system. This manual provides

- 1) Simple introduction of the installation relating to PV-ezRack SolarTerrace III-A Mounting systems.
- 2) Planning and installation instructions for SolarTerrace III-A.

SolarTerrace III-A™ parts, when installed in accordance with this guide, will be structurally sound and meet the AS/ NZS 1170.2:2011 (R2016) standards. During installation and especially when working on the roof, please comply with the appropriate safety regulations, and please also comply with the relevant regulations of your local region.

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Please check that you are using the current version of the Installation Manual by contacting Clenergy Australia by email on sales@clenergy.com.au, or your local representative.

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 particular installation and the installation environment;
- Using only PV-ezRack parts and installer supplied parts as specified by PV-ezRack (substitution of parts may void the warranty and invalidate the letter of certification on page 2);
- 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 all electrical equipment is performed by licensed electricians.
- Ensuring safe installation of all electrical aspects of the PV array. This includes providing adequate earth bonding of the PV array and PV-ezRack® SolarTerrace III-A™ components as required in AS/NZS 5033-2014 AMDT22-2018.

2. Planning

2.1 Installation Spacing and Concrete Footing Options

Tables 1-3 and 4-6 below, provide the maximum support spacing and concrete footing options in different wind regions for 60 cell panels (up to 1700x1100mm panel size) and 72 cell panels (up to 2000 x 1100mm panel size) respectively.

Table 1 Maximum Support Spacing and Footing Options in Wind Region A (Panels 1700x1100mm)

Wind Region	A			
Regional Wind Speed (m/s)	41			
Panels Tilt Angle	20°		30°	
Max Spacing (m)	3.75		3.25	
Footing Type	Concrete Footing Options (min N25)			
	Front Leg	Rear Leg	Front Leg	Rear Leg
Continuous Paving Slab (LxT) (m)	2.20x0.15		2.40x0.19	
Continuous Strip Footing (WxD) (m)	0.30x0.40	0.35x0.40	0.35x0.50	0.45x0.50
Individual Pad Footing per Leg (BxCxX) (m)	0.45x0.45x0.55	0.50x0.50x0.55	0.85x0.85x0.90	0.90x0.90x0.90
Transverse Strip Footing (LxAxD) (m)	2.20x0.60x0.60		2.50x0.70x0.70	

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Table 2 Maximum Support Spacing and Footing Options in Wind Region B (Panels 1700x1100mm)

Wind Region	B			
Regional Wind Speed (m/s)	48			
Panels Tilt Angle	20°		30°	
Max Spacing (m)	3.65		3.15	
Footing Type	Concrete Footing Options (min N25)			
	Front Leg	Rear Leg	Front Leg	Rear Leg
Continuous Paving Slab (LxT) (m)	2.20x0.15		2.40x0.19	
Continuous Strip Footing (WxD) (m)	0.35x0.45	0.40x0.45	0.50x0.58	0.58x0.58
Individual Pad Footing per Leg (BxCxX) (m)	0.50x0.50x0.60	0.60x0.60x0.60	0.90x0.90x0.90	1.0x1.0x0.90
Transverse Strip Footing (LxAxD) (m)	2.35x0.65x0.65		2.75x0.75x0.75	

Table 3 Maximum Support Spacing and Footing Options in Wind Regions C & D (Panels 1700x1100mm)

Wind Region	C		D	
Regional Wind Speed (m/s)	59		73	
Panels Tilt Angle	20°		20°	
Max Spacing (m)	3.20		2.70	
Footing Type	Concrete Footing Options (min N25)			
	Front Leg	Rear Leg	Front Leg	Rear Leg
Continuous Paving Slab (LxT) (m)	2.20x0.19		2.40x0.25	
Continuous Strip Footing (WxD) (m)	0.50x0.50	0.50x0.50	0.55x0.65	0.60x0.65
Individual Pad Footing per Leg (BxCxX) (m)	0.60x0.60x0.65	0.65x0.65x0.65	0.70x0.70x0.75	0.70x0.70x0.75
Transverse Strip Footing (LxAxD) (m)	2.40x0.75x0.75		2.70x0.80x0.80	

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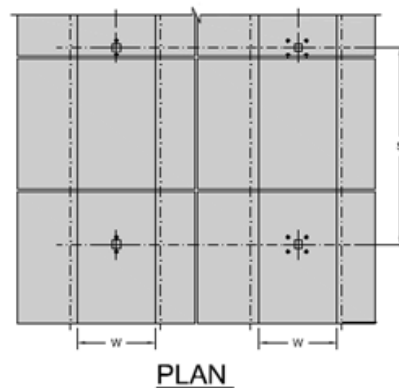
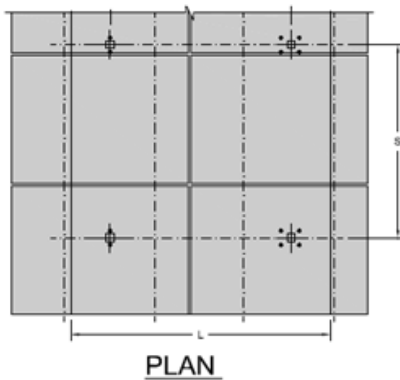
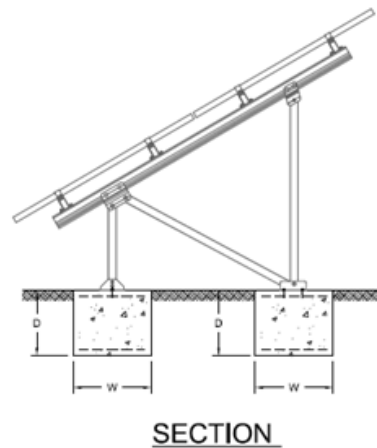
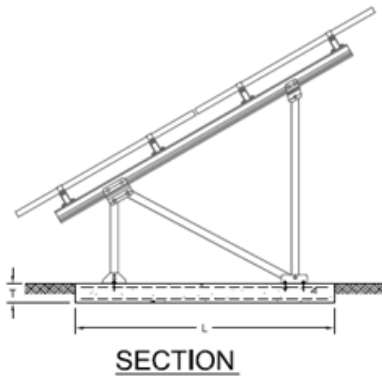
Table 4 Maximum Support Spacing and Footing Options in Wind Region A (Panels 2000x1100mm)

Wind Region	A			
Regional Wind Speed (m/s)	41			
Panels Tilt Angle	20°		30°	
Max Spacing (m)	3.60		3.10	
Footing Type	Concrete Footing Options (min N25)			
	Front Leg	Rear Leg	Front Leg	Rear Leg
Continuous Paving Slab (LxT) (m)	2.30x0.15		2.30x0.20	
Continuous Strip Footing (WxD) (m)	0.30x0.40	0.35x0.40	0.35X0.55	0.55x0.55
Individual Pad Footing per Leg (BxCxX) (m)	0.50x0.50x0.60	0.70x0.70x0.60	0.85x0.85x0.90	0.95x0.95x0.90
Transverse Strip Footing (LxAxD) (m)	2.30x0.75x0.60		2.50x0.80x0.80	

Wind Region	B			
Regional Wind Speed (m/s)	48			
Panels Tilt Angle	20°		30°	
Max Spacing (m)	3.50		2.95	
Footing Type	Concrete Footing Options (min N25)			
	Front Leg	Rear Leg	Front Leg	Rear Leg
Continuous Paving Slab (LxT) (m)	2.30x0.20		2.40x0.25	
Continuous Strip Footing (WxD) (m)	0.35x0.45	0.45x0.45	0.55x0.65	0.65x0.65
Individual Pad Footing per Leg (BxCxX) (m)	0.55x0.55x0.75	0.75x0.75x0.75	0.95x0.95x0.90	1.05x1.05x0.90
Transverse Strip Footing (LxAxD) (m)	2.50x0.75x0.70		2.85x0.85x0.80	

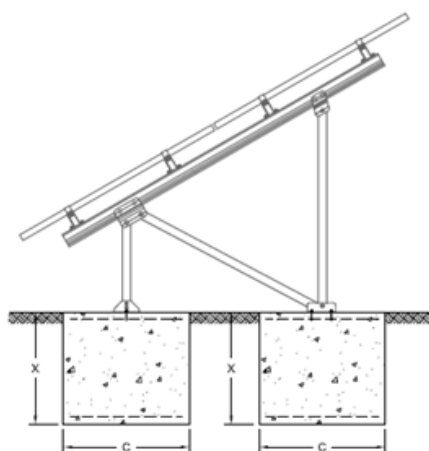
Wind Region	C		D	
Regional Wind Speed (m/s)	59		73	
Panels Tilt Angle	20°		20°	
Max Spacing (m)	3.00		2.00(1.90*)	
Footing Type	Concrete Footing Options (min N25)			
	Front Leg	Rear Leg	Front Leg	Rear Leg
Continuous Paving Slab (LxT) (m)	2.40x0.25		2.65x0.30	
Continuous Strip Footing (WxD) (m)	0.50x0.55	0.55x0.55	0.55x0.60	0.70x0.60
Individual Pad Footing per Leg (BxCxX) (m)	0.60x0.60x0.75	0.75x0.75x0.75	0.70x0.70x0.75	0.80x0.80x0.75
Transverse Strip Footing (LxAxD) (m)	2.70x0.85x0.80		2.90x0.80x0.80	

Footings Summary

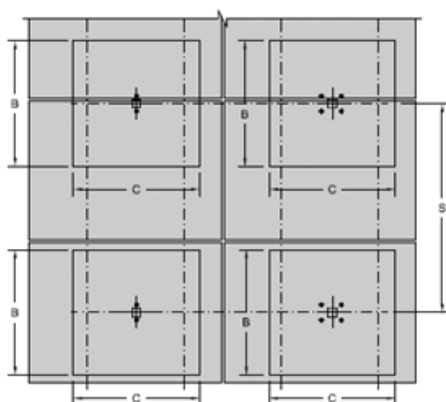


Continuous Paving Slab

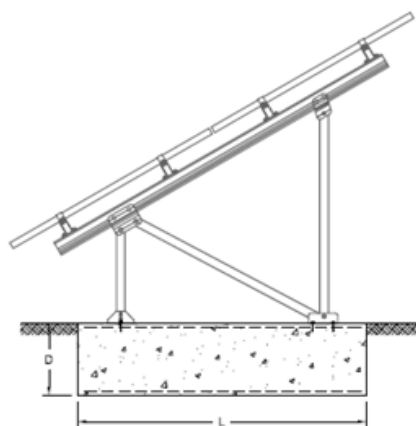
Continuous Strip Footing



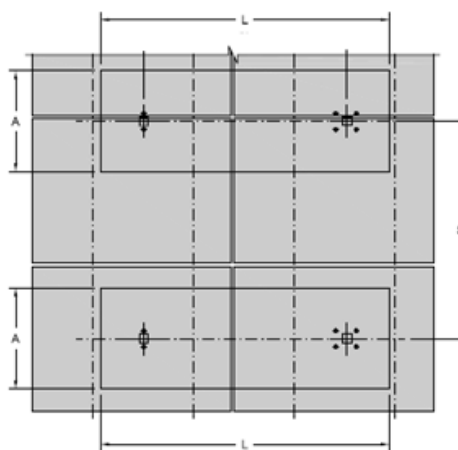
SECTION



PLAN



SECTION



PLAN

Individual Pad Footings per Leg

Transverse Strip Footing

Notes:

- The footing example shown are recommended for “firm” soils with allowable endbearing capacity of 100 kPa minimum (damp clays, sandy clays, damp sands). Contact Clenergy for site specific conditions (to find out whether a more cost effective solution is possible);
- Concrete grade: N25 minimum, cover: 50 mm (contact Clenergy to find out whether a more cost effective solution is possible, based on site specific conditions);
- For fixing the STIII-A support to the concrete footing, we recommend using M16(5.8 grade Carbon Steel anchor studs or similar). Adopt the minimum anchor embedment depth designated by the anchors manufacturer's manual. Clenergy STIII-A has 6 anchors per frame, 2 at the front and 4 at the rear;
- Rail end overhang should be not over 40% of the support spacing.
- Other footing options are possible – contact Clenergy.

2.2 Ground Clearance

The ground clearances to the panels and the concrete base (CL and h mm) using four concrete footing options at different wind regions are presented in the tables below. CL is the height from the bottom of the lower panel to the ground and h is the height from the top of the concrete to the ground. (See the diagrams on page 10).

Table1 Ground Clearance in Wind Region A (Panels up to 1700x1100mm)

Wind Region	A			
Panels Tilt Angle	20°		30°	
Max Spacing (m)	3.75		3.25	
	CL (mm)	h (mm)	CL (mm)	h (mm)
Continuous Paving Slab	500	0	500	0
Continuous Strip Footing	700	200	500	0
Individual Pad Footing per Leg	700	200	800	300
Transverse Strip Footing	900	400	800	300

Table 2 Ground Clearance in Wind Region B (Panels up to 1700x1100mm)

Wind Region	B			
Panels Tilt Angle	20°		30°	
Max Spacing (m)	3.65		3.15	
	CL (mm)	h (mm)	CL (mm)	h (mm)
Continuous Paving Slab	500	0	500	0
Continuous Strip Footing	700	200	700	200
Individual Pad Footing per Leg	800	300	900	400
Transverse Strip Footing	600	100	600	100

Table 3 Ground Clearance in Wind Region C & D (Panels up to 1700x1100mm)

Wind Region	C		D	
Panels Tilt Angle	20°		20°	
Max Spacing (m)	3.20		2.70	
	CL (mm)	h (mm)	CL (mm)	h (mm)
Continuous Paving Slab	500	0	500	0
Continuous Strip Footing	700	200	600	100
Individual Pad Footing per Leg	700	200	700	200
Transverse Strip Footing	600	100	600	100

Table 4 Ground Clearance in Wind Region A (Panels up to 2000x1100mm)

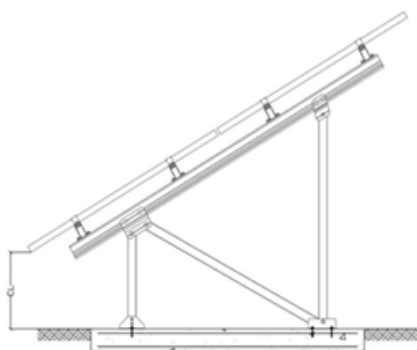
Wind Region	A			
Panels Tilt Angle	20°		30°	
Max Spacing (m)	3.60		3.10	
	CL (mm)	h (mm)	CL (mm)	h (mm)
Continuous Paving Slab	500	0	500	0
Continuous Strip Footing	700	200	700	200
Individual Pad Footing per Leg	700	200	900	400
Transverse Strip Footing	600	100	700	200

Table 5 Ground Clearance in Wind Region B (Panels up to 2000x1100mm)

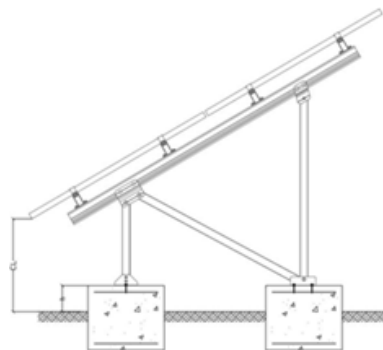
Wind Region	B			
Panels Tilt Angle	20°		30°	
Max Spacing (m)	3.50		2.95	
	CL (mm)	h (mm)	CL (mm)	h (mm)
Continuous Paving Slab	500	0	500	0
Continuous Strip Footing	700	200	700	200
Individual Pad Footing per Leg	800	300	900	400
Transverse Strip Footing	600	100	600	100

Table 6 Ground Clearance in Wind Region C & D (Panels up to 2000x1100mm)

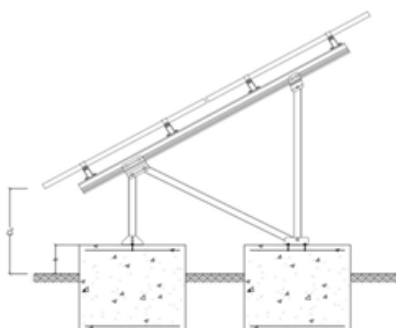
Wind Region	C		D	
Panels Tilt Angle	20°		20°	
Max Spacing (m)	3.00		2.45	
	CL (mm)	h (mm)	CL (mm)	h (mm)
Continuous Paving Slab	500	0	500	0
Continuous Strip Footing	700	200	600	100
Individual Pad Footing per Leg	700	200	700	200
Transverse Strip Footing	900	400	1000	500



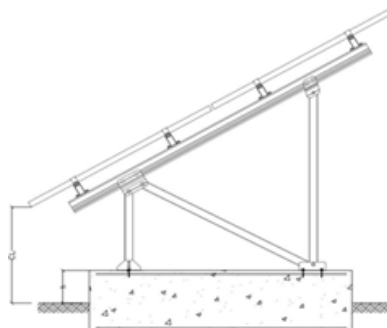
Continuous Paving Slab



Continuous Strip Footing



Individual Pad Footing per Leg

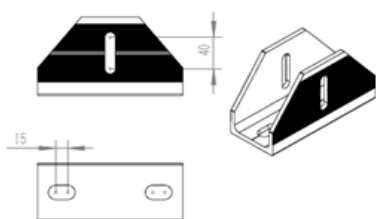


Transverse Strip Footing

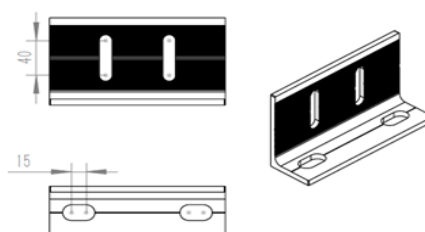
2.3 Range of Adjustment

The system can be adjusted using the anchor plates below. Table 2.3.1 below indicates the range of adjustment depending on the front or rear legs and if you are using either a U or L anchor plate.

2.3.1 Installation with Concrete Foundation		
Adjustable area	Adjustable part	Adjustable Range
Front leg Up-down	Corrugated U-anchor Plate	±20mm
Front leg North-South	Corrugated U-anchor Plate	±7.5mm
Front leg East-West	NA	--
Rearleg Up-down	Corrugated L-anchor Plate	±20mm
Rearleg North-South	Corrugated L-anchor Plate	±7.5mm
Rearleg East-West	NA	--



Corrugated U-anchor Plate (at Front leg)



Corrugated L-anchor Plate (at Rear leg)

Depending on the system design, there is another option to concrete footings and that is using Ground Screw methodology, which is defined in more detail on pages 25-27. The table below defines the range of adjustments for the support structure when using this method.

2.3.2 Installation with Ground Screw		
Adjustable area	Adjustable part	Adjustable Range
Front leg Up-down	NA	--
Front leg North-South	Ground Screw	±7.5mm
Front leg East-West	NA	--
Rearleg Up-down	NA	--
Rearleg North-South	Ground Screw	±7.5mm
Rearleg East-West	NA	--

Tools & Components

3. Tools & Components

3.1 Installation Tools

Allen Key 6mm

(M8
Hexagon
Socket
Screw)



Electric Drill

(ST4.8x16
self-tapping
screw & M8
Hexagon
Socket
Screw)



Tape



Torque Wrench



String



Mark Pen



Wrench



Socket Wrench
M8/M12



Total Station or
Equivalent Instrument



3.2 Components

ER-EC-ST
End Clamp



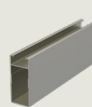
ER-IC-ST
Inter Clamp



ER-R-T110
T-Rail110



ER-SP-T110
Splice for T-110 Rail



ER-RC-T/G
Rail Clamp for T Rail
with Grounding



ER-S-STIIIA
Support(Pre-assembled)



ER-CAP-T110
Cap for T-110 Rail



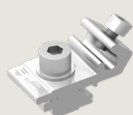
ER-CAP-G/A
Cap for Square Girder



EZ-GC-ST
Grounding Clip



EZ-GL-ST
Grounding Lug



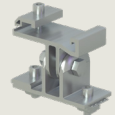
C-U/30/46-G
Universal
Clamp for
Frame Height
30-46mm with
Grounding
Clip



C-U/30/46
Universal
Clamp for
Frame Height
30-46mm



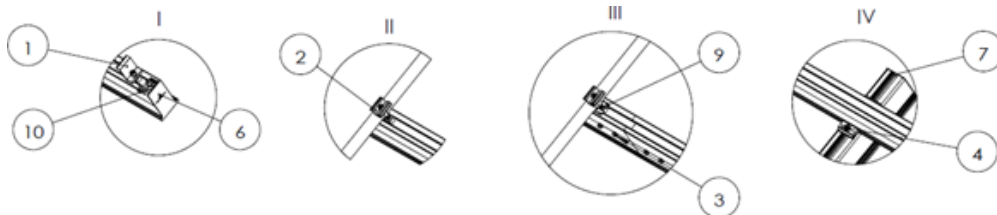
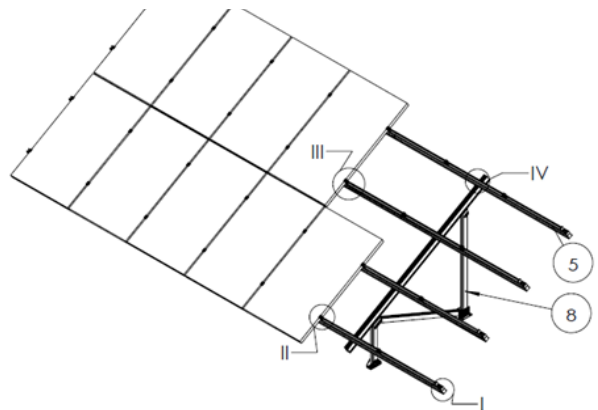
BR-R110/EW/G
(Optional)
PV-ezRack East/West
Adjustable
Bracket for
T-Rail 110 with
grounding



4. System Overview

4.1 Overview of PV-ezRackSolarTerrace III-A

- ① End Clamp
- ② Inter Clamp
- ③ Splice for T-110 Rail
- ④ Rail Clamp with grounding
- ⑤ T Rail 110*L
- ⑥ Cap for T-110 Rail
- ⑦ Cap for Support Girder
- ⑧ Support(Pre-assembled)
- ⑨ Grounding Clip
- ⑩ Grounding Lug



4.2 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.

4.2.1 General installation instructions:

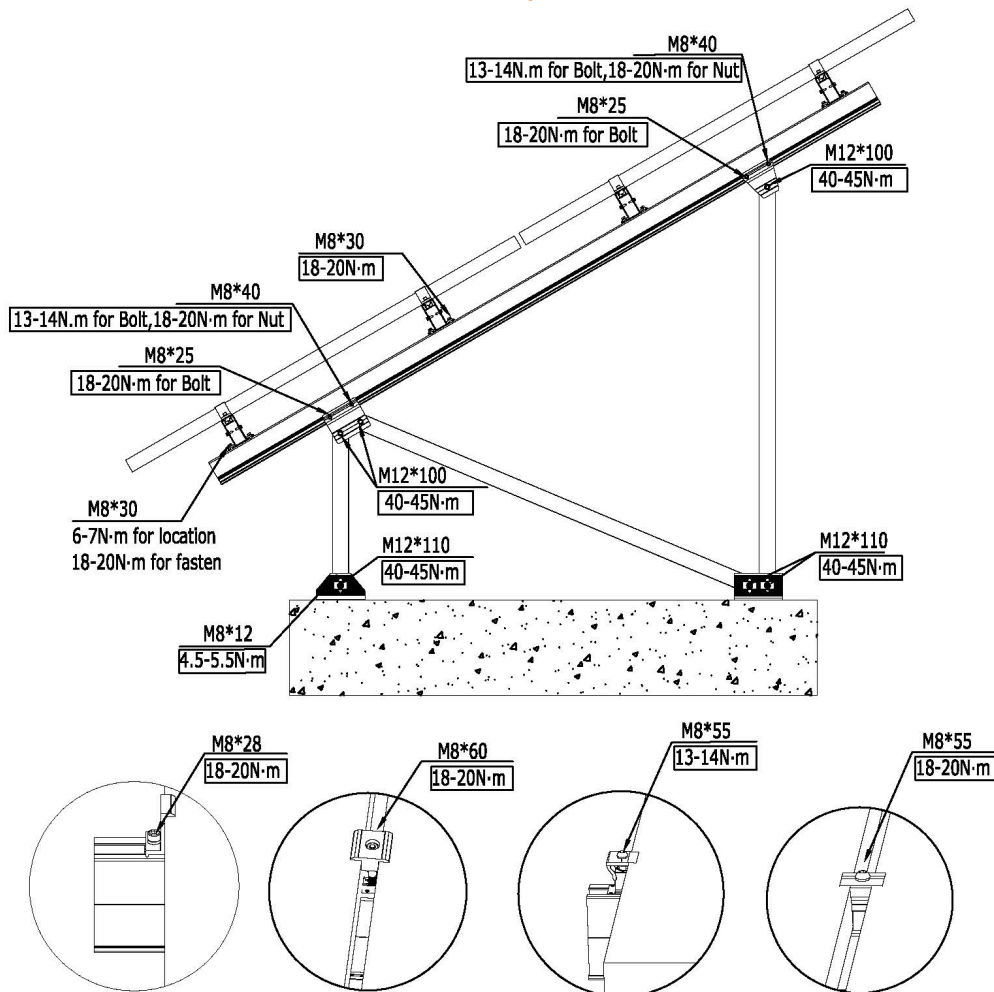
- (1) Apply force to fasteners in the direction of thread
- (2) Apply force uniformly, to maintain the required torque
- (3) Professional tools and tool belts are recommended
- (4) In some cases, fasteners could be seized over time. As an option, if want to avoid galling or seizing of thread, apply lubricant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

4.2.2 Safe Torques

Please refer to safe torques as shown on page 13. 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 dead lock 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.

4.2.3 These steps should be applied for every stainless steel nut and bolt assembly.

Safe Torques



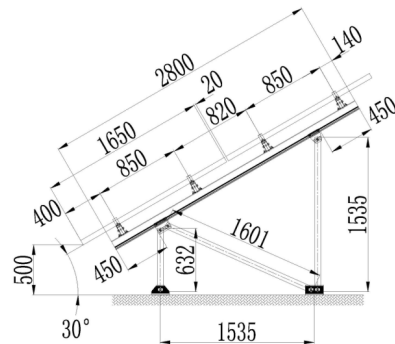
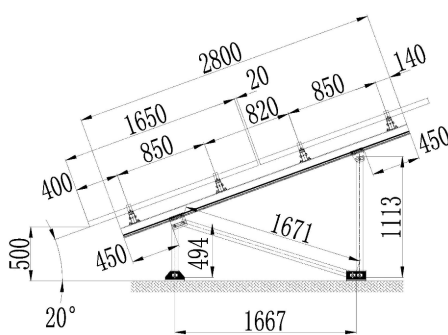
4.3 Installation Dimensions

All drawings and dimensions in this installation guide are for a generic reference. PV-ezRack® SolarTerrace III-A™ is to be optimized to suit specific conditions for each project and documented in a construction drawing. As a result, major components of PV-ezRack® SolarTerrace III-A™ may be provided in section sizes and lengths that vary from those shown in this guide. The installation process detailed in this instruction guide remains the same regardless of the component size. In case you need to do any on-site modifications or alteration of the system in a way that would be different from the construction drawing please provide marked up drawings/sketches for Clenergy's review prior modification for comment and approval.

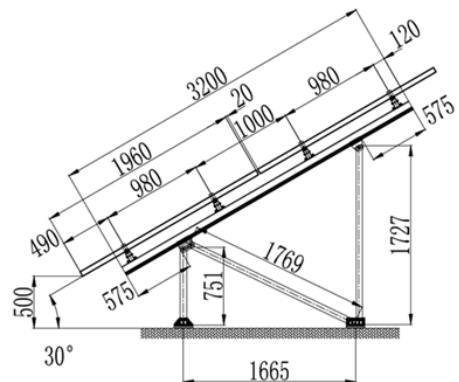
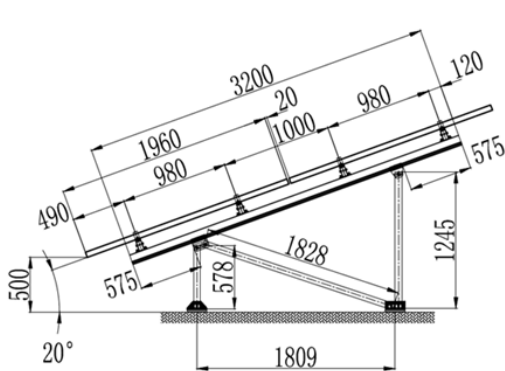
Installation Instruction

INTRODUCTION

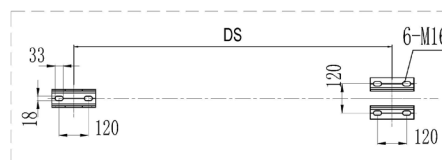
Below are the side view drawings of support for 60 cell panels (up to 1700 x 1100 mm) and 72 cell panels (up to 2000 x 1100 mm) at 20° and 30° tilt angles.



Side view drawings of support for 60 cell panels (up to 1700x1100mm)



Side view drawings of support for 72 cell panels (up to 2000x1100mm)



Location Plan of Anchors (DS is the distance between the front leg and rear leg)

PLEASE NOTE THE DISTANCE BETWEEN FRONT LEG AND REAR LEG COULD BE DIFFERENT FOR OTHER TILT ANGLES OR FOR OTHER GIRDER LENGTHS. PLEASE CONTACT CLENERGY FOR CONFIRMATION.

5. Installation Instruction

5.1 Pre-assembled Support Installation

5.1.1 Unfold the Pre-assembled Support

Solution 1 (For 30 degree tilt support)

Step 1:
Unfold the pre-assembled support as shown in Fig. 2;

Step 2:
Unfold the Slotted Al-Tube as shown in Fig.3;

Step 3:
Unlock the M12*100 bolts from the H Joint first and fasten the Al-Tube and H Joint lightly with M12*100 again as shown in Fig.4;

Step 4:
Rotate the L-anchor and U-anchor plates to ensure they align as shown as Fig. 5.

NOTE: The bolt heads have to be kept in same direction.



Fig. 1



Fig. 2

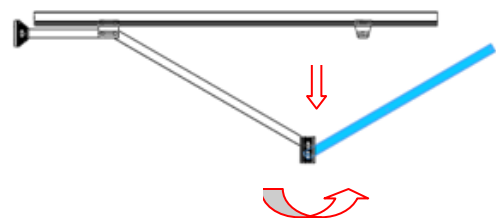


Fig. 3

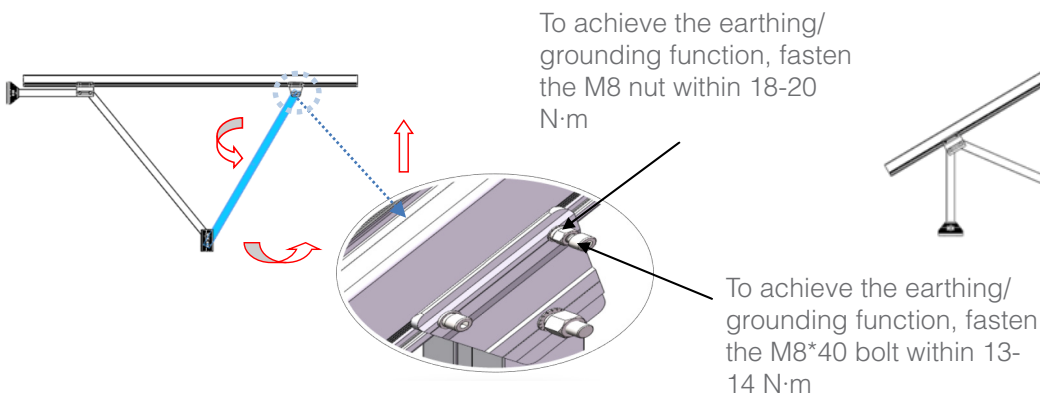


Fig. 4

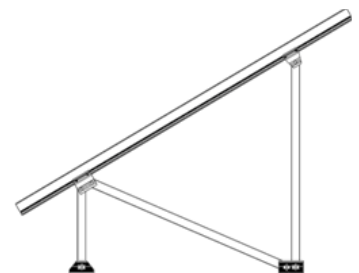


Fig. 5

Installation Instruction

Solution 2 (For 20 degree tilt support)

Step 1:
Unfold the pre-assembled support as shown in Fig.7 and 8;

Step 2:
Unlock the M12*100 bolts from H Joint first and fasten the Al-Tube and H Joint lightly with M12*100 again as shown in Fig.8;

Step 3:
Rotate the L-anchor and U-anchor plates to ensure they align as shown as Fig.10.

Note: The bolt heads have to be kept in same direction.



Fig. 6



Fig. 7

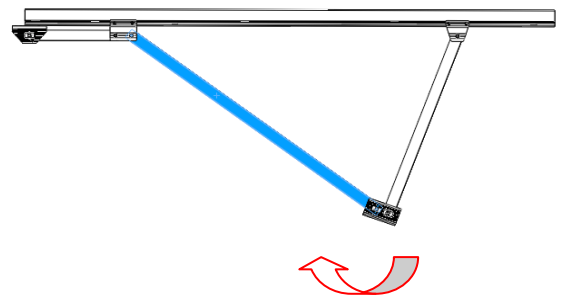


Fig. 8

To achieve the earthing/
grounding function, fasten
the M8 nut within 18-20
N·m

To achieve the earthing/
grounding function, fasten
the M8*40 bolt within 13-
14 N·m

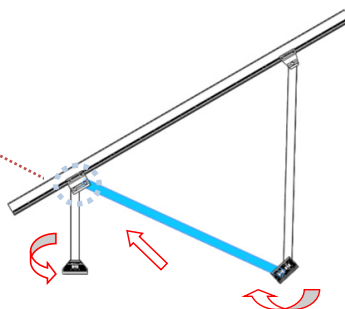
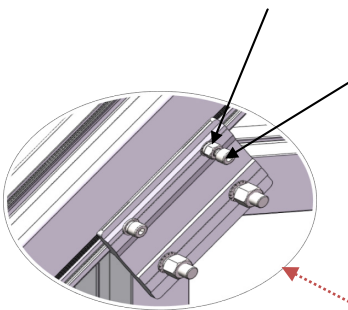


Fig.9

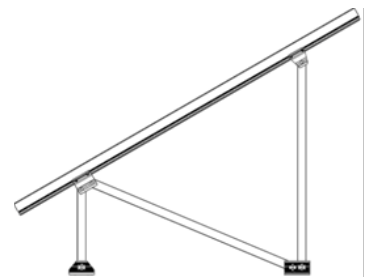


Fig. 10

5.1.2 Fix the Pre-assembled Support to the Concrete Footings.

Fix the Pre-assembled Support to the Concrete footings laid using the dimensions indicated by the tables in the Planning section. Use embedded M16 (Grade 5.8 Carbon Steel anchor studs or similar). Adopt the minimum anchor embedded depth according the anchors manufacturer's Manual. The up-down adjustable range of the Front/Rear leg is $\pm 20\text{mm}$. The north-south adjustable range of the Front/Rear leg is $\pm 7.5\text{mm}$.

Recommended Torque:

M16: 135~150N·m

To achieve earthing/
grounding function,
fasten the M8*12 bolt
within 4.5-5.5 N·m

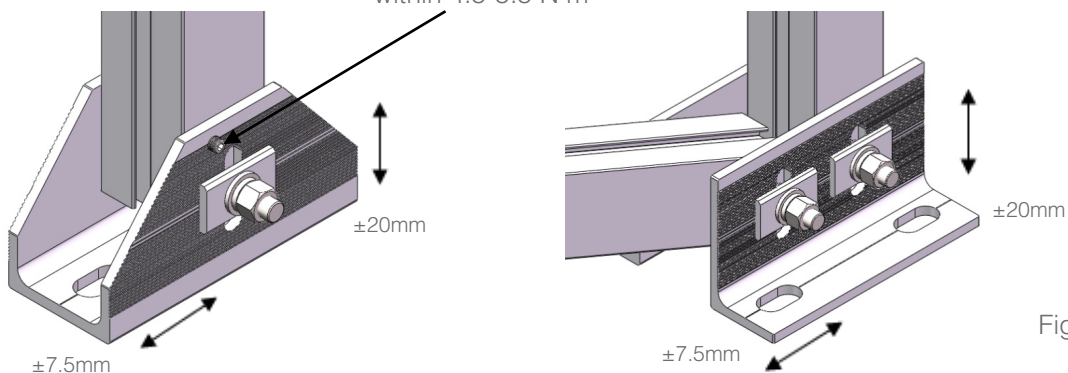


Fig. 11

5.1.3 Check the System and Fasten all Bolts with Recommended Torque (please refer to Page 13).

Recommended Torque:

M8 Bolt: 13N·m;

M8 Nut: 18~20N·m

M12: 40~45N·m

5.1.4 According to Engineering Drawing, Repeat the Above Operations to Install Other Pre-assembled Supports

Ensure all the Tri-Groove Beams of Pre-assembled Support are aligned and all Pre-assembled Supports are parallel to each other.
Now fasten all bolts tightly.

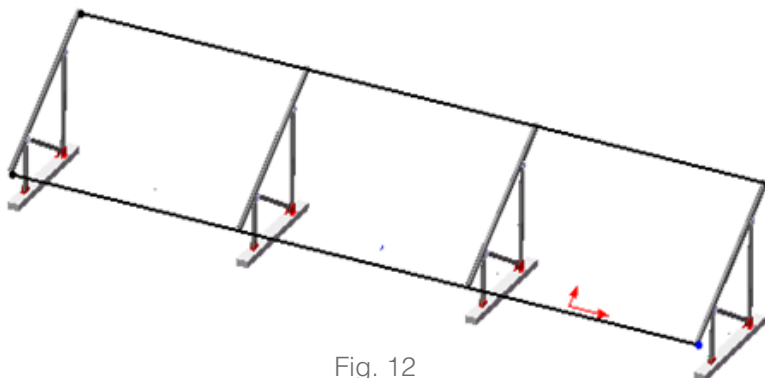


Fig. 12

5.2 T Rail Installation

5.2.1 Direct Installation

5.2.1.1 According to the engineering drawing, mark the locations for the Rail on the Tri-groove beam. The dimensions shown in the figure on the right is an example.

5.2.1.2 Slide the T Rail on to the Tri-Groove Beam. Apply one Rail Clamp to the T Rail on each side of Rail, and fasten lightly with the 6mm Allen Key as shown in the Figures below.

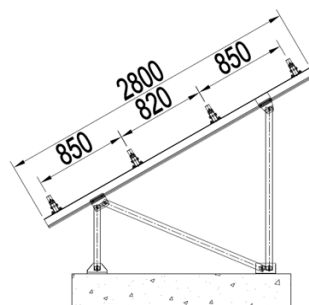


Fig. 13

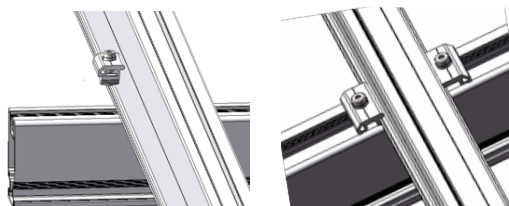


Fig. 14

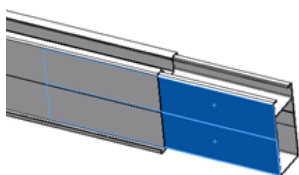


Fig. 15

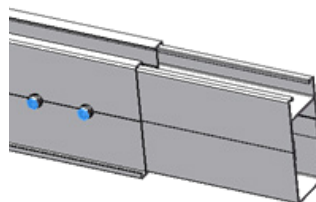
Note: if the Pre-assembled Support has pre-positioned Rail Clamps for the T Rail, slide another Rail Clamp in other side of the T Rail.

5.2.1.3 If the T Rail is not long enough, connect two T Rails together using the Splice for the T-110 Rail as shown in the diagram below. Insert half of the Splice into the T Rail and fasten with two sets of Self-tapping screws in each side of the T Rail, and then insert the other Splice into the T Rail and again fasten with Self-tapping screws. To prevent thermal expansion problems, the Rails shall not exceed 30m long.

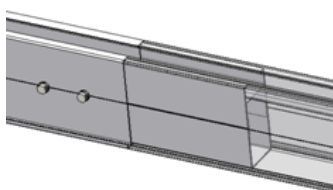
NOTE: Please fasten the Self-tapping screw until the rubber washer grips firmly, attaching the T Rails tightly onto the splice.



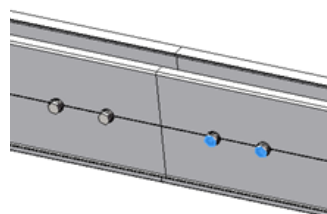
Insert half of Splice into the T Rail



Then use two sets of Self-tapping screws in each side of the T Rail



Insert half of the Splice into the T Rail



Two sets of Self-tapping screws each side of the T Rail

Fig. 16

5.2.1.4 Place the T Rails one by one in the planned position on the supports.



Fig. 17

5.2.1.5 Repeat the above operations and install all other T Rails. Ensure the end faces of the Rails are aligned and all Rails are at same height. Now fasten all the bolts tightly.

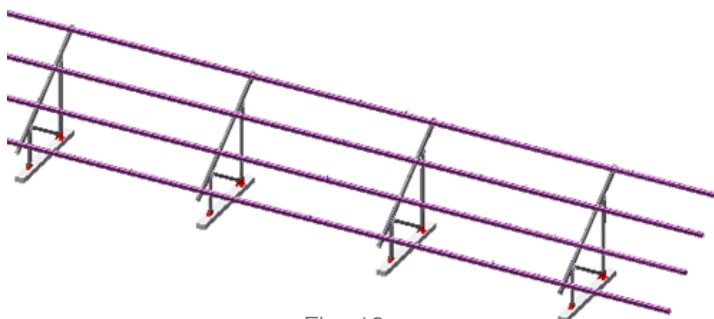


Fig. 18

5.2.2 East/West Adjustable Bracket Installation (optional)

5.2.2.1 Click the pre-assembled East/West Adjustable Bracket into the Tri-Groove Beams and adjust properly as shown in Fig.19. Fasten the M8 bolt slightly with the Allen key.

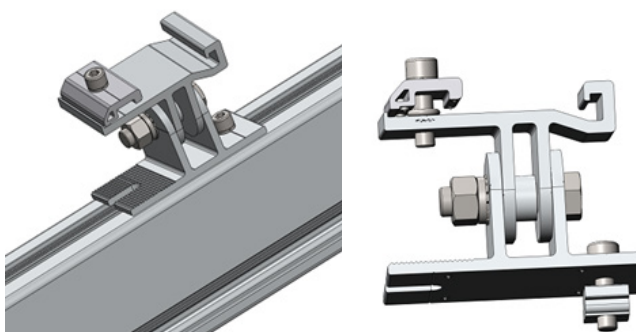


Fig. 19

5.2.2.2 Click the corrugated shim and Z Mould/bolt into the Tri-Groove Beams and move them into the opening slot hole of East/West Adjustable Bracket. After the bolt is at the end of slot hole, fasten the M8 bolts slightly as shown in Fig. 20.

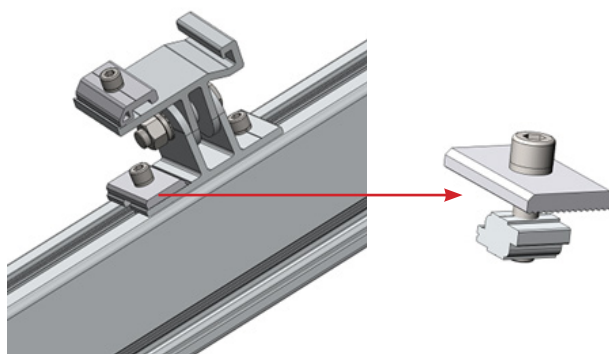


Fig. 20

5.2.2.3 Repeat above steps to install other East/West Adjustable Brackets. Adjust all brackets and make the brackets sit at the right positions.
Now fasten all M8 bolts tightly within 18~20 N·m.

5.2.2.4 Tilt the T Rail to a certain angle and slide into the groove of East/West Adjustable Brackets of the same height on the Tri-Groove Beams. Then use a 6mm Allen key (Hex) to fasten on another side via Rail Clamp for T-Rail. Fasten all the M12 bolts on the East/West Adjustable Brackets.

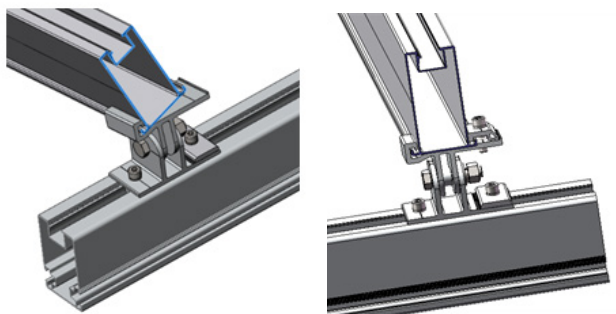


Fig. 21

Recommended Torque:

M8: 18~20 N·m

M12: 50~55 N·m

5.2.2.5 Repeat the step 5.2.1.3 to determine the necessary length of T-Rail prior to installation.

5.2.2.6 Repeat the above operations and install all other T Rails. Ensure the end faces of the Rails are aligned and all Rails are at same height. Now fasten all the bolts tightly.

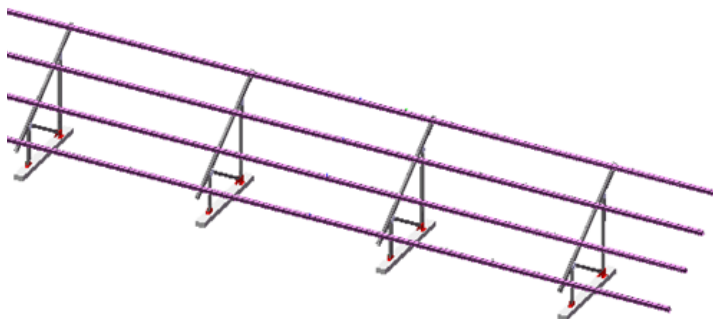
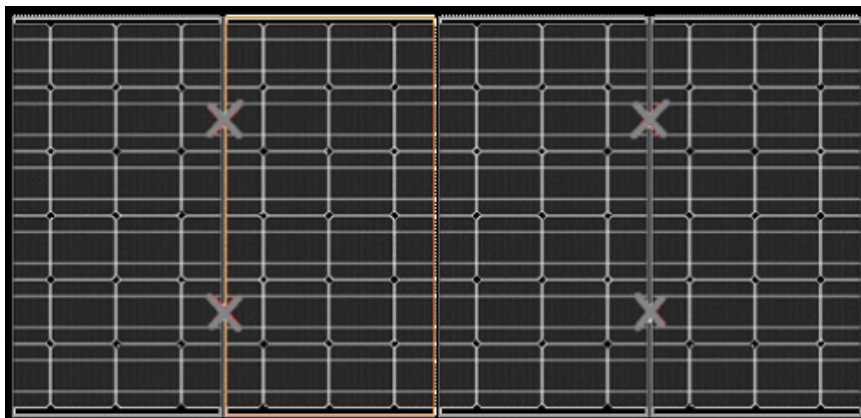


Fig. 22

5.3 PV Module Installation

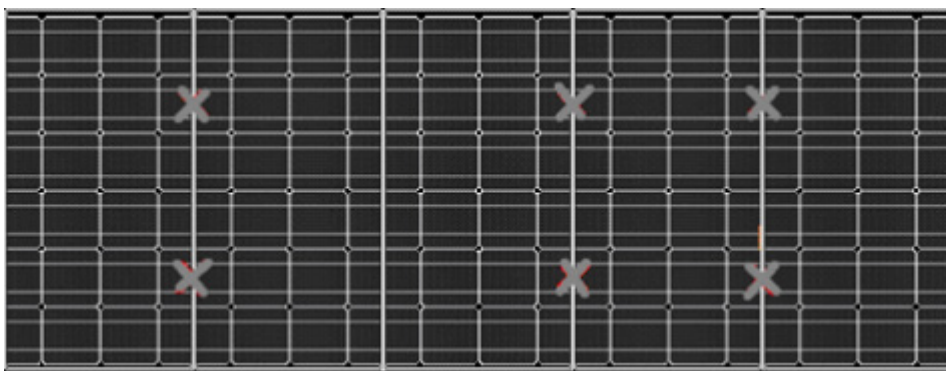
5.3.1 Deployment of Grounding Clip

5.3.1.1 When there is an even number of PV Module in each row.



Install the Grounding clips at the positions marked X in the figure shown. Then the number of Grounding clips = number of PV Modules. Eg: 4 Grounding clips in the figure shown.

5.3.1.2 When there is an odd number of PV Module in each row



Installation Instruction

Install the Grounding clips at the positions marked X in the figure shown. Then the number of Grounding clips = number of PV Modules + 1. Eg: 6 Grounding clips in the figure shown.

Key point:

When replacing a defective single PV Module, it is required to replace the Grounding Clip under the PV Module, as they are intended for single use only.

5.3.2 Place the PV Modules on the Rails, and fix them with End Clamps and Inter Clamps or Universal Clamps, then fasten them with the Allen key. Please choose either Solution 1 or 2 below, according to your project.

Solution 1(Apply End Clamps and Inter Clamps)

Step 1 Place the first PV Module on the T Rails according to your plan and apply the End Clamps to fix it in place. Then fasten lightly with the Allen Key as shown in Fig. 23.

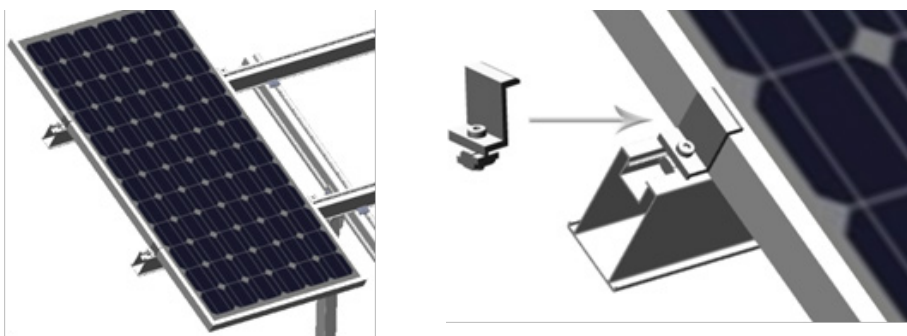


Fig. 23

Step 2 Slightly lift the PV Module and slide the Inter Clamps and Grounding Clips into position. The teeth on Grounding Clip will be automatically aligned when the Inter Clamp is properly installed as shown in Fig. 24.

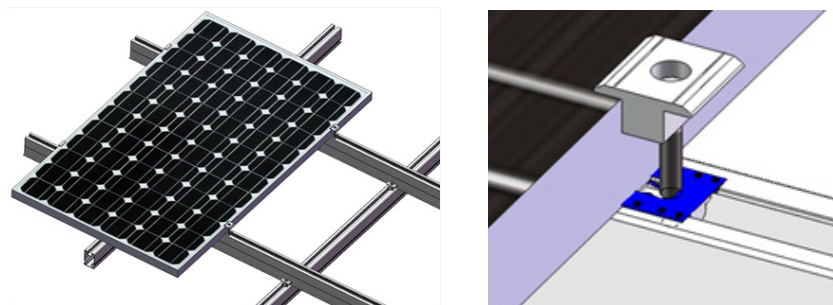


Fig. 24

Step 3 Place the next framed PV Module into the other side of Inter Clamp and Grounding Clip as shown in Fig. 25.

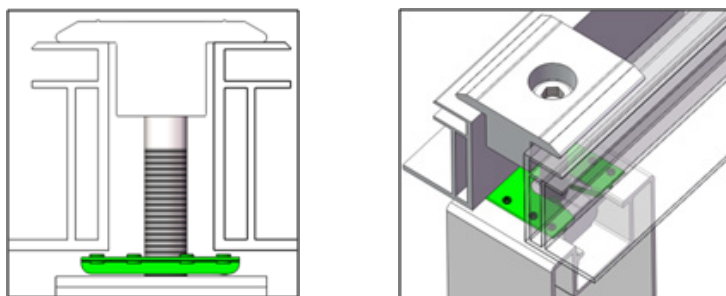


Fig. 25

Important Notes:

- To fix the Grounding Clip properly, ensure the frames of the PV Modules are now firmly pressed against the Inter Clamp and Grounding Clip and visually check that Grounding Clips are positioned properly. (Grounding Clips are intended for SINGLE USE ONLY!) Only fasten the bolts down when you are sure the PV modules are in the correct position and lightly tighten the bolts at this stage to keep the PV Modules in place.

Step 4 When using End and Inter clamps, maintain an 18mm vertical and horizontal gap between the two adjacent rows of PV Modules. You can use two Inter Clamps as separation between two PV Modules to achieve this and remove them after the installation is completed as shown in Fig. 26.

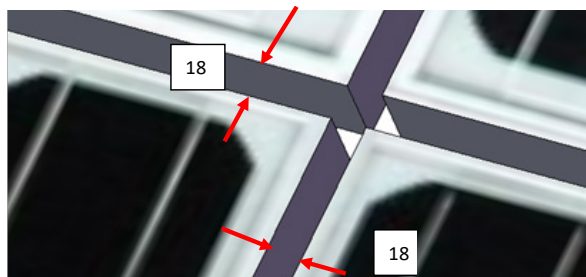


Fig. 26

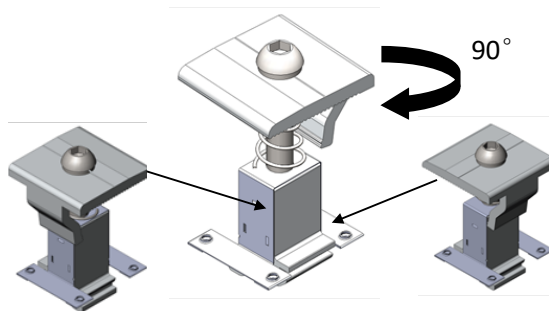
Installation Instruction

Step 5 Repeat the above steps to install all PV Modules. Fasten all the End and Inter Clamps tightly with 18~20N.m until all the PV Modules are correctly installed.

Solution 2 (Apply Universal Clamps)

Step 1 Twisting the head of the Universal Clamp changes the functionality from end to inter clamp as shown in Fig. 27.

Fig. 27



NOTE: Please ensure the Universal Clamp C-U/30/46 or Universal Clamp with Grounding clip C-U/30/46-G is positioned correctly according to 5.3.1: Deployment of Grounding clip.

Step 2 Incline the Universal Clamp to place the channel on its lower part against the lower channel of the T Rail. Then press the Universal Clamp down towards the other side of the T Rail to engage the channel on its upper part against the upper channel of T Rail as shown in Fig. 28.

Note: before installation, make sure there will be enough clearance between the screw and module of Universal Clamp as shown in Fig. 28.

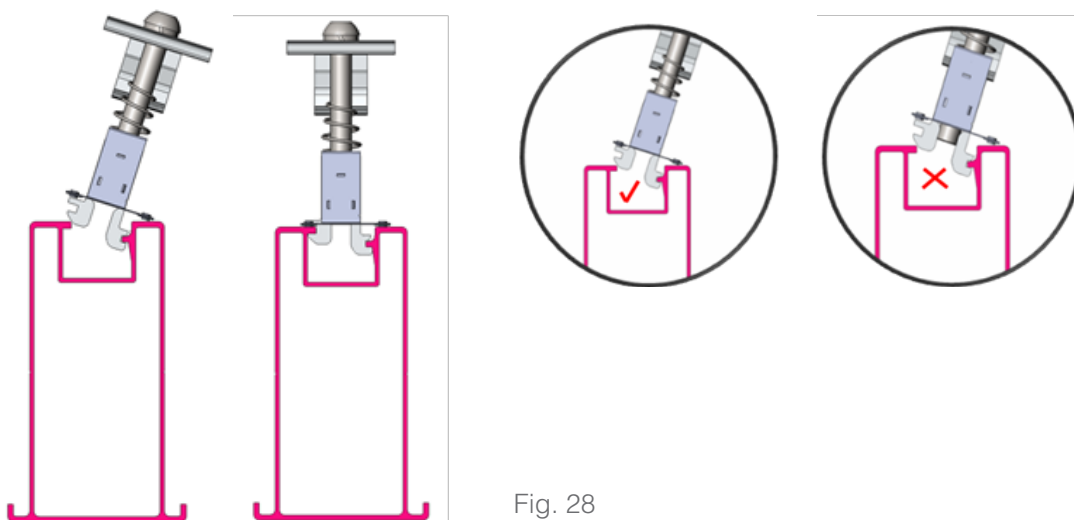


Fig. 28

Installation Instruction

Step 3 Place the first PV Module on the T Rails and position the Universal Clamp as an End Clamp to fix it and then fasten lightly with Allen Key. Make sure the frame of the PV Module is fully in contact with the Universal Clamp as shown in Fig.29. Visually check the Universal Clamp and PV module are correctly installed.

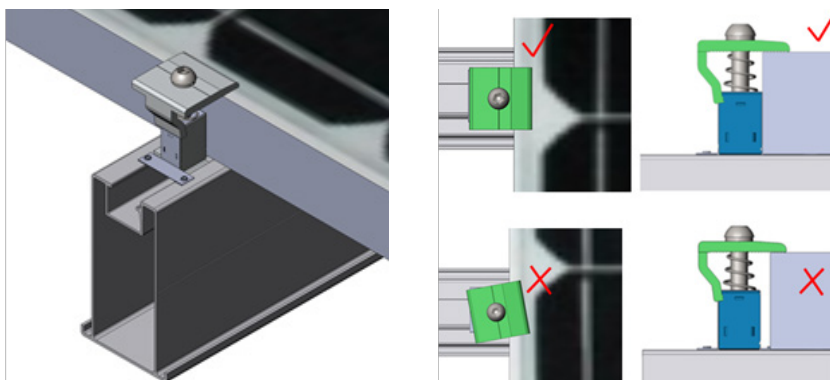


Fig.29

Step 4 When using as Inter Clamp, click the Universal Clamp into the channel of T Rail and then slightly lift the framed PV Module to make sure the Grounding Clip of Universal Clamp is fully covered as shown in Fig. 30.

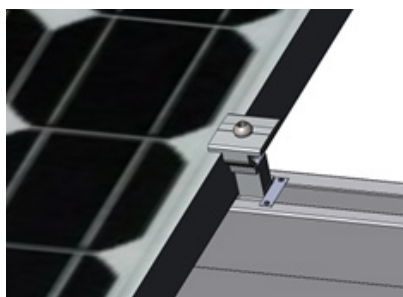


Fig.30

Step 5 Place the next framed PV Module into the other side of Universal Clamp. Make sure the Grounding Clip of the Universal Clamp will be fully covered and ensure the frame of PV Module is closely in contact with Universal Clamp as shown in Fig. 31. Note the 20mm gap when using Universal Clamps.

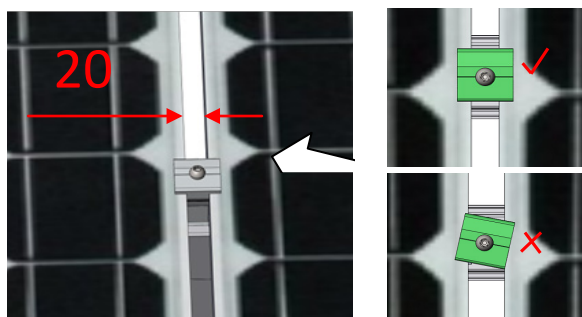


Fig.31

Step 6 Repeat the above steps to install all PV Modules. Visually check the Universal Clamps and PV modules are properly positioned and then tighten all Clamps.

The recommend torque for Universal Clamps that are used as End Clamps is 13~14N·m.

The recommend torque for Universal Clamps that are used as Inter Clamps is 18~20N·m.

5.3.3 Apply one pre-assembled Grounding Lug per T Rail. Click the Grounding Lug into the channel of the T Rail and insert the Copper Wire. (the maximum size is 6AWG or similar) Then fasten the bolt M6*10 with 10N·m and fasten the bolt M8*25 with 13.5N·m as shown in the Fig.32.

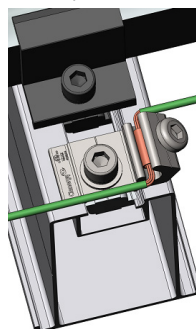


Fig.32

5.3.4 Now the installation is completed as shown in Fig.33. Please recheck all Bolts and fasten them tightly according to the recommended torque. The PV Modules should be aligned correctly with 18mm gaps when using End and Inter Clamps and 20mm gaps when using Universal Clamps.

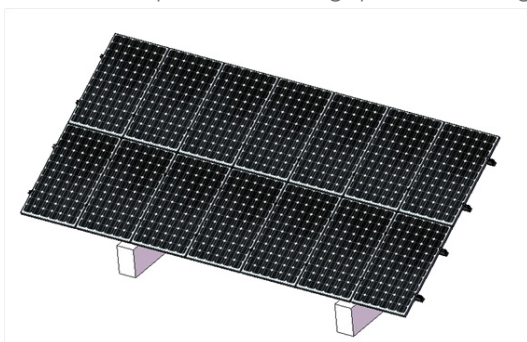


Fig.33

5.4 Ground Screw Installation(Alternative to a Concrete Base and dependent on the system design)

5.4.1 Before the installation, please prepare the necessary installation tools & products, and ensure that the hydraulic pile driver can work normally at the installation site. Read the relevant engineering documents to get the project layout information such as piling depth, column span, etc. If you have any questions, please contact and consult Clenergy customer service.



Fig.34

5.4.2 According to the installation planning, use Total Station (or any instrument of similar functions) to mark out the piling position of each Ground Screw. Check the marked positions before piling, to ensure accuracy.

Piling depth, horizontal and vertical position of Ground Screws are determined by the engineering drawings of the specific project.

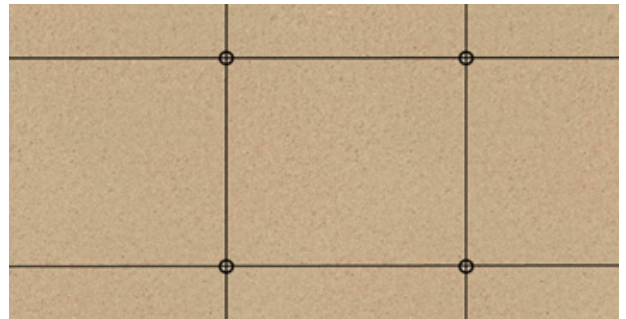


Fig. 35

5.4.3 Ensure all Ground Screws are on the same level and aligned as per the diagram below.

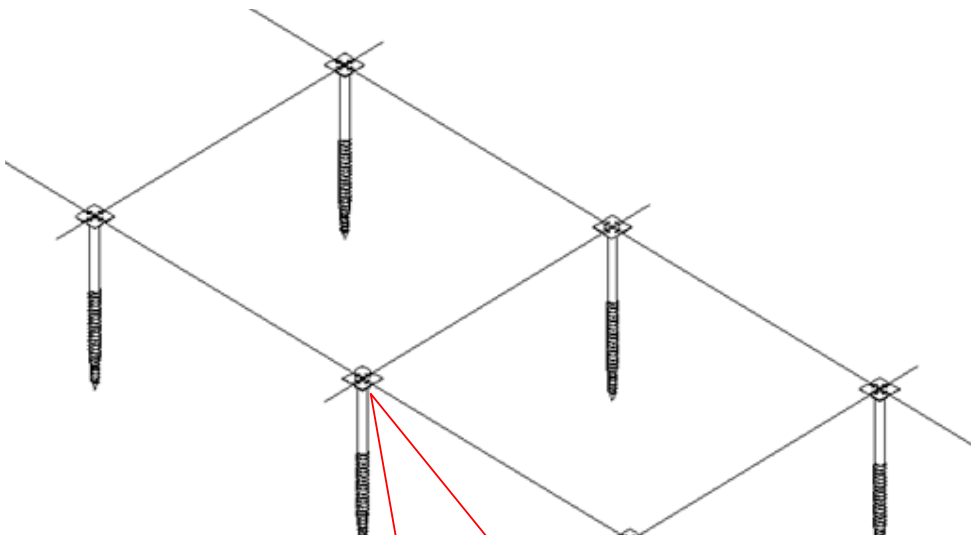


Fig. 36

The maximum allowable connection deviation of the Ground Screw to the Support should be within the range of adjustments shown in Fig. 37 below.

5.4.4 Follow Solution 1 or Solution 2 (on page 15 and 16 depending on either a 30 or 20 degree tilt support) to unfold and construct the pre-assembled support.

5.4.5 Connect the Pre-assembled Support to the Ground Screw by using Hexagonal Bolt M16*50(with Nut and washer)

Recommended Torque:

M16: 135~150N·m

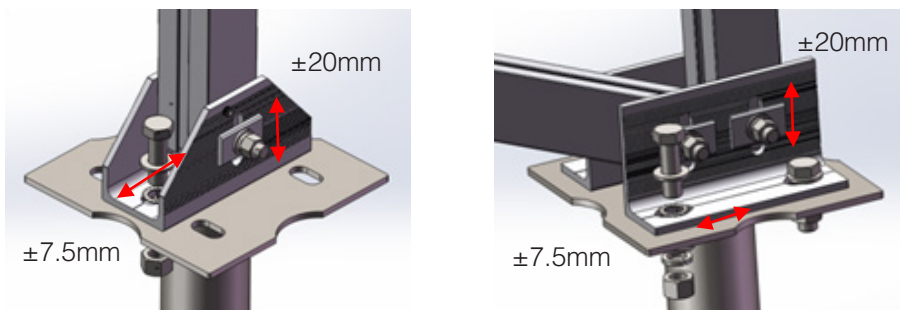


Fig.37

Ground screw connection plate enables the connection of either U or L anchors, which also allows some adjustment to the support structure as shown in Fig. 37 above.

6. Warranty

10 year limited Product Warranty, 5 year limited Finish Warranty

Clenergy (Xiamen) Technology co. Ltd warrants to the original purchaser ("Purchaser") of product(s) that it manufactures ("Product") at the original installation site that the Product shall be free from defects in material and workmanship for a period of ten (10) years. The anodised finish shall be free from visible peeling, or cracking or chalking under normal atmospheric conditions for a period of five (5) years, from the earlier of 1) the date the installation of the Product is completed, or 2) 30 days after the purchase of the Product by the original Purchaser ("Finish Warranty").

The Finish Warranty does not apply to any foreign residue deposited on the finish. All installations in corrosive atmospheric conditions are excluded. The Finish Warranty is VOID if the practices specified by AAMA 609 & 610-02 – "Cleaning and Maintenance for Architecturally Finished Aluminum" (www.aamanet.org) are not followed by Purchaser. This Warranty does not cover damage to the Product that occurs during its shipment, storage, or installation.

This Warranty shall be VOID if installation of the Product is not performed in accordance with Clenergy's written installation instructions, or if the Product has been modified, repaired, or reworked in a manner not previously authorized by Clenergy IN WRITING, or if the Product is installed in an environment for which it was not designed. Clenergy shall not be liable for consequential, contingent or incidental damages arising out of the use of the Product by Purchaser under any circumstances.

If within the specified Warranty periods the Product shall be reasonably proven to be defective, then Clenergy shall repair or replace the defective Product, or any part thereof, at Clenergy's sole discretion. Such repair or replacement shall completely satisfy and discharge all of Clenergy's liability with respect to this limited Warranty. Under no circumstances shall Clenergy be liable for special, indirect or consequential damages arising out of or related to use by Purchaser of the Product.

Manufacturers of related items, such as PV modules and flashings, may provide written warranties of their own. Clenergy's limited Warranty covers only its Product, and not any related items.

Cetification Letter

Our Ref: 4679-1 / BG+LvS
3 August 2018

Clenergy Australia
1/10 Duerdin Street
Clayton, VIC 3168

Array Frame Engineering Certificate

RE: Solar Terrace III-A with Panels 1700×1000 mm Installation

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian and NZ Building Regulations, have carried out a structural design check of the PV-ezRack SolarTerrace III-A with panels 1700×1000mm within Australia and New Zealand. The design check has been based on the information in the *PV-ezRack SolarTerrace III-A Planning and Installation Guide v1* and schematic drawings of the system components, provided by Clenergy Australia.

Component Description	Part Number
T-Rail 110	ER-R-T110/XX
PV-ezRack SolarTerrace III-A, Single Support (Pre-assembled) 20°, with 2800 mm Girder	ER-S-STIIIA/S20
PV-ezRack SolarTerrace III-A, Single Support (Pre-assembled) 30°, with 2800 mm Girder	ER-S-STIIIA/S30
Splice for T-Rail 110	ER-SP-T110
PV-ezRack Inter Clamp	ER-IC-STXX
PV-ezRack End Clamp	ER-EC-STXX
PV-ezRack Universal Clamp for Frame Height 30-46mm with Grounding Clip	C-U/30/46-G
PV-ezRack Universal Clamp for Frame Height 30-46mm	C-U/30/46
PV-ezRack T-Rail Clamp with Grounding	ER-RC-T/G
East/West Adjustable - Bracket for T-Rail 110	BR-R110/EW

We find the SolarTerrace III-A to be structurally sufficient for Australian and New Zealand use, based on the following conditions:

- Wind Loads to AS/NZS1170.2:2011 (R2016);
 - Wind Terrain Category 2;
 - Wind average recurrence interval of 100 years (ultimate);
 - Wind region A, B, C & D;
 - No shielding considered ($M_s=1$)
- Soils classification and properties to AS/NZS 4676-2000 and AS4678-2002;
- Solar Panel size **1.7×1.0 m**, mass approx **15 kg/m²**;
- Maximum support(frame) spacing and footing options: refer following pages.



Relationships built on trust

Gamcorp (Melbourne) Pty Ltd A.C.N 141 076 904 A.B.N 73 015 060 240

www.gamcorp.com.au melbourne@gamcorp.com.au

Suite 4, 346 Ferntree Gully Rd, Notting Hill VIC 3168

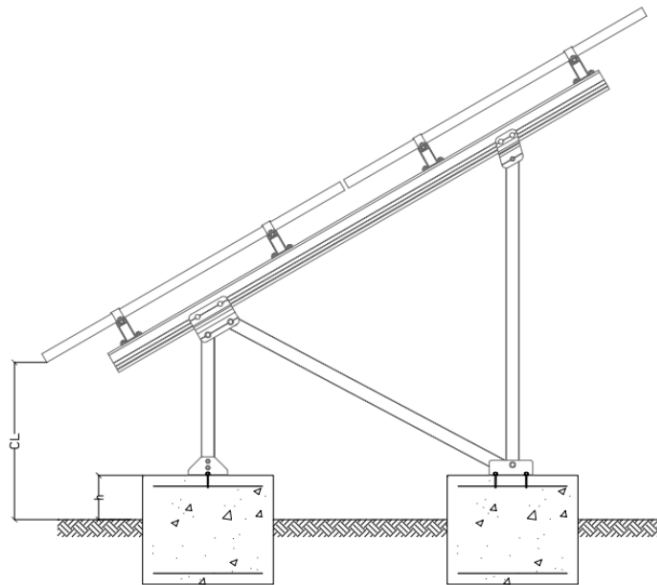
Tel: 03 9543 2211 Fax: 03 9543 4046



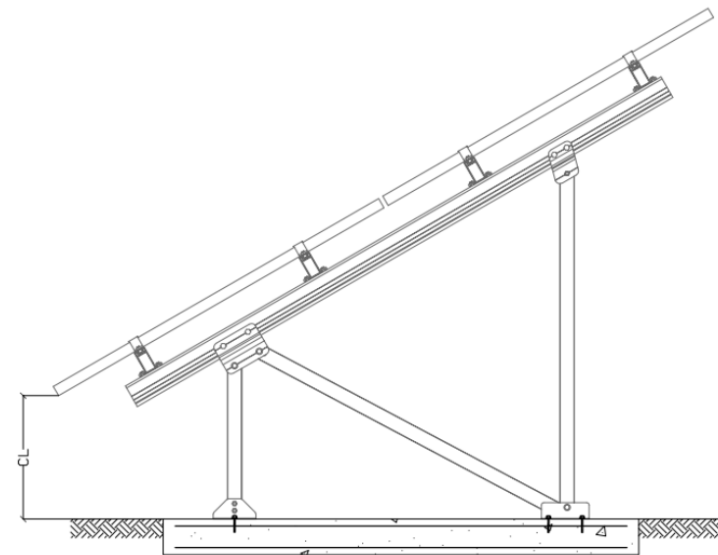
Maximum Support Frame Spacing and Footing Options

Wind region	A								B								C				D					
Regional wind speed (VR, m/s)	41								48								59				73					
Panels Tilt angle	20°				30°				20°				30°				20°				20°					
	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)		
Maximum spacing (S, m)	3.75				3.25				3.65				3.15				3.20				2.7 (2.45*)					
Uplift (kN)	1.8	7.2			0.0	12.6			2.9	9.9			0.0	17.0			4.4	13.3			6.1	17.5				
Down Force (kN)	6.4	4.1			5.4	6.5			7.9	5.2			6.7	8.4			9.8	6.5			12.1	8.1				
Total horizontal force at leg base (kN)	4.0				7.7				5.3				10.2				7.0				9.1					
Footing Type	Concrete Footing Options								Concrete Footing Options								Concrete Footing Options									
Wind region	A								B								C						D			
Continuous Paving Slab, Length x Thickness (L x T)- m	2.20 x 0.15		500	0	2.4 x 0.19		500	0	2.20 x 0.15		500	0	2.40 x 0.19		500	0	2.20 x .19		500	0	2.40 x 0.25		500	0		
Adopt reo	N8@125 both ways (bw) or SL-81								N8@125 both ways (bw) or SL-81								N8@125 both ways (bw) or SL-81						N8@125 both ways (bw) or SL-81			
Continuous Strip Footing, Width x Depth (W x D)- m	0.30x 0.40	0.35x 0.40	700	200	0.35 x 0.50	0.45 x 0.50	500	0	0.35 x 0.45	0.40 x 0.45	700	200	0.50 x 0.58	0.58 x 0.58	700	200	0.50 x 0.50	0.50 x 0.50	700	200	0.55 x 0.65	0.60 x 0.65	600	100		
Adopt reo	SL-81								SL-81								SL-81				SL-81					
Individual Pad footing per leg, Length (=Width) x Depth (B x C x X)	0.45 x 0.45 x 0.55	0.50 x 0.50 x 0.55	700	200	0.85 x 0.85 x 0.9	0.90 x 0.90 x 0.9	800	300	0.5x 0.5 x 0.6	0.6 x 0.6 x 0.6	800	300	0.9 x 0.9 x 0.9	1.0 x 1.0 x 0.9	900	400	0.60x 0.60x 0.65	0.65 x 0.65 x 0.65	700	200	0.7 x 0.7 x 0.75	0.7 x 0.7 x 0.75	700	200		
Adopt reo	SL-81								SL-81								SL-81				SL-81					
Transverse Strip Footing, Length x Width x Depth (L x A x D)	2.20 x 0.60 x 0.60		900	400	2.50 x 0.70 x 0.70		800	300	2.35 x 0.65 x 0.65		600	100	2.75 x 0.75 x 0.75		600	100	2.40 x 0.75 x 0.75		600	100	2.7 x 0.8 x 0.8		600	100		
Adopt reo	SL-81								SL-81								SL-81				SL-81					

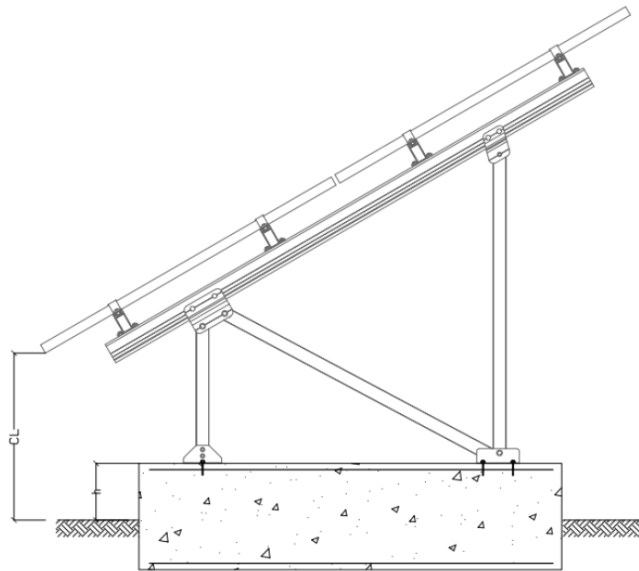
Note(*): when using east west adaptor



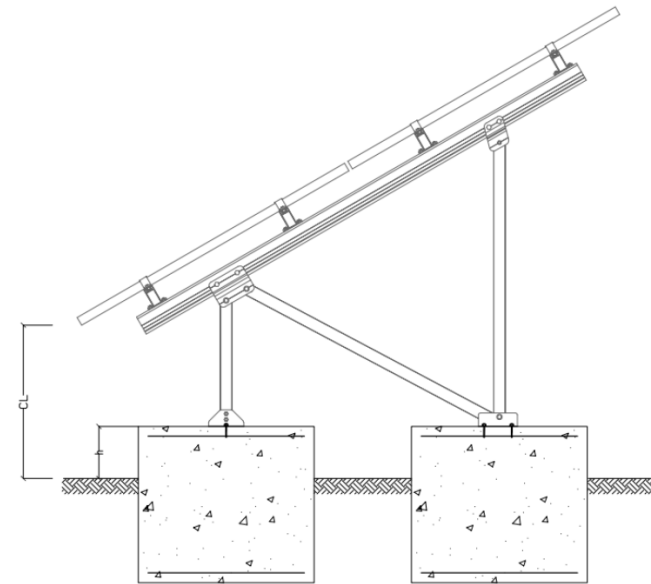
Continuous Strip Footing



Continuous Paving Slab



Transverse Strip Footing



Individual Pad footing

Notes:

1. The footing examples shown, recommended for 'Firm' soils with allowable end bearing capacity of 100 kPa minimum (damp clays, sandy clays, damp sands). Contact Gamcorp for site specific conditions (to find out whether more cost effective solution is possible).
2. Concrete grade: N25 minimum, cover: 50mm (Contact Gamcorp to find out whether more cost effective solution is possible, based on site specific conditions).
3. For the fixing of STIII-A to the concrete footing we recommend using M16 (Grade 5.8 Carbon Steel anchor studs or similar). Adopt minimum anchor embedment depth according the anchors manufacturer's manual. Clenergy STIII-A has 6 anchors per frame, 2 at front and 4 at rear.
4. Other footing options are possible – contact Gamcorp.

Construction is to be carried out strictly on accordance with the instruction manual. This work was designed by **Behrooz Ghaemi** in accordance with the provisions of Australian Building Regulations and in accordance with sound, widely accepted engineering principles. Should you need to clarify anything please contact the designer. This certification is valid till 3 July 2021.

Yours faithfully,
Gamcorp (Melbourne) Pty Ltd

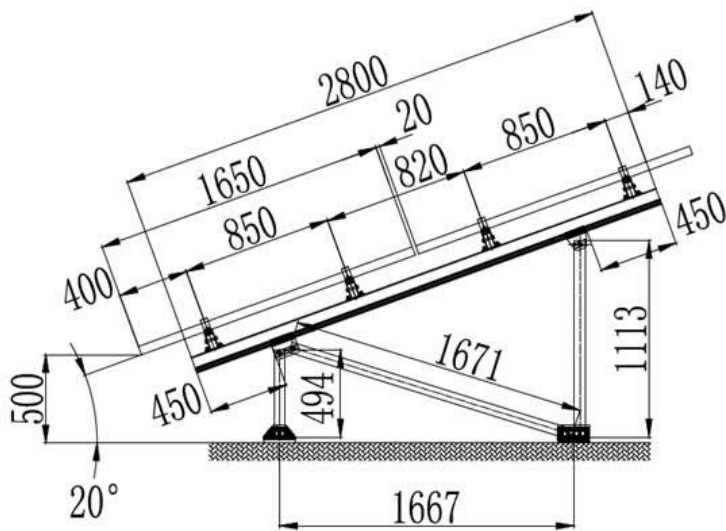


<u>L. Van Spaandonk</u>	
Principal Engineer	
MIEAust MscEng NER	

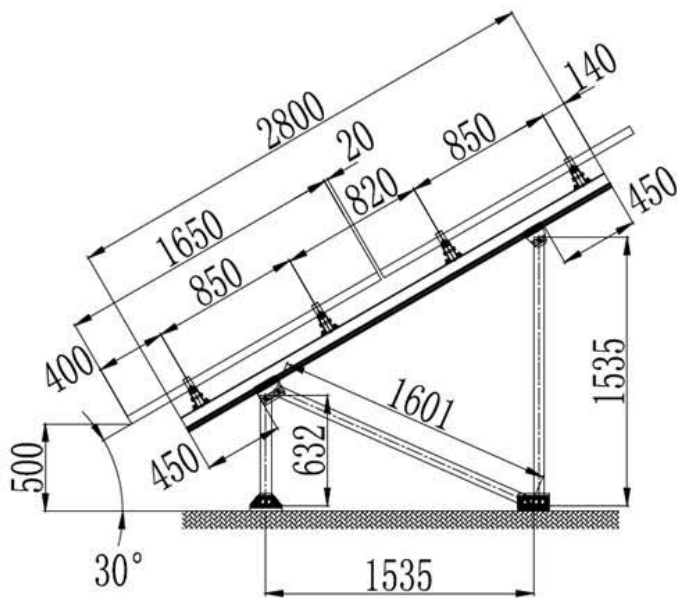
Attachments

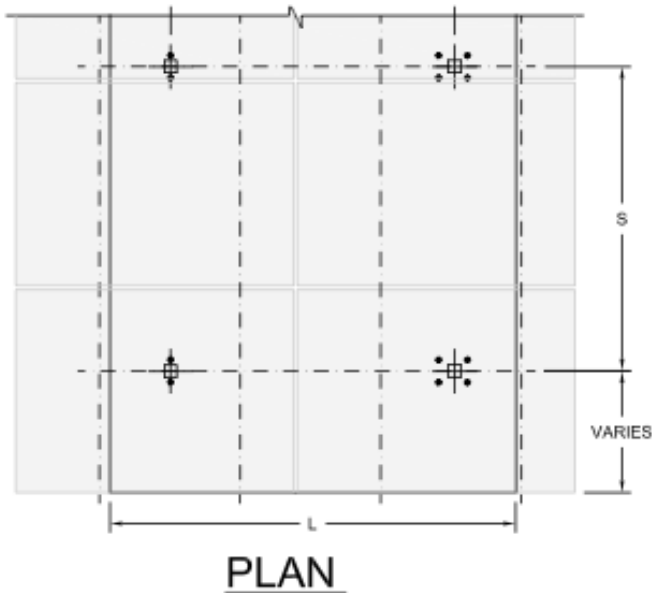
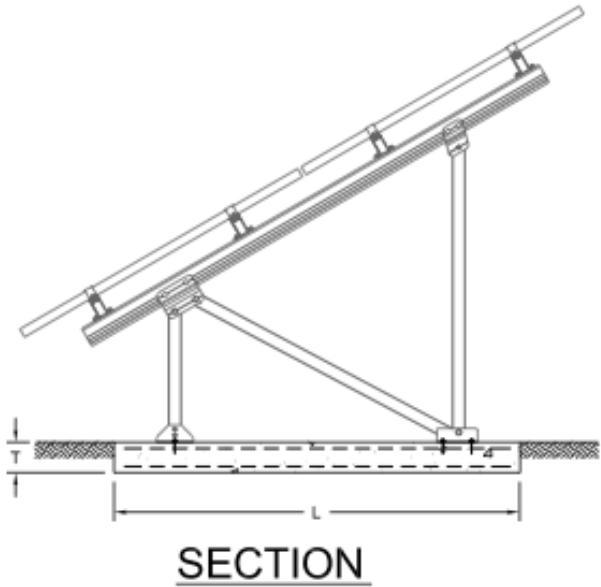
- Frames pictures by Clenergy
- Footing drawings by Gamcorp (S01-S04)

Part Number: ER-S-STIIIA/S20

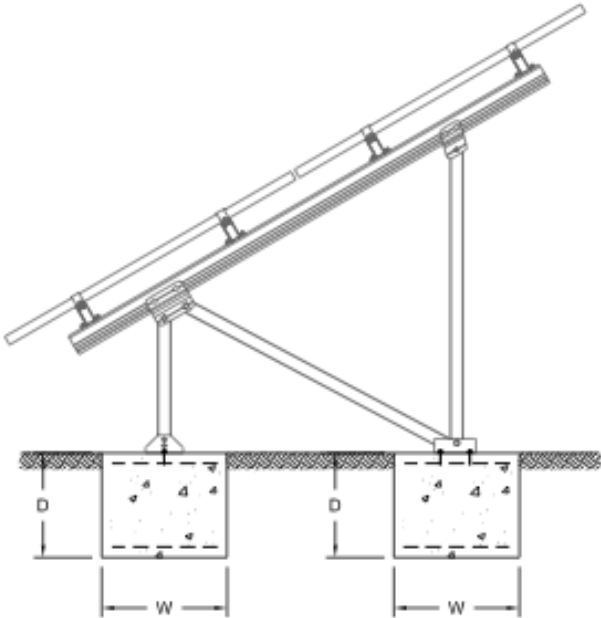


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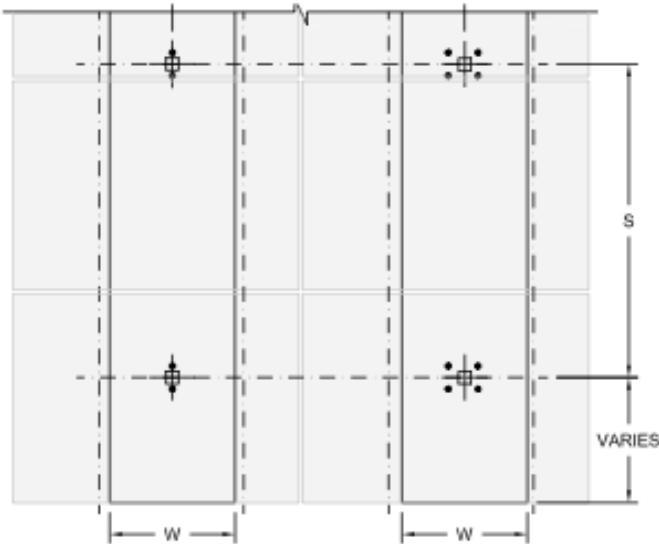




S01. Continuous Paving Slab

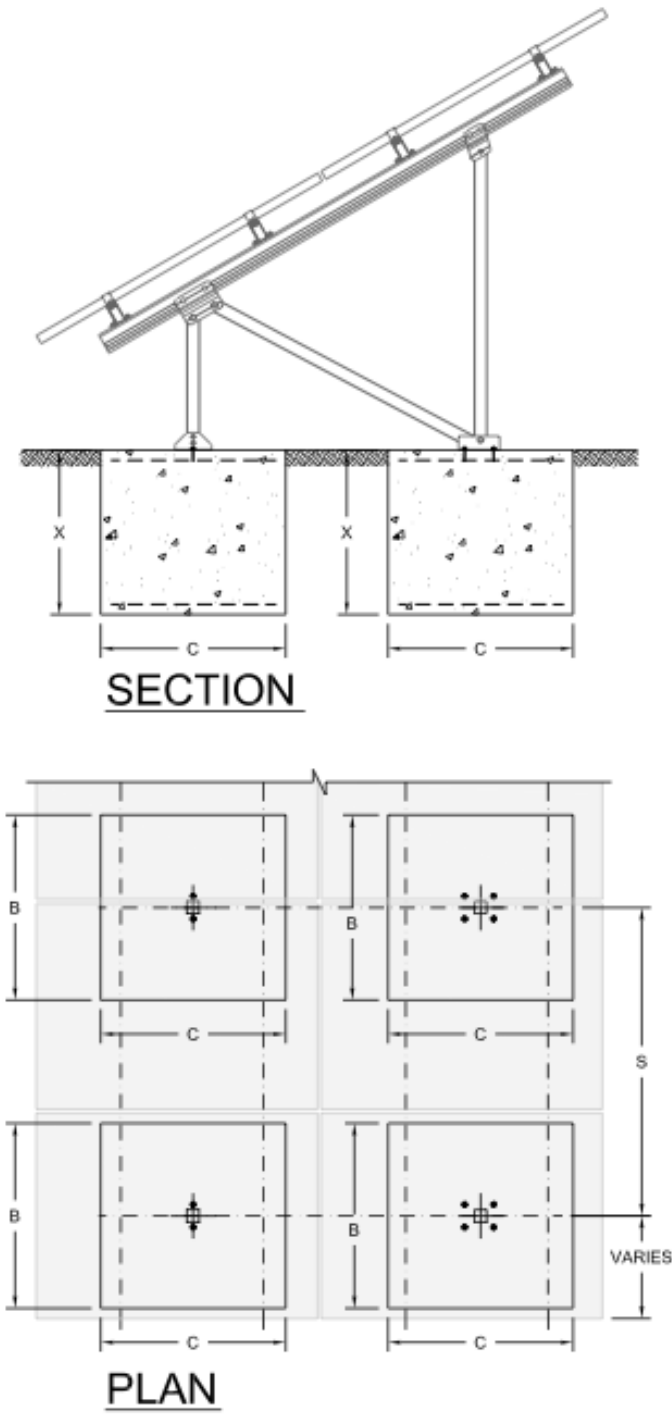


SECTION



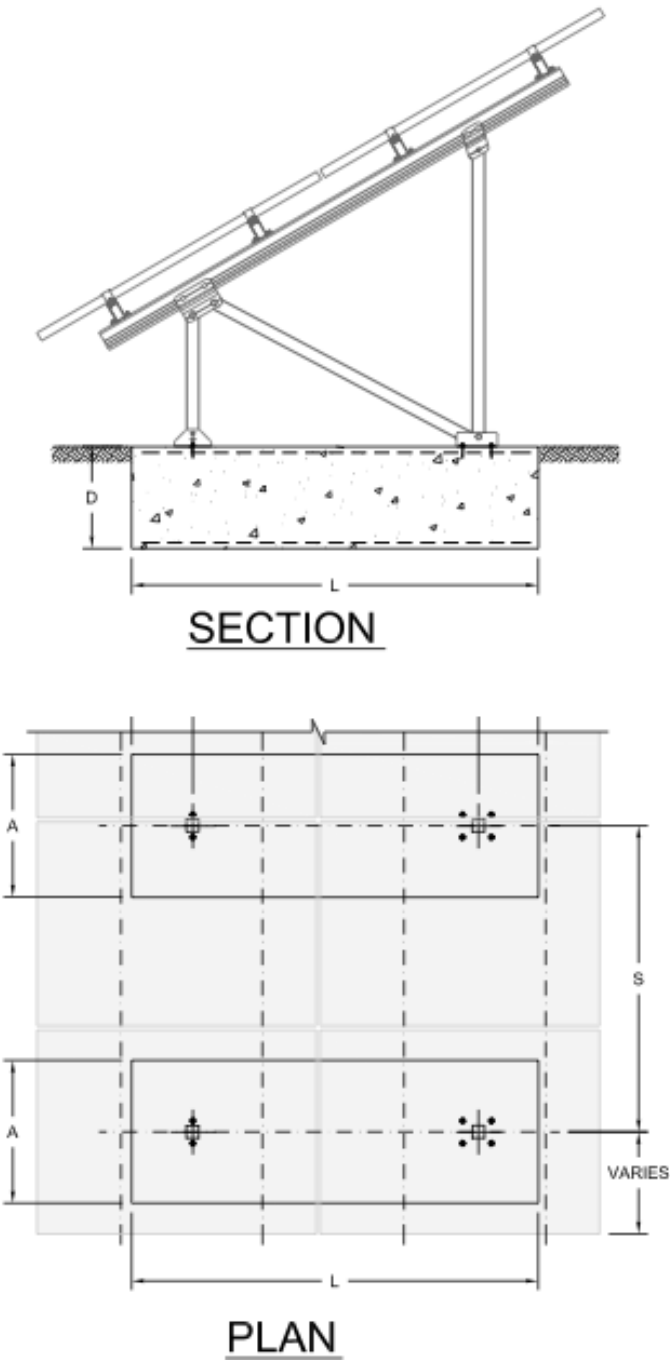
PLAN

S02. Continuous Strip Footing



S03. Individual Pad footing per leg

ISO 9001:2008 Registered Firm
Certificate No: AU1222



S04. Transverse Strip Footing

Clenergy Australia
1/10 Duerdin Street
Clayton, VIC 3168

Array Frame Engineering Certificate

RE: SolarTerrace III-A with panels 2000×1100mm Installation

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian and NZ Building Regulations, have carried out a structural design check of the PV-ezRack SolarTerrace III-A with panels 2000mm × 1100mm within Australia and New Zealand. The design check has been based on the information in the *PV-ezRack SolarTerrace III-A Planning and Installation Guide v1* and schematic drawings of the system components, provided by Clenergy Australia.

Component Description	Part Number
T-Rail 110	ER-R-T110/XX
PV-ezRack SolarTerrace III-A, Double Support (Pre-assembled) 20°, with 3200 mm Girder	ER-S-STIIIA/D20
PV-ezRack SolarTerrace III-A, Double Support (Pre-assembled) 30°, with 3200 mm Girder	ER-S-STIIIA/D30
Splice for T-Rail 110	ER-SP-T110
PV-ezRack Inter Clamp	ER-IC-STXX
PV-ezRack End Clamp	ER-EC-STXX
PV-ezRack Universal Clamp for Frame Height 30-46mm with Grounding Clip	C-U/30/46-G
PV-ezRack Universal Clamp for Frame Height 30-46mm	C-U/30/46
PV-ezRack T-Rail Clamp with Grounding	ER-RC-T/G
East/West Adjustable - Bracket for T-Rail 110	BR-R110/EW

We find the SolarTerrace III-A to be structurally sufficient for Australian and New Zealand use, based on the following conditions:

- Wind Loads to AS/NZS1170.2:2011 (R2016);
 - Wind Terrain Category 2;
 - Wind average recurrence interval of 100 years (ultimate);
 - Wind region A, B, C & D;
 - No shielding considered ($M_s=1$)
- Soils classification and properties to AS/NZS 4676-2000 and AS4678-2002;
- Solar Panel size **2.0 m × 1.1 m**, weight approx **15kg/m²**;
- Maximum support(frame) spacing and footing options at the edge zone: refer following pages.
- For ground screws option see Gamcorp letter 6292



Relationships built on trust

Gamcorp (Melbourne) Pty Ltd A.C.N 141 076 904 A.B.N 73 015 060 240
www.gamcorp.com.au melbourne@gamcorp.com.au
 Suite 4, 346 Ferntree Gully Rd, Notting Hill VIC 3168
 Tel: 03 9543 2211

Maximum Support Frame Spacing and Footing Options

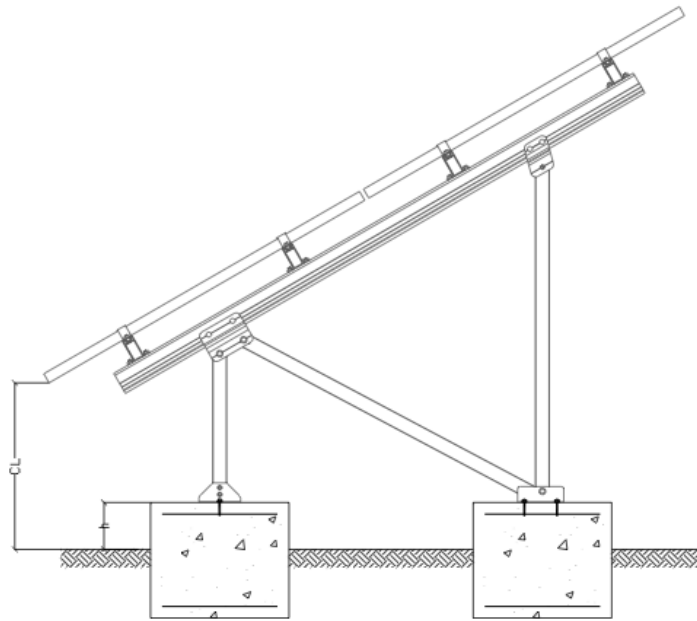
Wind region	A								B								C						D					
Regional wind speed (VR, m/s)	41								48								59						73					
Panels Tilt angle	20°				30°				20°				30				20°						20°					
	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)	Front Leg	Rear Leg	Cl(mm)	h(mm)
Maximum spacing (S, m)	3.60				3.10				3.50				2.95				3.00				2.00 (1.90*)							
Uplift (kN)	0.1	10.7			0.1	16.0			0.5	15.0			0.0	22.3			1.1	20.3			1.5	21.5						
Down Force (kN)	6.2	5.8			5.0	8.4			7.5	8.1			6.8	11.5			9.1	10.2			8.8	10.4						
Total horizontal force at leg base (kN)	4.5				8.6				6.0				11.2				7.7				7.9							
Footing Type	Concrete Footing Options								Concrete Footing Options								Concrete Footing Options						Concrete Footing Options					
Wind region	A								B								C						D					
Continuous Paving Slab, Length x Thickness (L x T)- m	2.30 x 0.15		500	0	2.3 x 0.20		500	0	2.30 x 0.20		500	0	2.40 x 0.25		500	0	2.40 x 0.25		500	0	2.65 x 0.30		500	0				
Adopt reo	N8@125 both ways (bw) or SL-81								N8@125 both ways (bw) or SL-81								N8@125 both ways (bw) or SL-81						N8@125 both ways (bw) or SL-81					
Continuous Strip Footing, Width x Depth (W x D)- m	0.30x0.40	0.35x0.40	700	200	0.35 x 0.55	0.55 x 0.55	700	200	0.35 x 0.45	0.45 x 0.45	700	200	0.55 x 0.65	0.65 x 0.65	700	200	0.50 x 0.55	0.55 x 0.55	700	200	0.55 x 0.60	0.70 x 0.60	600	100				
Adopt reo	SL-81								SL-81								SL-81						SL-81					
Individual Pad footing per leg, Length (=Width) x Depth (B x C x X)	0.50 x 0.50 x 0.60	0.70 x 0.70 x 0.60	700	200	0.85 x 0.85 x 0.9	0.95 x 0.95 x 0.9	900	400	0.55x 0.55 x 0.75	0.75 x 0.75 x 0.75	800	300	0.95 x 0.95 x 0.9	1.05 x 1.05 x 0.9	900	400	0.60x 0.60x 0.75	0.75 x 0.75 x 0.75	700	200	0.70 x 0.70 x 0.75	0.80 x 0.80 x 0.75	700	200				
Adopt reo	SL-81								SL-81								SL-81						SL-81					
Transverse Strip Footing, Length x Width x Depth (L x A x D)	2.30 x 0.75 x 0.60		600	100	2.50 x 0.80 x 0.80		700	200	2.50 x 0.75 x 0.70		600	100	2.85 x 0.85 x 0.80		600	100	2.70 x 0.85 x 0.80		900	400	2.90 x 0.80 x 0.80		1000	500				
Adopt reo	SL-81								SL-81								SL-81						SL-81					

Note(*): when using east west adaptor

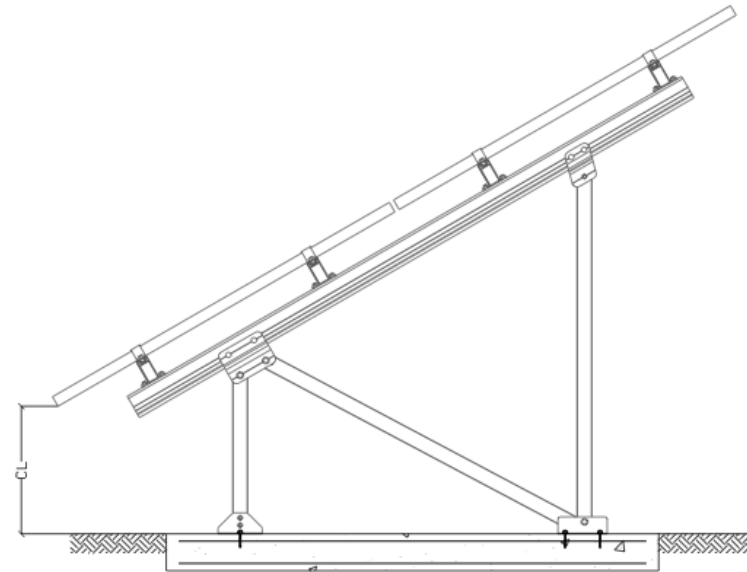


Relationships built on trust

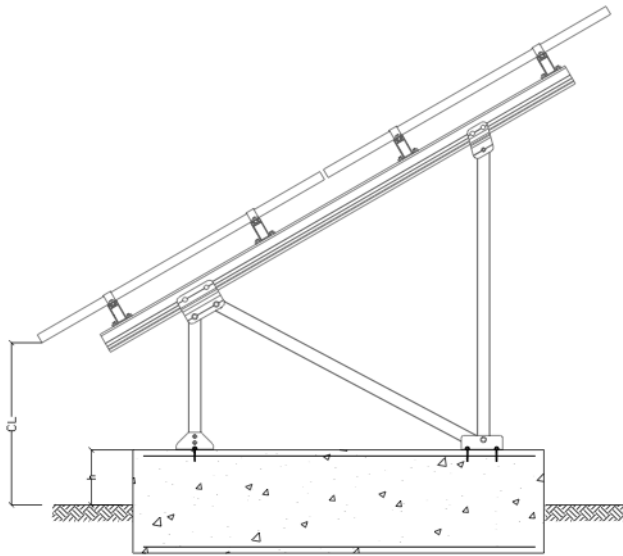
Gamcorp (Melbourne) Pty Ltd A.C.N 141 076 904 A.B.N 73 015 060 240
www.gamcorp.com.au melbourne@gamcorp.com.au
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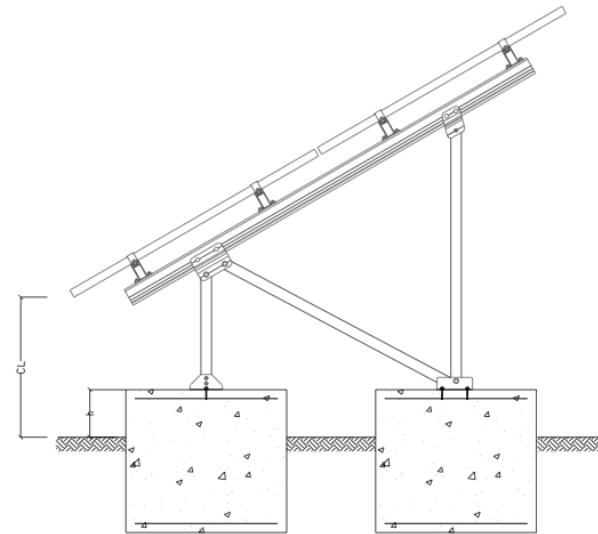
Continuous Strip Footing



Continuous Paving Slab



Transverse Strip Footing



Individual Pad footing



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Suite 4, 346 Ferntree Gully Rd, Notting Hill VIC 3168
Tel: 03 9543 2211

Notes:

1. The footing examples shown, recommended for 'Firm' soils with allowable end bearing capacity of 100 kPa minimum (damp clays, sandy clays, damp sands). Contact Gamcorp for site specific conditions (to find out whether more cost effective solution is possible).
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Construction is to be carried out strictly on accordance with the instruction manual. This work was designed in accordance with the provisions of Australian Building Regulations and in accordance with sound, widely accepted engineering principles. This certification is valid till 28 October 2021.

Yours faithfully,
Gamcorp (Melbourne) Pty Ltd

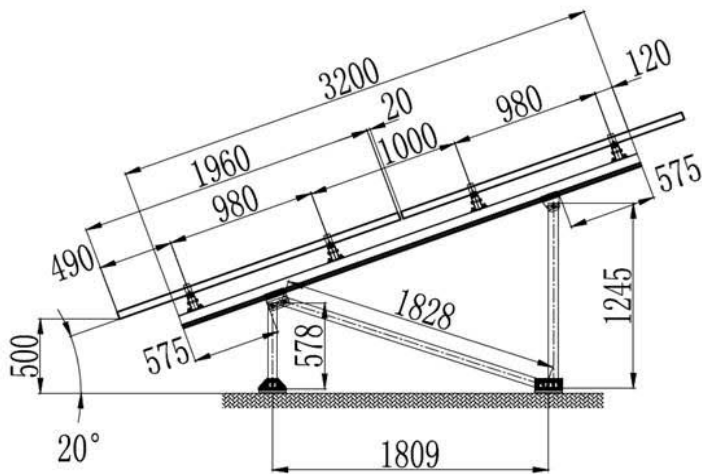
A handwritten signature in black ink, appearing to read "L. Van Spaandonk".

L. Van Spaandonk
Principal Engineer
FIEAust CPEng NER

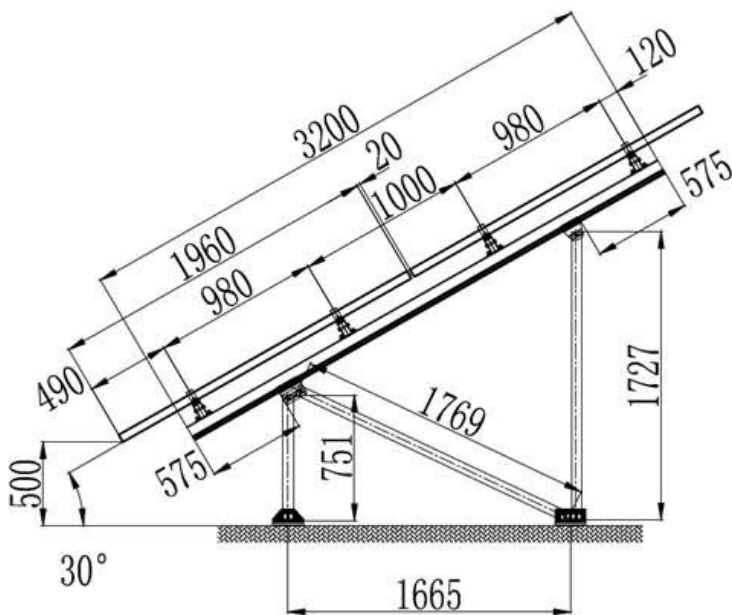
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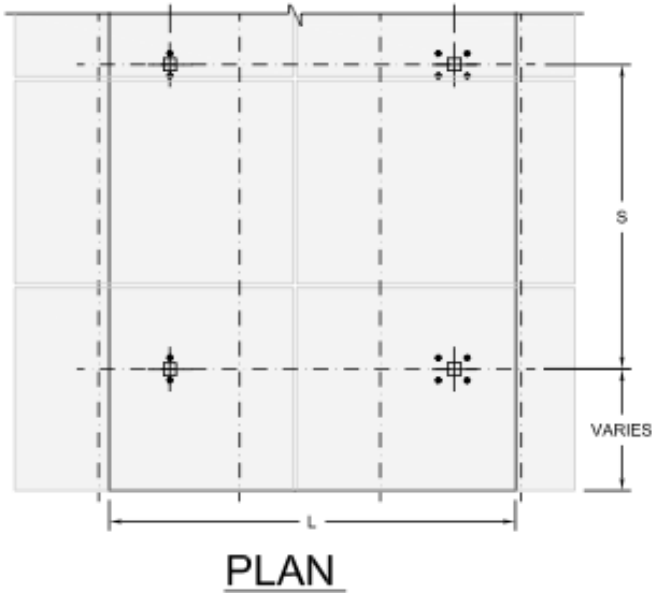
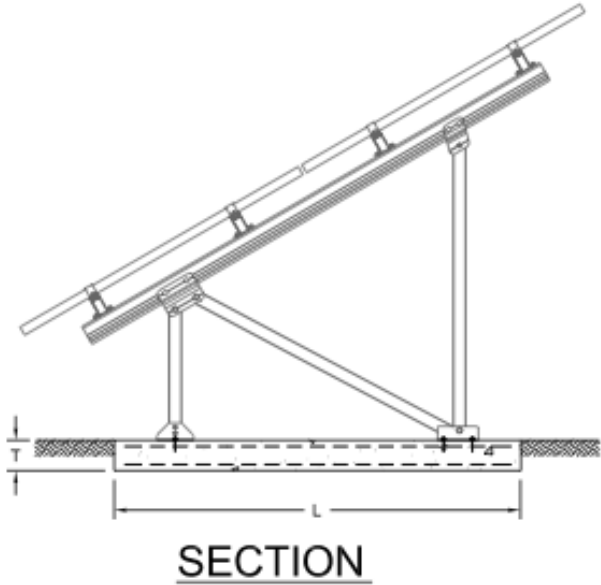
- Frames pictures by Clenergy
- Footing drawings by Gamcorp (S01-S04)

Part Number: ER-S-STIIIA/D20

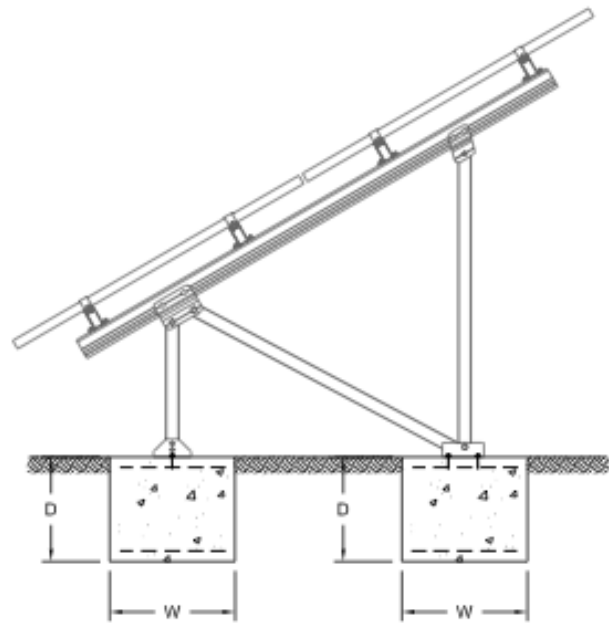


Part Number: ER-S-STIIIA/D30

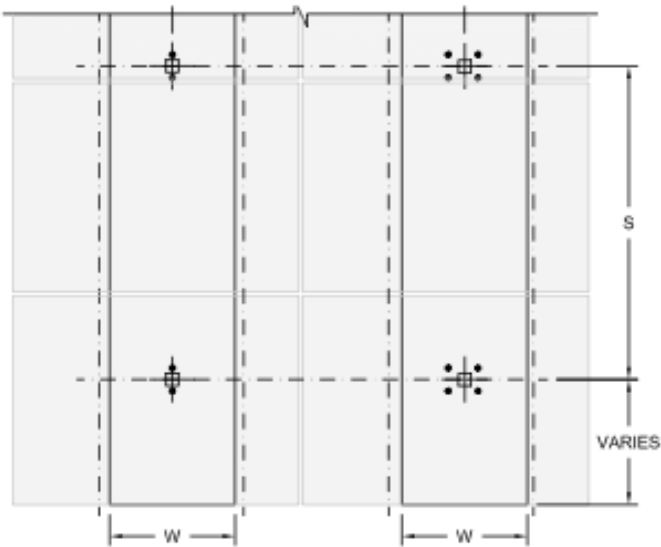




S01. Continuous Paving Slab

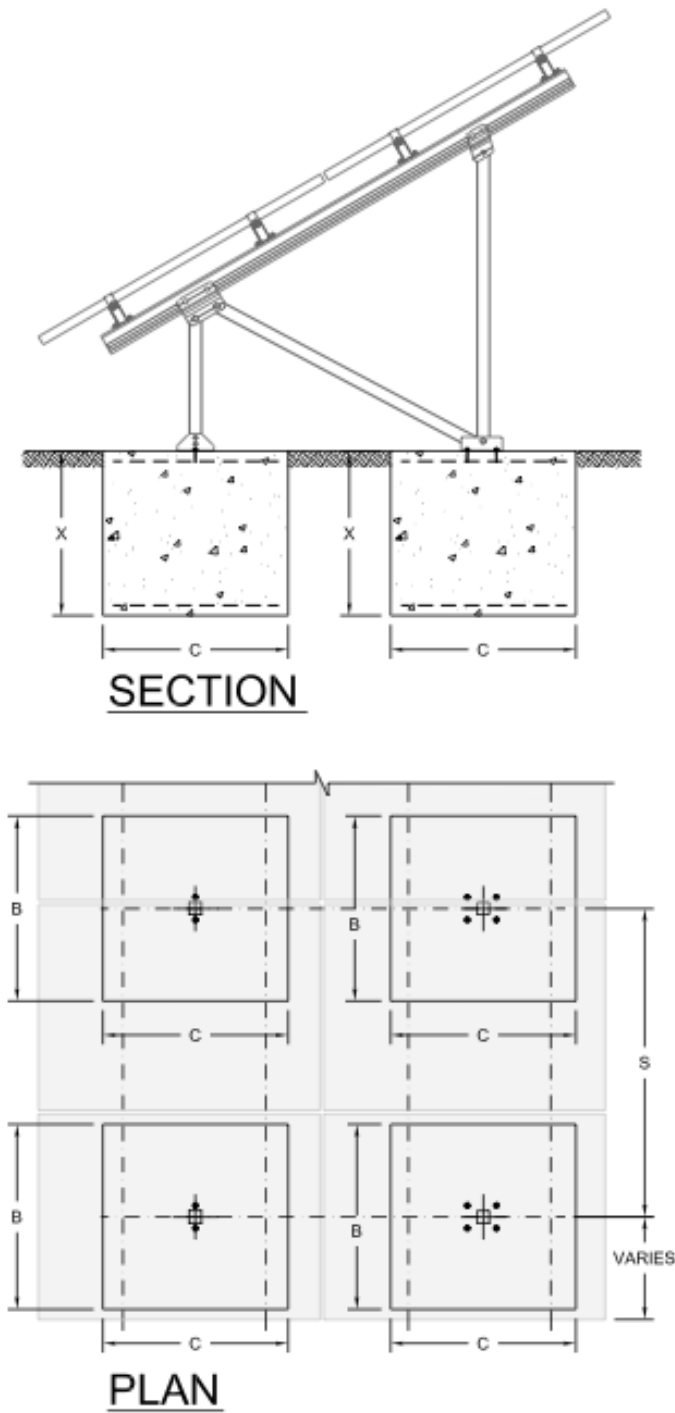


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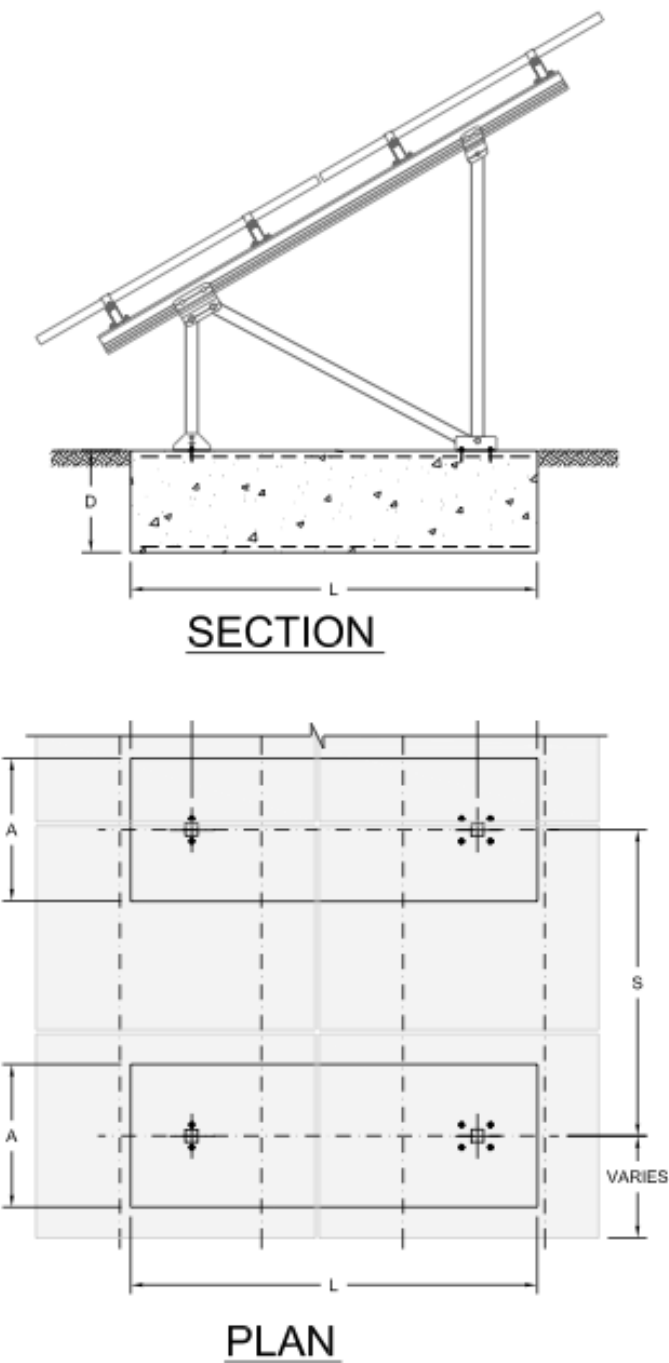


PLAN

S02. Continuous Strip Footing



S03. Individual Pad footing per leg



S04. Transverse Strip Footing



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E-mail: sales_th@clenergy.com, support_th@clenergy.com

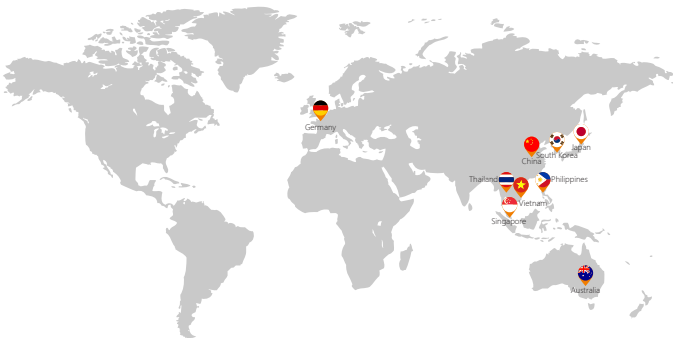
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Worldwide Network



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