PV-ezRACK®

SolarTerrace III-A

Code-Compliant Planning and Installation V 4.0
Complying with AS/NZS 1170.2:2021

SOLAR TERRACE

Last Updated - Oct. 2023

Introduction

Clenergy PVezRack® SolarTerrace III-A is a pre-assembled ground mount system suitable for large scale commercial and utility scale installations. PVezRack® 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 PVezRack® 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 1170.2:2021 standard. During installation please comply with the appropriate safety regulations, and please also comply with the relevant regulations of your local region.

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

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

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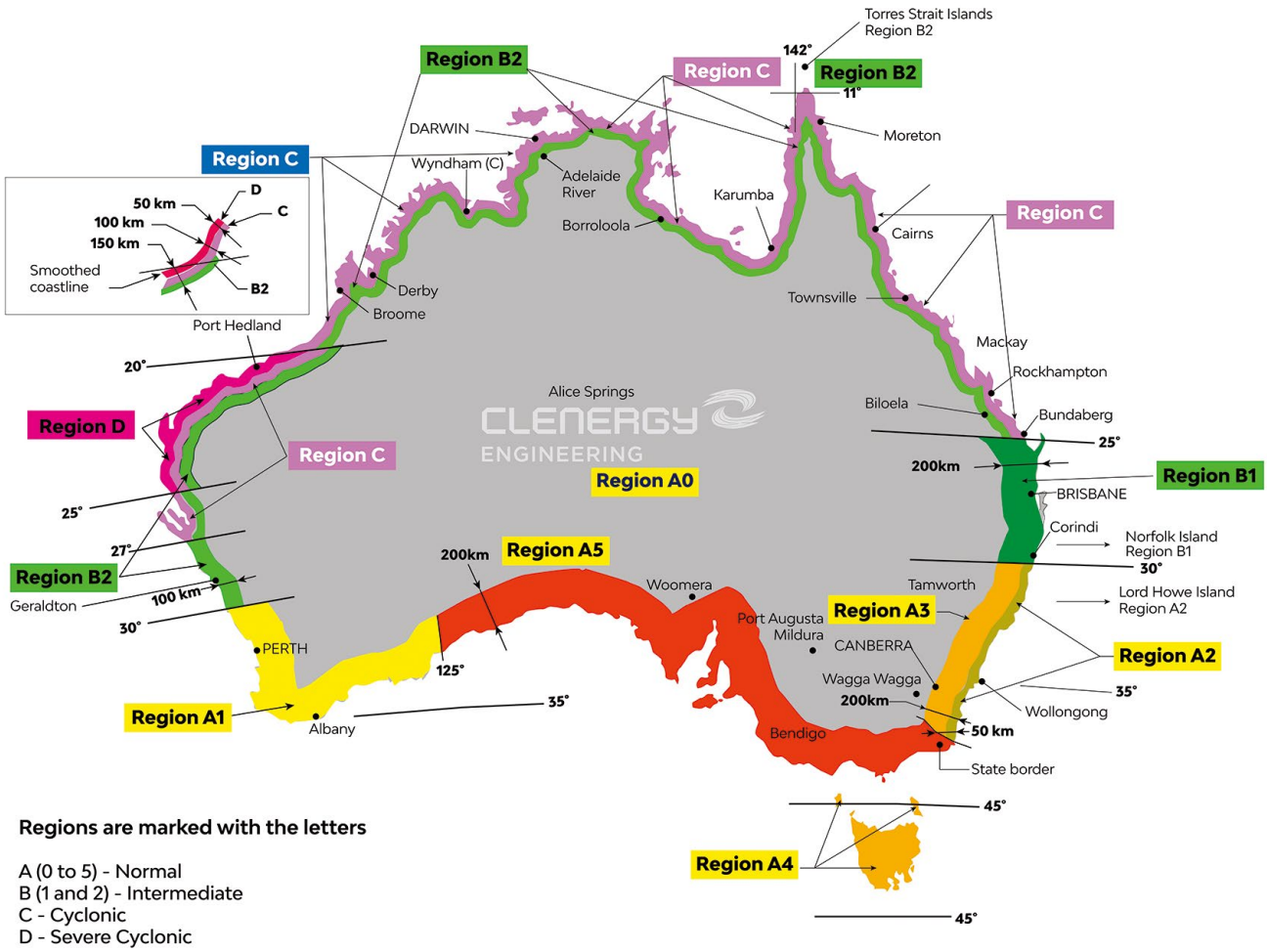
The installer is solely responsible for:

- Comply with all applicable local or national building codes, including any 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® (substitution of parts may void the warranty and invalidate the letter of certification);
- 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 PVezRack® SolarTerrace III-A components as required in AS/NZS 5033: 2021.

Planning

Determine the wind region of your installation site

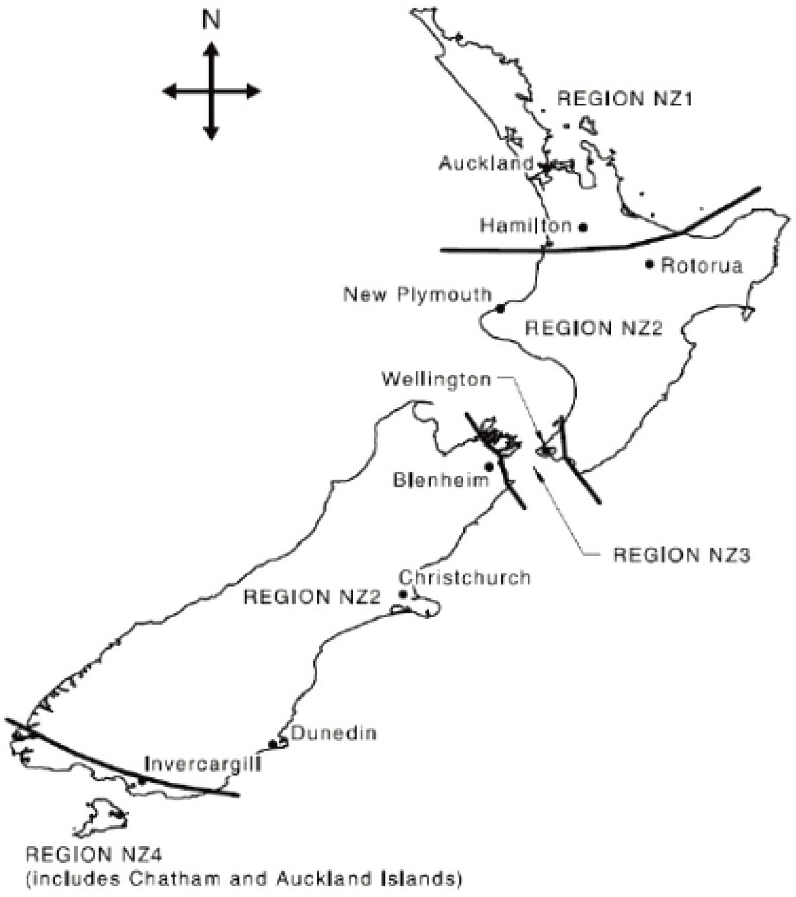


Wind Regions – Australia

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.

Wind regions map below shows 4 different wind regions in New Zealand: NZ1, NZ2, NZ3 and NZ4.



Wind Regions – New Zealand

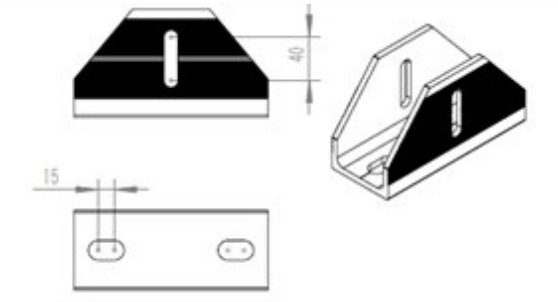
Installation Spacing and Concrete (or Ground Screws) Footing Options

Please refer to the certification letters for max support spacing and different footing options of different PV solar panels up to 2400 x 1400 mm.

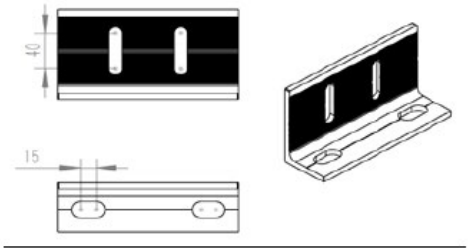
Range of Adjustment

The system can be adjusted using the anchor plates below. Table 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.

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



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.

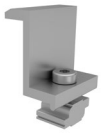
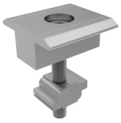
Installation with Ground Screw		
Adjustable area	Adjustable part	Adjustable Range
Front leg Up-down	NA	--
Front leg North-South	Ground Screw	± 7.5mm
Front leg East-West	NA	--
Rearleg Up-down	NA	--
Rearleg North-South	Ground Screw	± 7.5mm
Rearleg East-West	NA	--

Tools and Components

Tools

 Allen Key 6 mm (M8Hexagon Socket Screw)	 Electric Drill (ST4.8x16 self-tapping screw & M8Hexagon Socket Screw)	 Tape	 Torque Wrench	 String
 Mark Pen	 Wrench	 Socket Wrench M8/M12	 Total Station or Equivalent Instrument	

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/UC Grounding lug with U-shape copper channel

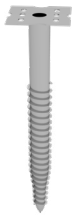
Components

EZ-GL-AT
The Austin – Commercial Grounding Lug with SUS316

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

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

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

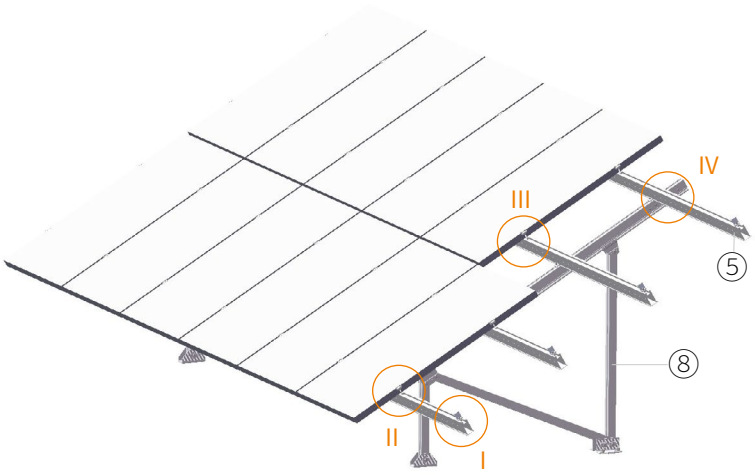


GS-76/3.5/16-F0, GS-76/3.5/13-F0
Ground Screw, 1300 or 1600 mm

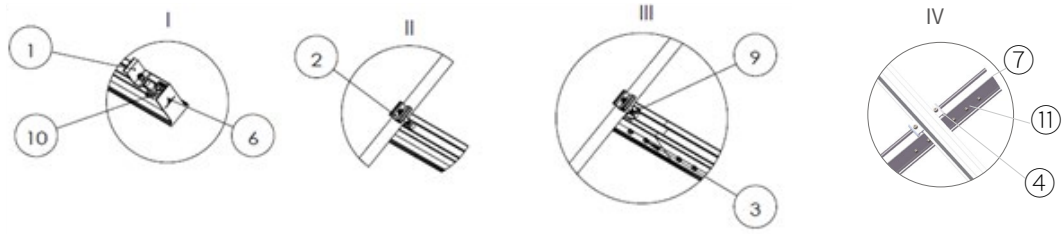
GE-STA/200
Girder Extension, 200mm

System Overview

Overview of PVezRack® SolarTerrace 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
11. Girder Extension



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.

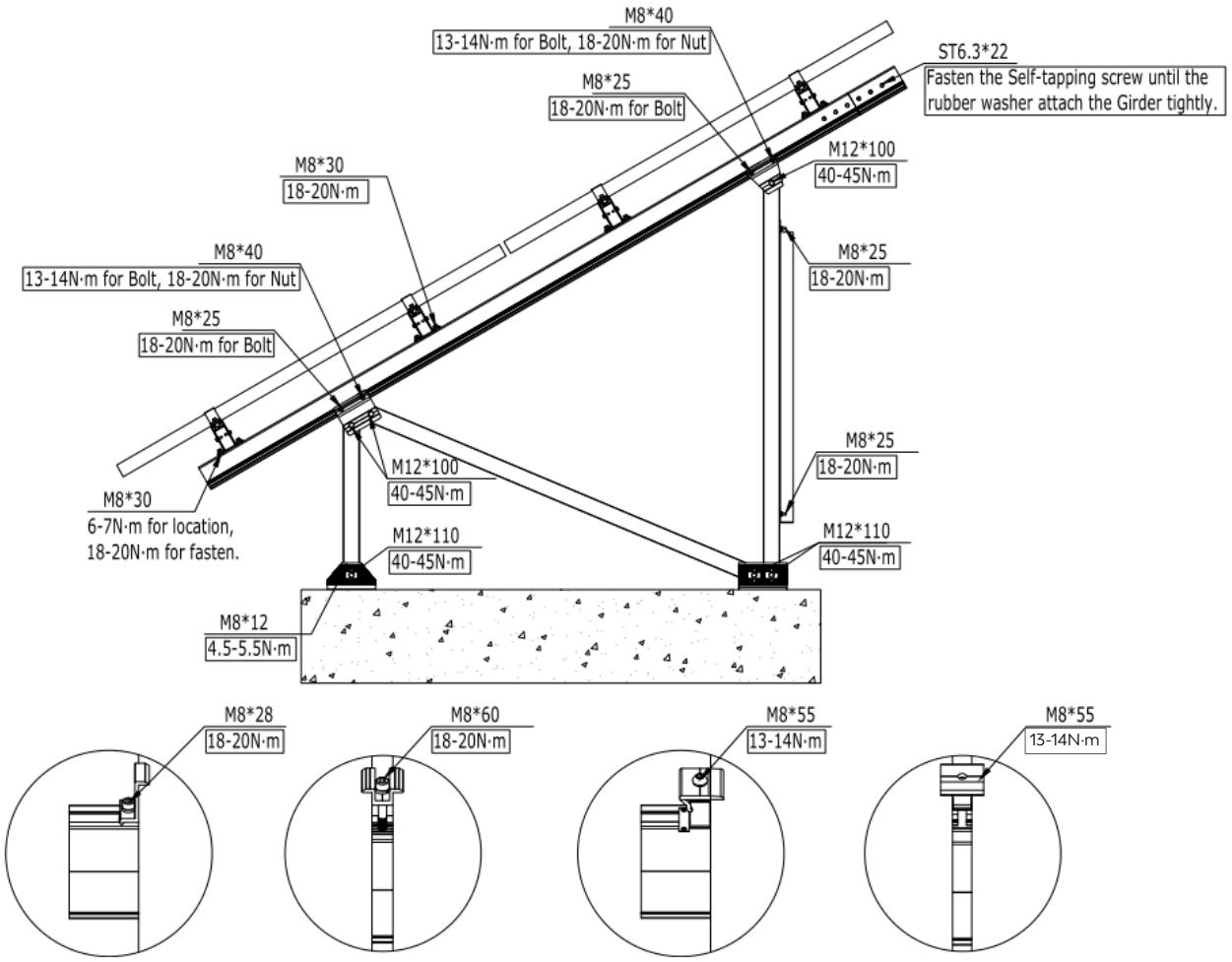
General installation instructions

(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.

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



Safe Torques

Installation Dimensions

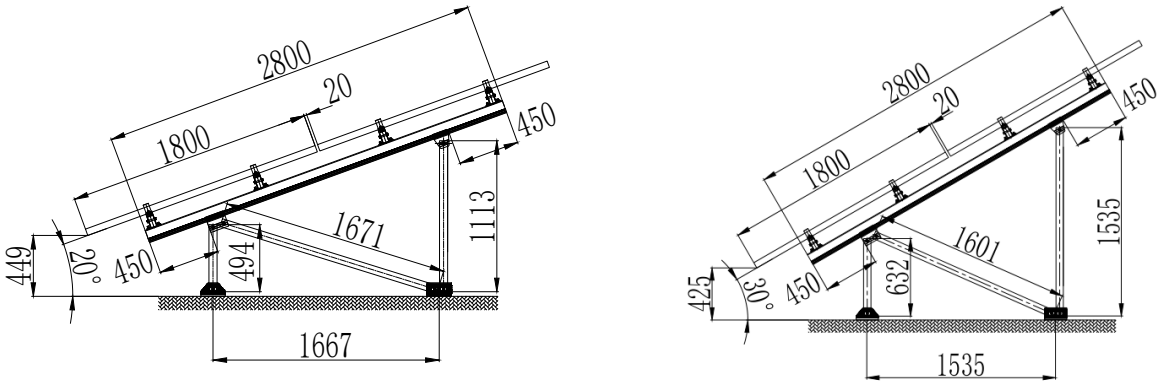
All drawings and dimensions in this installation guide are for a generic reference. PVezRack® SolarTerrace III-A is to be optimized to suit specific conditions for each project and documented in a construction drawing. As a result, major components of PVezRack® SolarTerrace III-A may be provided in section 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 Instructions

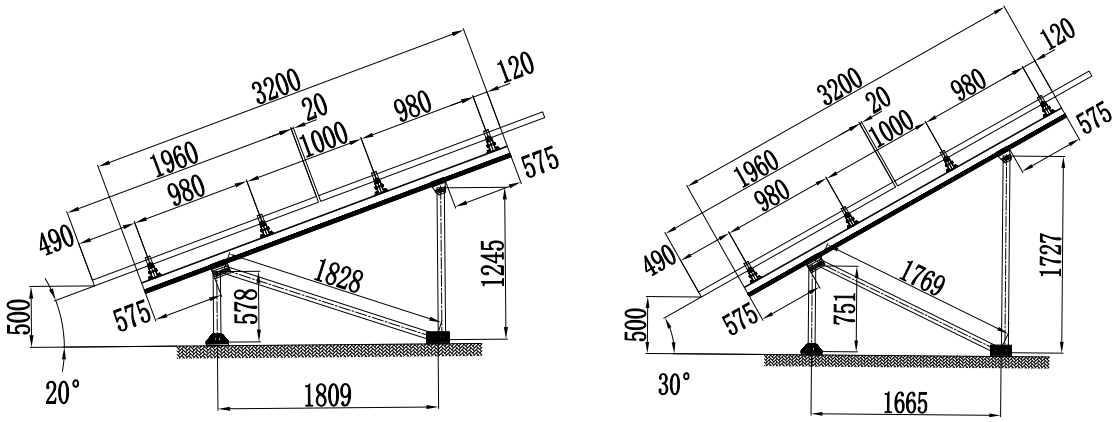
Introduction

Solar Terrace III-A with Concrete Footing

Below are the side view drawings of support for panels up to 1800 x 1400 mm and panels up to 2000 x 1400 mm at 20° and 30° tilt angles.

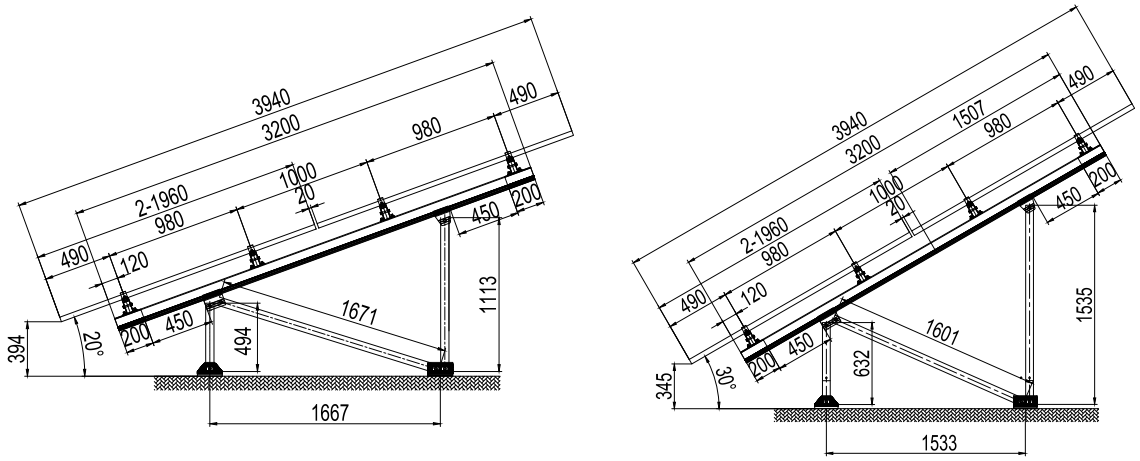


Side view drawings of support for panels up to 1800 x 1400mm

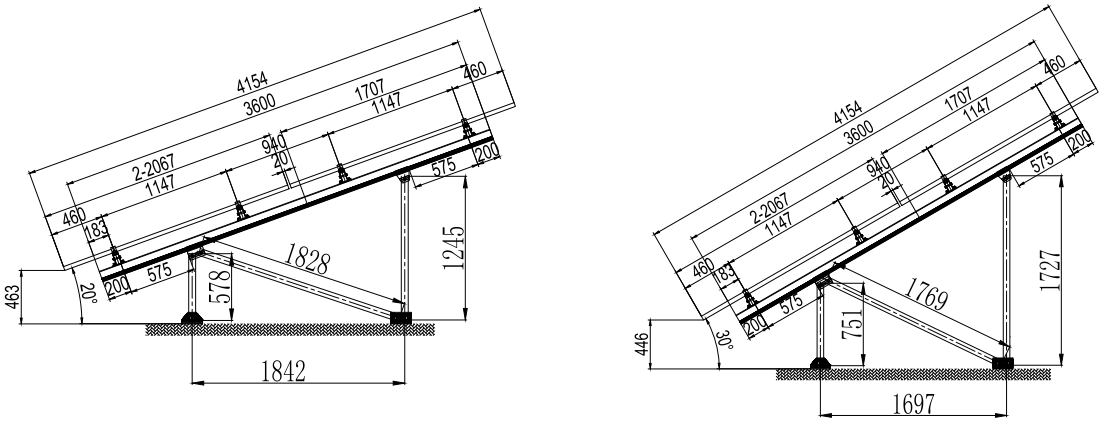


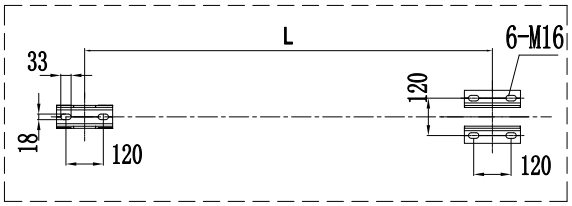
Side view drawings of support for panels up to 2000 x 1400mm

Below are the side view drawings of STIII-A Single Support with Girder Extension for panels up to 2000 x 1400 mm at 20° and 30° tilt angle.



Below are the side view drawings of STIII-A Double Support with Girder Extension for panels up to 2400 x 1400 mm at 20° and 30° tilt angle.



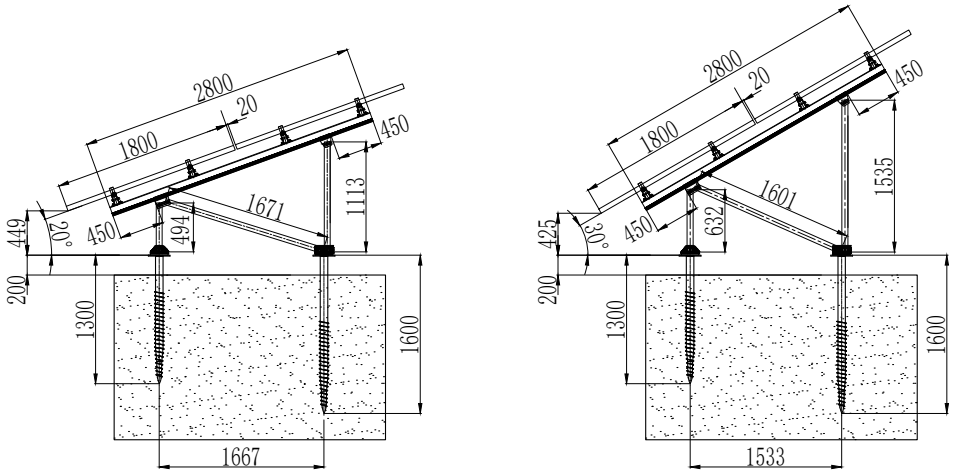


Location Plan of Anchors (DS is the distance between the front leg and rear leg)

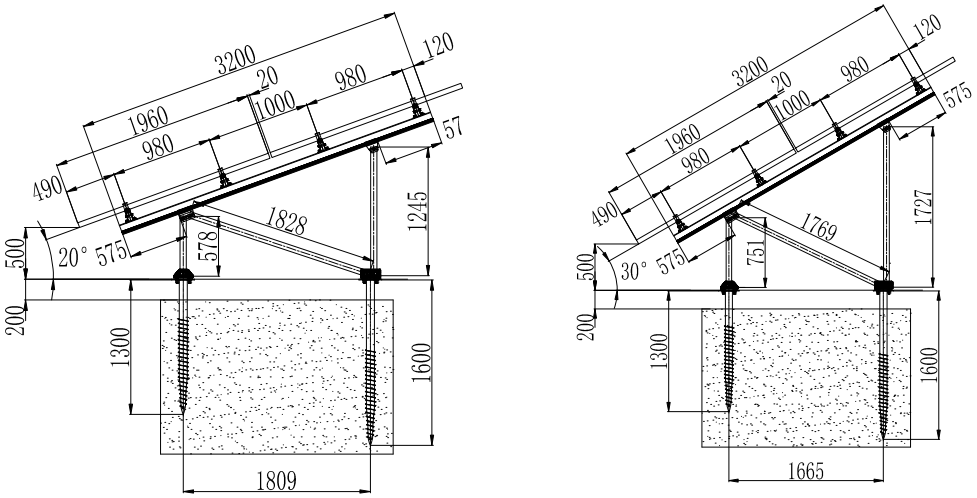
PLEASE NOTE THE DISTANCE BETWEEN FRONT LEG AND REAR LEG COULD BE DIFFERENT FOR OTHER TILT ANGLES OR FOR OTHER GIRDER LENGTHS. PLEASE CONTACT CLENERGY FOR CONFIRMATION.

Solar Terrace III-A with Ground Screw

Below are the side view drawings of support for panels up to 1800 x 1400 mm and panels up to 2000 x 1400 mm at 20° and 30° tilt angles.

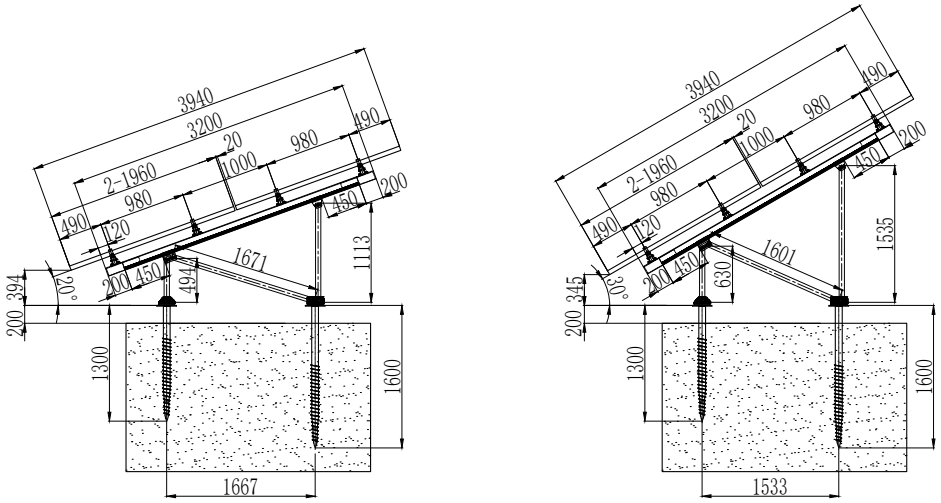


Side view drawings of support for panels up to 1800 x 1400 mm

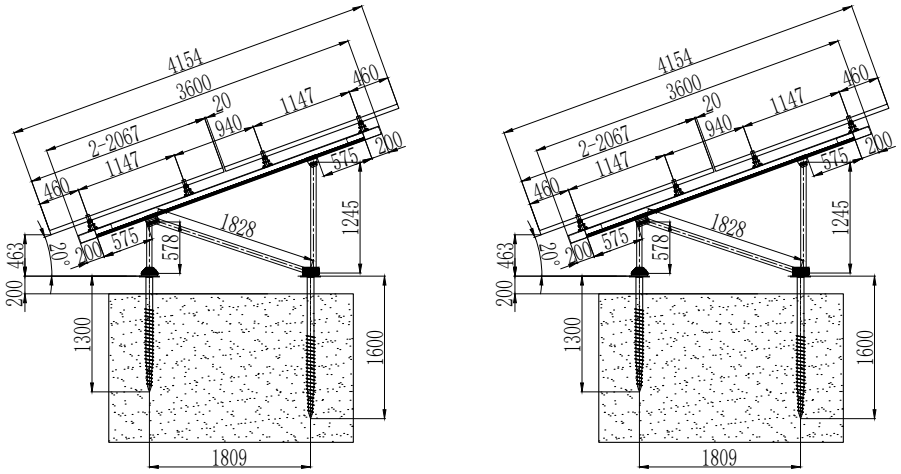


Side view drawings of support for panels up to 2000 x 1400 mm

Below are the side view drawings of STIII-A Single Support with Girder Extension for panels up to 2000 x 1400 mm at 20° and 30° tilt angle.



Below are the side view drawings of STIII-A Double Support with Girder Extension for panels up to 2400 x 1400 mm at 20°and 30°tilt angle.



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.

Pre-assembled Support Installation

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 tthey align as shown as Fig. 5.

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

Fig. 1

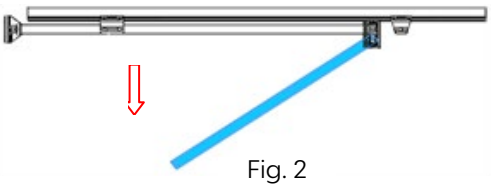


Fig. 2

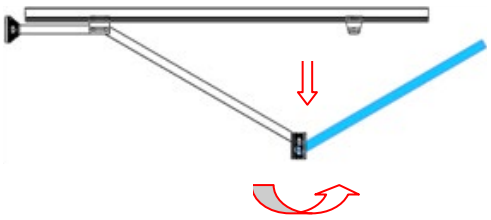
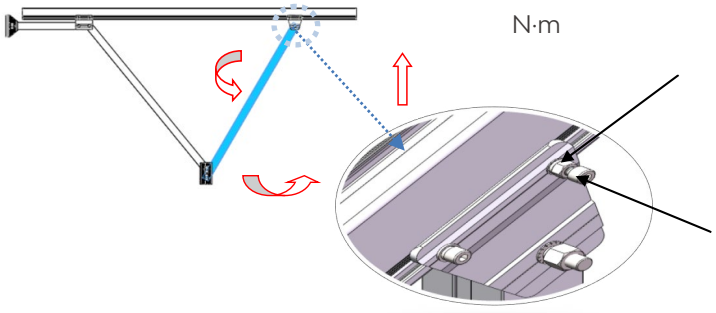


Fig. 3



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

Fig. 4

Fig. 5

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

Solution 2 (For 20 degree tilt support)

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

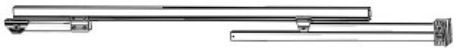


Fig. 6

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;

Fig. 7

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

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

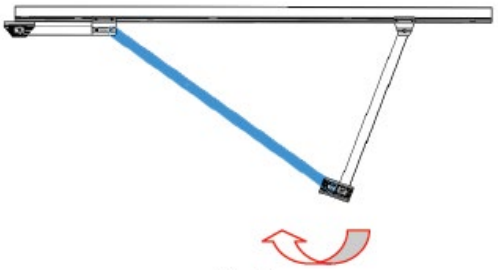
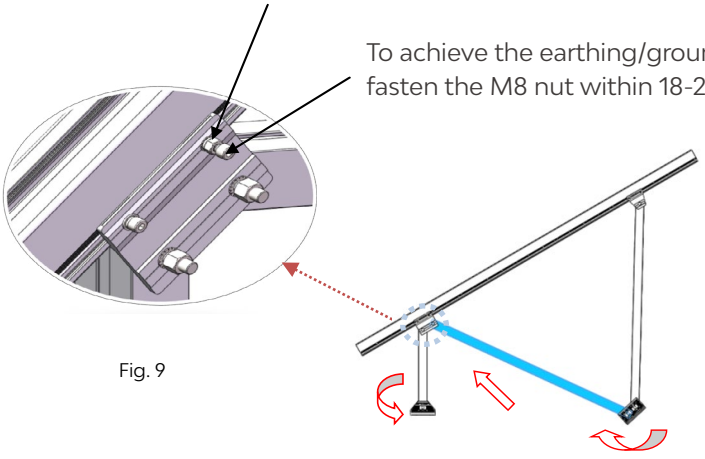


Fig. 8

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



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

Fig. 9

Fig. 10

Girder Extension Installation

Insert half of the Splice for Tri-Groove Square Girder into one end of the Girder on the pre-assembled support.

Apply 6 sets of self-drilling screws ST6.3*22 in the connection position on both sides, the screws have to be fixed according to the figure with dimension on the right. Fasten the screws until their rubber pads are slightly flattened.

Recommended torque for self-tapping screw ST6.3*22 is 12 N·m.

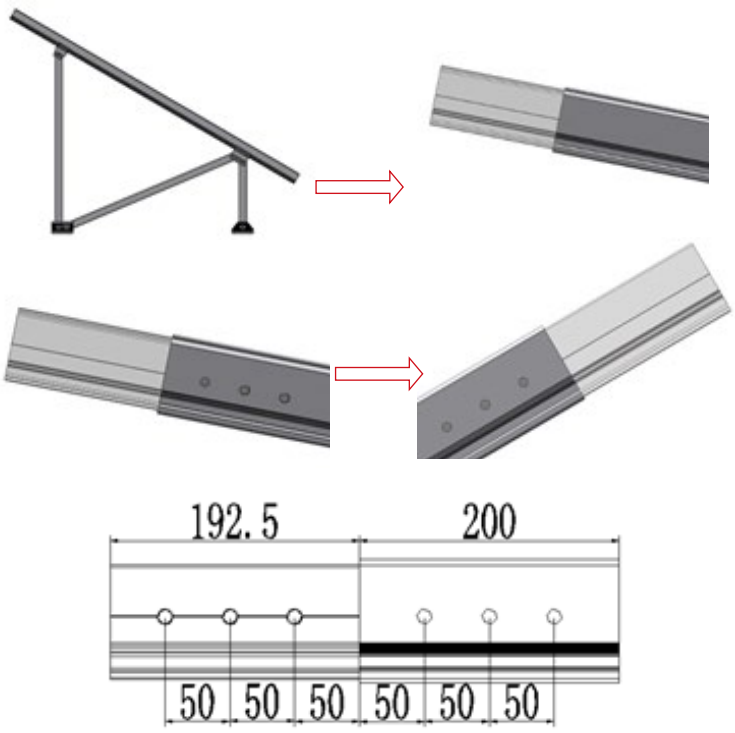


Fig. 11

Insert a 200mm long Tri-Groove Square Girder into Splice and ensure that it will be orientated in the same direction as the existing Tri-Groove Square Girder. Now apply 6 sets of self-tapping screws in the connection positions on both sides. Repeat step 5.2 to fix the self-tapping screws.

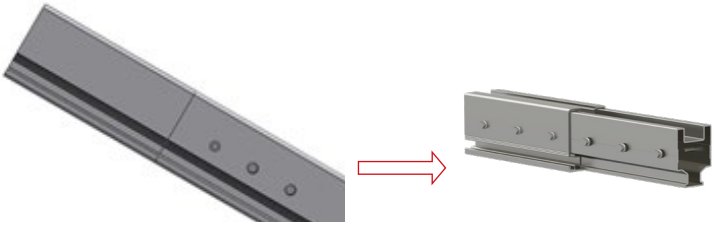


Fig. 12

The assembled Splice and Girder is shown on the right.

Fig. 13

Fix the Splice for Tri-Groove Square Girder at the other side of the Girder on the pre-assembled support according to the steps above.

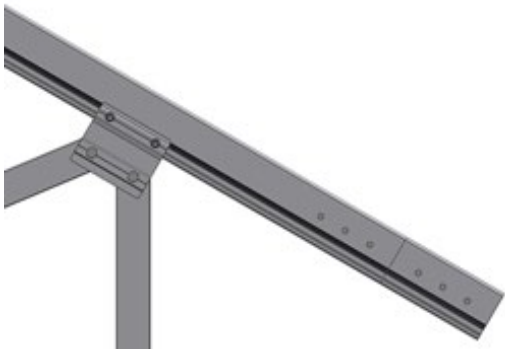


Fig. 14

The Girder Extension installation on the pre-assembled support of PVezRack® SolarTerrace III-A is completed as shown on the right.

Fig. 15

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 ±20mm.The north-south adjustable range of the Front/Rear leg is ±7.5mm.

Recommended Torque:
M16: 135~150N·m

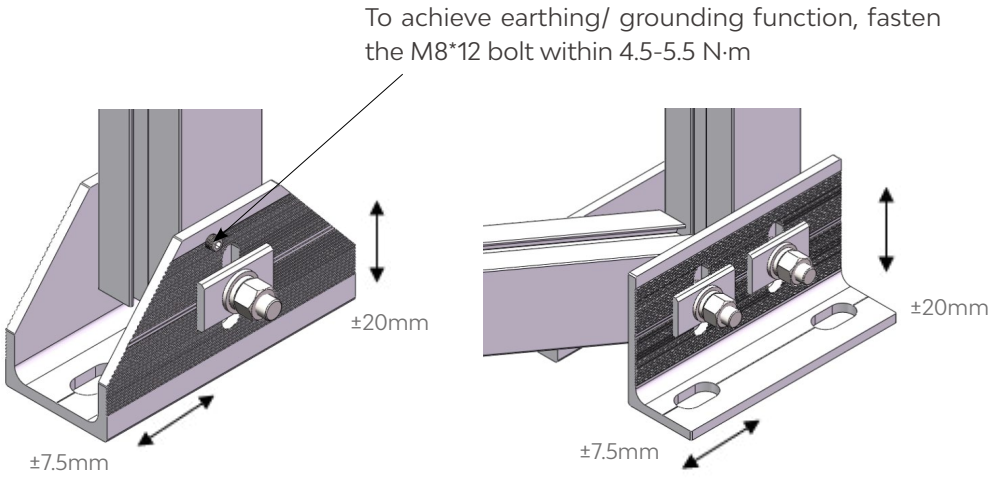


Fig. 16

Check the System and Fasten all Bolts with Recommended Torque(please refer to Page 14).

Recommended Torque:
M8 Bolt: 13N·m;
M8 Nut: 18~20N·m
M12: 40~45N·m

According to Engineering Drawing, Repeat the Above Operations to Install Other Preassembled 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.

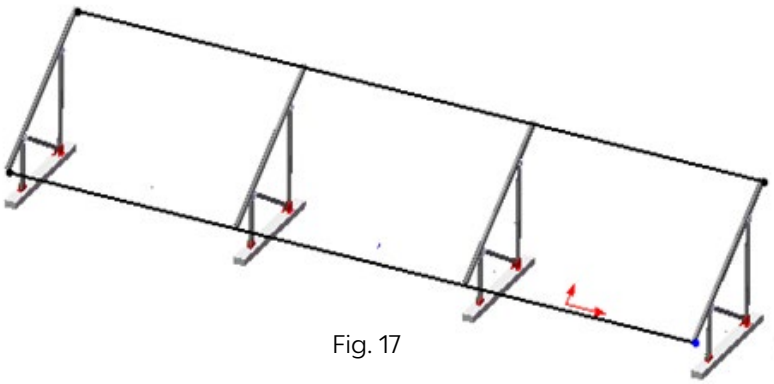


Fig. 17

T Rail Installation

Direct Installation

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.

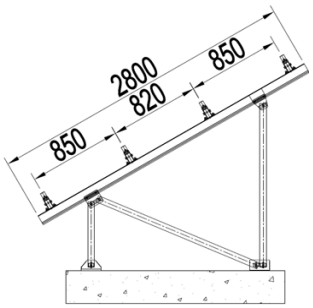


Fig. 18

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.

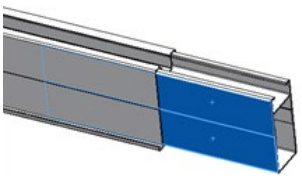
Fig. 19

Fig. 20

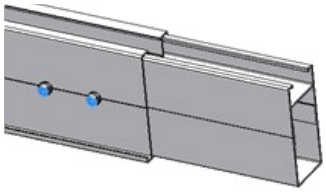
Note:
If the Pre-assembled Support has pre-positioned Rail Clamps for the T Rail, slide another Rail Clamp in other side of the T Rail.

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 Selftapping 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.

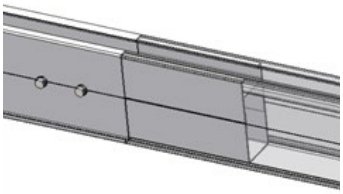
Note:
Please fasten the Self-tapping screw until the rubber washer grips firmly, attaching the T Rails tightly onto the splice.



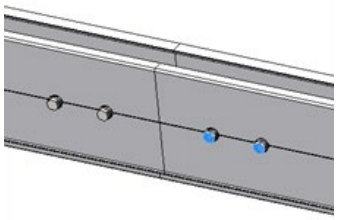
Insert half of Splice into the T Rail



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. 21

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

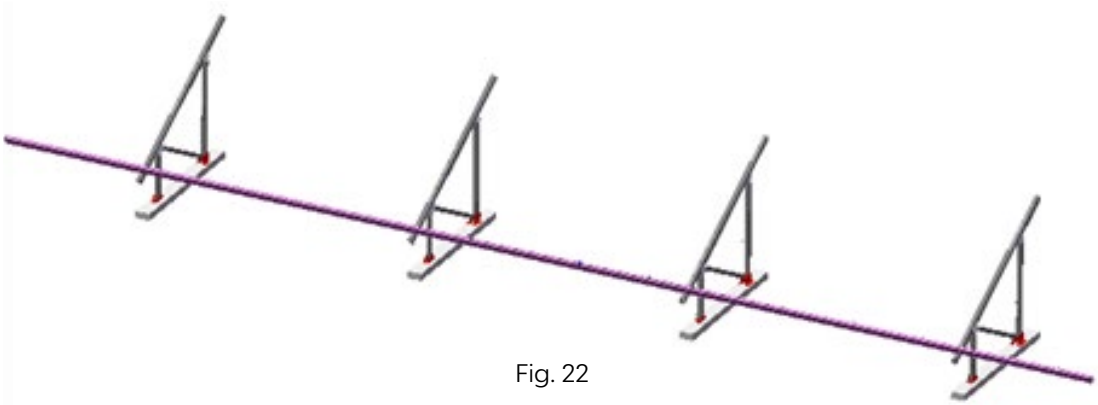


Fig. 22

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.

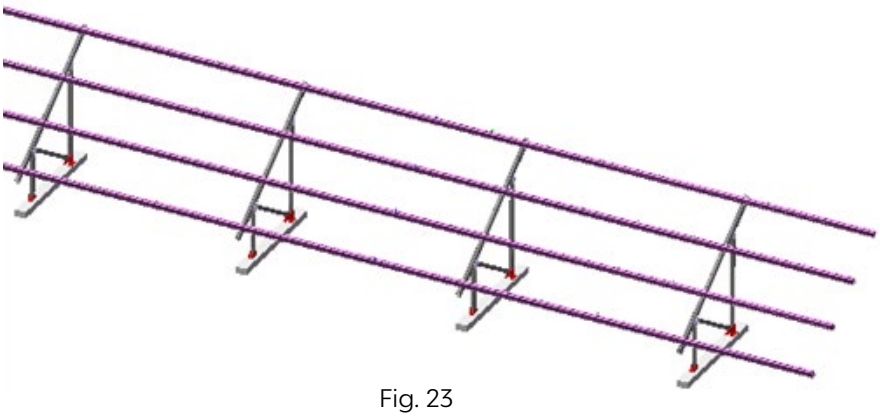


Fig. 23

East/West Adjustable Bracket Installation (optional)

Click the pre-assembled East/ West Adjustable Bracket into the Tri- Groove Beams and adjust properly as shown in Fig.24. Fasten the M8 bolt slightly with the Allen key.

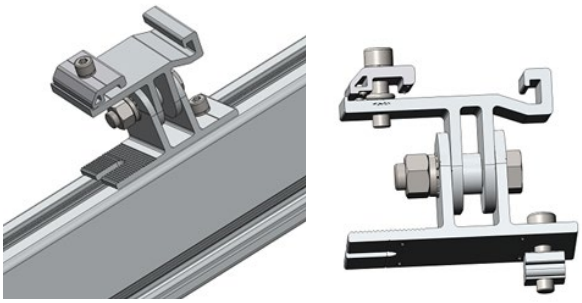


Fig. 24

Click the corrugated shim and Z Moulde/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. 25.

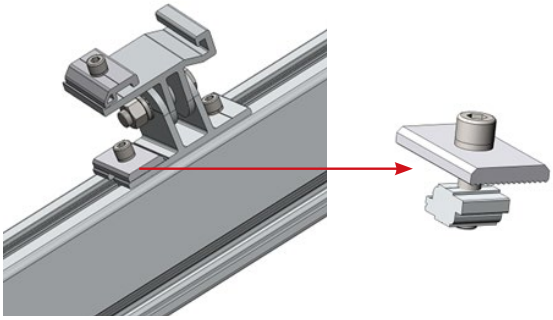


Fig. 25

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.

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.

Recommended Torque:
M8:18~20 N·m
M12: 50~55 N·m

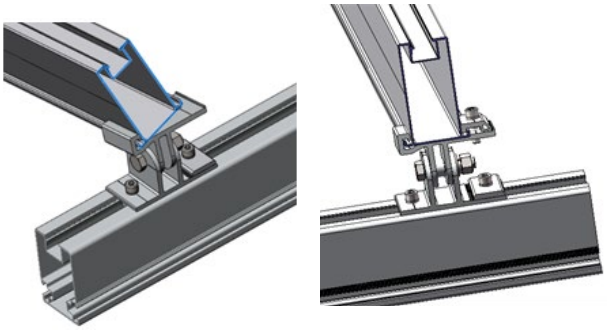


Fig. 26

Repeat the step on **T Rail Installation** (Fig.21) to determine the necessary length of T-Rail prior to installation.

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.

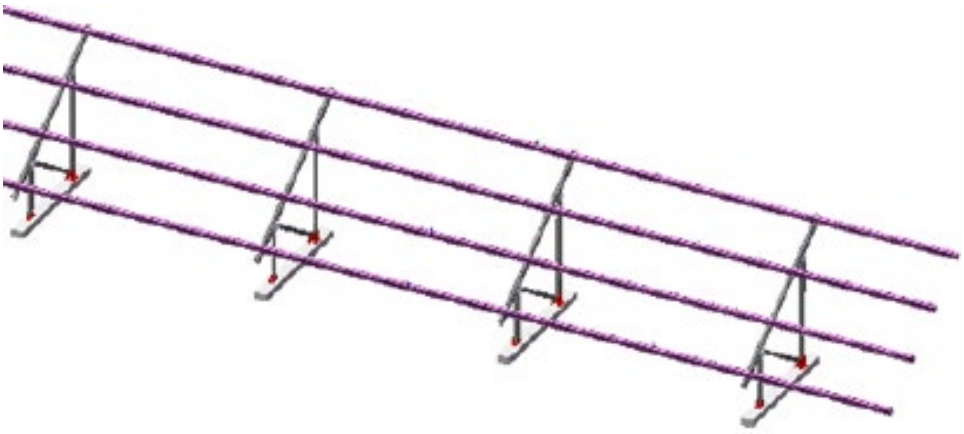


Fig. 27

PV Module Installation

PV Module Clamps Installation

The guide below is for PV module clamps installation. For PV Module installation, please follow manual provided by the manufacturer.

Before module and clamps installation, it is important to arrange how to position grounding clips to achieve earthing continuity between each PV modules and rails. The Clenergy recommends three different methods for Grounding Clips Layout Arrangement.

Method 1: "Even and Odd"

• When there is an even number of PV Modules in each row, install the grounding clips at the positions marked X in Fig. 28, where the number of Grounding Clips = number of PV Modules. Figure shows 4 x PV Modules requiring 4 x grounding clips.

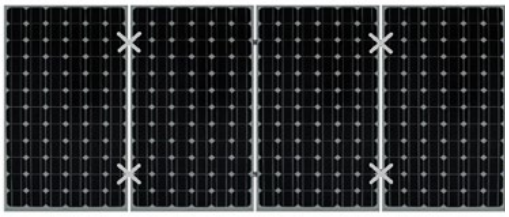


Fig. 28

• When there is an odd number of PV Modules in each row, install grounding clips at positions marked X in Fig. 29, where the number of Grounding Clips = number of PV Modules + 1. Figure shows 5 x PV Modules requiring 6 x grounding clips.

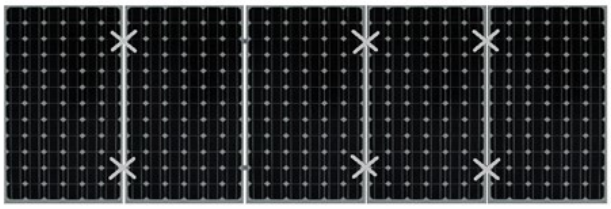


Fig. 29

Method 2: "Zig Zag"

Install the grounding clips at the positions marked X in Fig. 30, where the number of Grounding Clips = number of PV Modules + 1. Figure shows 5 x PV Modules requiring 6 x grounding clips.

Notes:

- Please consult local PV Module supplier to check whether "Zig Zag" grounding clips layout has any effect on PV modules.
- Grounding clips are not suitable for Dual End Clamp.

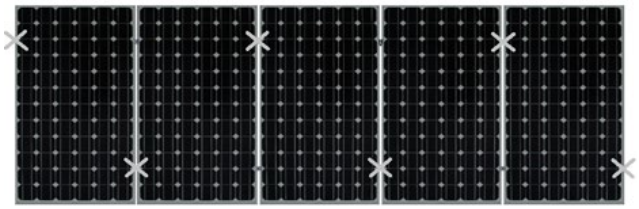


Fig. 30 "Zig Zag" Grounding Clips Layout

Method 3: "All Inter Clamps"

Install the grounding clips at the positions marked X in Fig. 31, where the number of Grounding Clips = (number of PV Modules -1) x 2. Figure shows 5 x PV Modules requiring 8 x grounding clips.

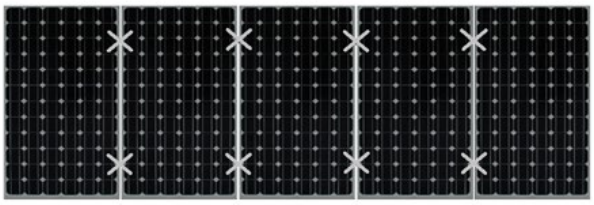


Fig. 31 "All Inter Clamps" Grounding Clips Layout

Important Notes for any of method above:

- When replacing defective PV Modules, it is required to replace the grounding clips under the defective PV Modules;
- When removing defective PV Modules, it is required to keep sufficient grounding clips to maintain all other PV modules' earthing continuity with the rail. It is required to install grounding clips under end clamps when necessary to achieve this;
- For array requiring more than 2 rows of rails, the layout and quantity of grounding clips are the same as those for 2 rows of rails.

There are two types of clamps for PV Modules Installation.

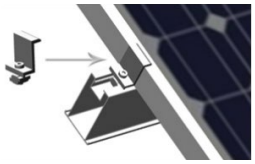


Fig. 32

Option 1: Standard Inter and End Clamps

Place the first PV Module on the Rail according to your plan, and fix it in place using the End Clamps. Then fasten lightly as shown in Fig. 32. If arranging grounding clips using "Zig Zag" layout method above, a grounding clip needs to be installed under an end clamp as shown in Fig. 33

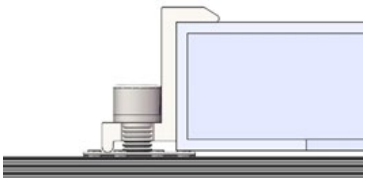


Fig. 33

Slightly lift the PV Module and slide Inter Clamps and Grounding Clips into position. The teeth on Grounding Clip will automatically align when the Inter Clamp is properly installed as shown in Fig. 34.

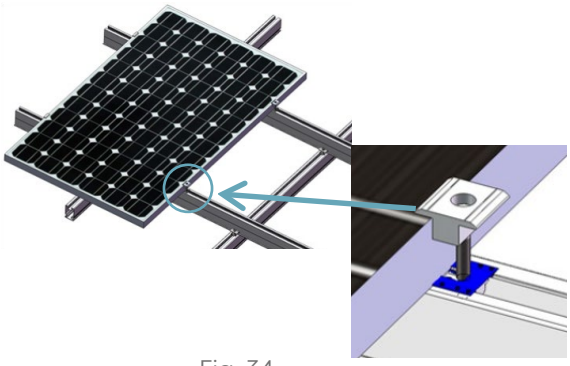


Fig. 34

Loosely place the next framed PV Module into the other side of the Inter Clamp and Grounding Clip as shown in Fig. 35.

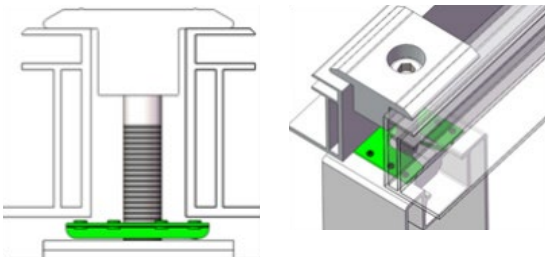


Fig. 35

Important Notes:

- To fix the Grounding Clip properly, ensure the frames of PV Modules are completely pressed against End and Inter Clamps and Grounding Clips. Visually check that Grounding Clips are positioned properly;
- Grounding Clips are intended for SINGLE USE ONLY! Only fasten the bolts down with recommended torque of 16~20 N·m when the position of the PV Module is finalized. (Only slightly tighten bolts to keep PV Modules in place prior to the final check).

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. 36

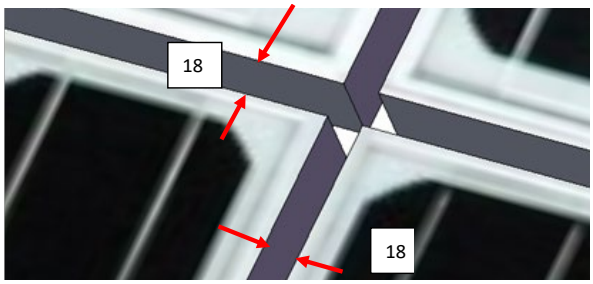


Fig. 36

Option 2: Akashi Clamps

Turning the top plate of the Akashi Clamp to switch the functionality between End and Inter Clamp as shown in Fig. 37.

Note: Akashi Clamp with part number of C-U/30/46 has no pre-fitted grounding clip and Akashi Clamp with part number of C-U/30/46-G has pre-fitted grounding clip. Please use one of grounding clips layout arrangement methods above to position them correctly.

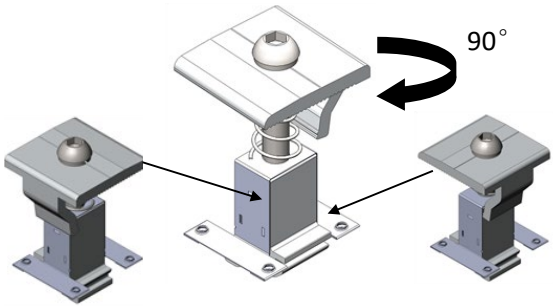


Fig. 37

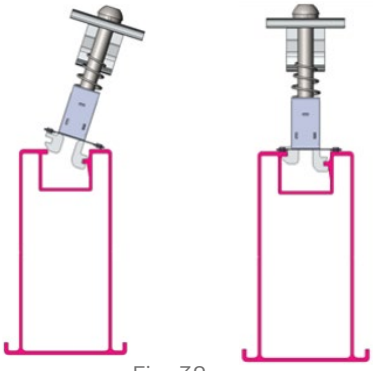


Fig. 38

Note: Before clicking in, make sure there is enough room between two "claws" of the module otherwise it needs to screw up the bolt as shown in Fig. 39.

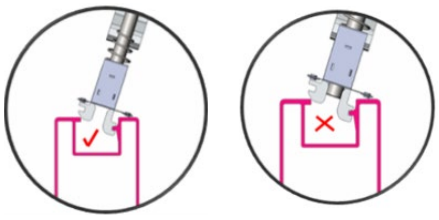


Fig. 39

Place the first PV Module on the Rails and apply the Akashi Clamp as the End Clamp and fasten slightly. Make sure the frame of the PV Module is fully in contact with the Akashi Clamp as shown in Fig. 40 and 41. Visually check the Akashi Clamp and PV module are properly installed.

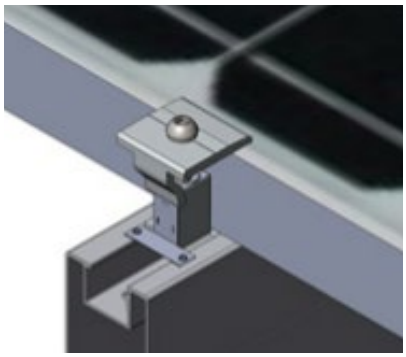


Fig. 40

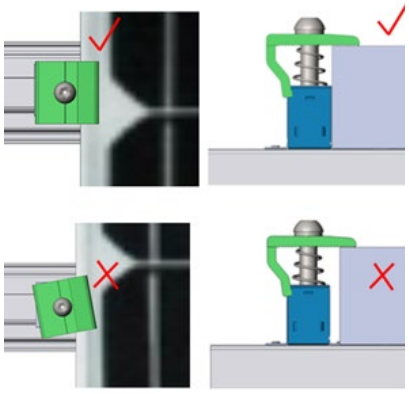


Fig. 41

When using as an Inter Clamp, click the Akashi Clamp into the rail channel and slightly lift the framed PV Module to ensure the Grounding Clip is properly positioned as shown in Fig. 42.

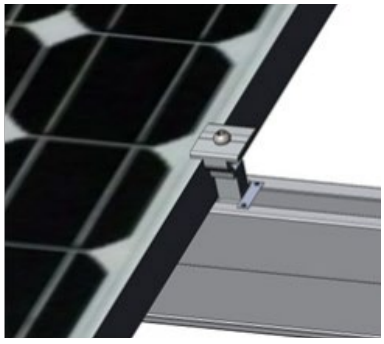


Fig. 42

Loosely place the next framed PV Module into the other side of the Akashi Clamp. Ensure the Grounding Clip is properly positioned, and the frame of the PV Module is in proper contact with Akashi Clamp as shown in Fig. 43 and 44.

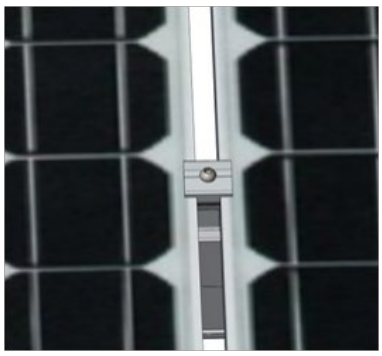


Fig. 43

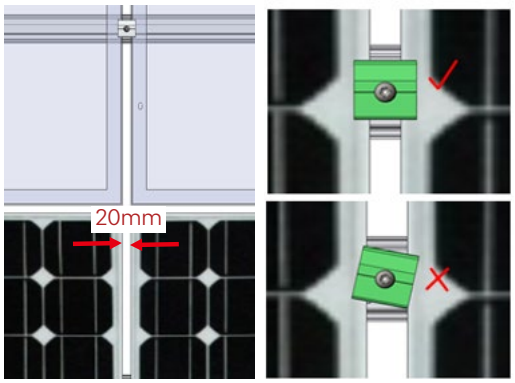


Figure 44

Note: The gap between two adjacent PV Modules generated by Akashi Clamp is 20mm. The recommend torque for Akashi Clamp as Inter and End Clamp is 13~14 N·m.

Grounding Lug Installation

The Clenergy provides two types of grounding lugs to meet different installation requirements, such as required earthing cable sizes. In order to meet the minimum earthing electrical resistance requirement by AS/NZS 5033:2021, it is required to install one Grounding Lug per row of rail.

A. Grounding Lug with U-shape Copper Channel (EZ-GL-ST/UC)

The recommended fasten torque of the bolt M8*25 is 16~20 N·m.

Once grounding lug fixing with rail, insert U-Shape Copper Channel into grounding lug as shown in Figure 45. Strip earthing cable (the maximum size is 10 mm^2), insert the conductor into the Copper Channel and tighten the bolt M6*14 with 5~6 N·m to ensure the earthing cable is tight.

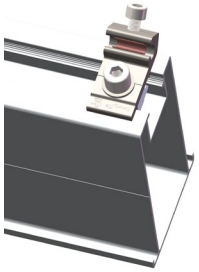


Fig. 45

Note: Please check the electrical resistance between rail and earthing cable conductor to ensure the bonding is made.

There are three options for Grounding Lug installation.

Option 1

Fix the Grounding Lug into the top channel of Rail as shown in Fig. 46.

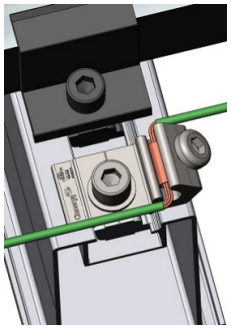


Fig. 46

Option 2

Fix the Grounding Lug into the top channel of Rail where just under the PV Module as shown in Fig. 47. Total height of grounding lug allows installation under 30 mm high PV module.

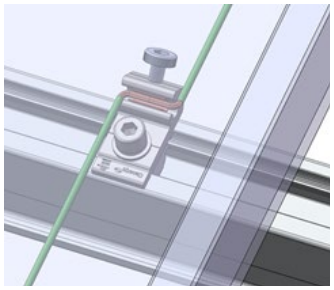


Fig. 47

B. The Austin – Commercial Grounding Lug (EZ-GL-AT)

Place the grounding lug on top of rail and ensure z module is on the right position and lug sits flush on the rail surface as shown in Fig. 48. Do not fully tighten the bolt.

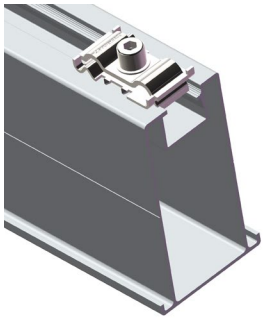


Fig. 48

There are two channels to fit different earthing cables.

Channel one is for earthing cable of 4, 6, 10 and 16 mm^2 and channel two is for earthing cable of 25, 35, 50 mm^2

Lift up one side of top plate of lug, insert the conductor of earthing cable into channel and tighten the bolt to ensure lug is well fixed on the rail and earthing cable is tight.

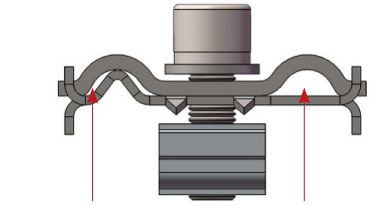


Fig. 49

Note:
Please check the electrical resistance between rail and earthing cable conductor to ensure the bonding is made.

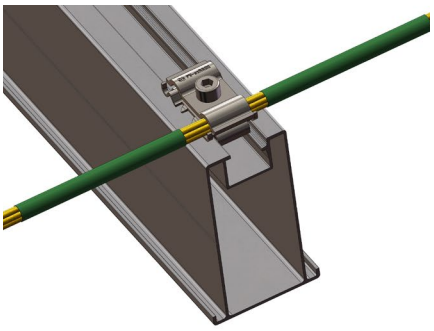


Fig. 50

There are two options for Grounding Lug installation.

Option 1

Fix the Commercial Grounding Lug into the top channel of Rail as shown in Fig. 51a and b.

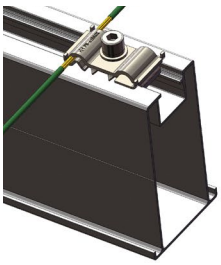


Fig. 51a Installed in channel one

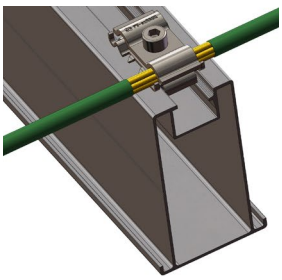


Fig. 51b Installed in channel two

Option 2

Fix the Commercial Grounding Lug into the top channel of Rail where is under the PV Module as shown in Fig. 52. The height of grounding lug above the rail is less than 20 mm.

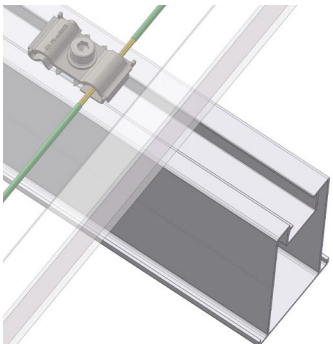


Fig. 52

Now the installation is completed as shown in Fig. 53. 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 Akashi Clamps.

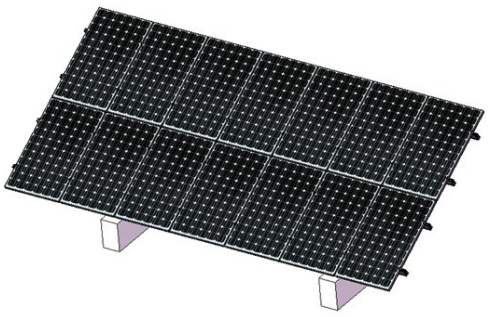


Fig. 53

Ground Screw Installation

(Alternative to a Concrete Base and dependent on the system design)

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. 54

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

Minimum piling depth of ground screws is determined by the corresponding engineering letter. Front leg and rear leg of Solar Terrace III-A are connected with 1300 mm and 1600 mm long ground screws, respectively.

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

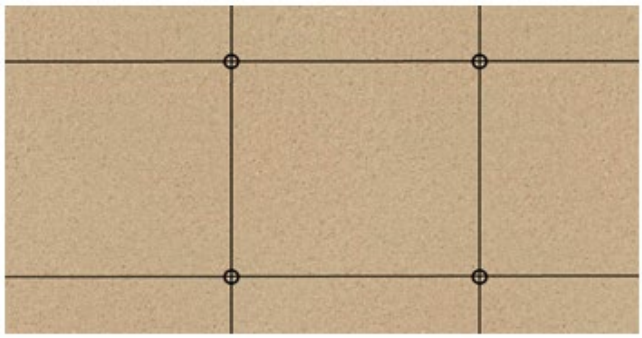


Fig. 55

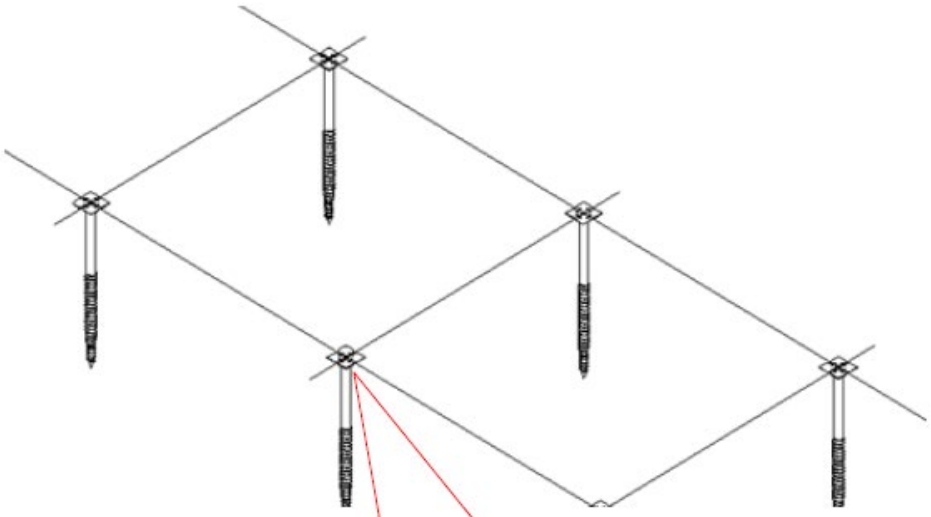


Fig. 56

The maximum allowable connection deviation of the Ground Screw to the Support should be within the range of adjustments shown in Fig. 57 below.

Follow Solution 1 or Solution 2 (on page 13 and 14 depending on either a 30 or 20 degree tilt support) to unfold and construct the pre-assembled support.

Connect the Pre-assembled Support to the Ground Screws by using Hex Bolts M16*50 with Nuts and Washers. A plain washer is at bolt head side and two washers are at nut side. The spring washer needs to be placed next to nut. See Fig. 57.

Recommended Torque:
M16: 135~150N·m

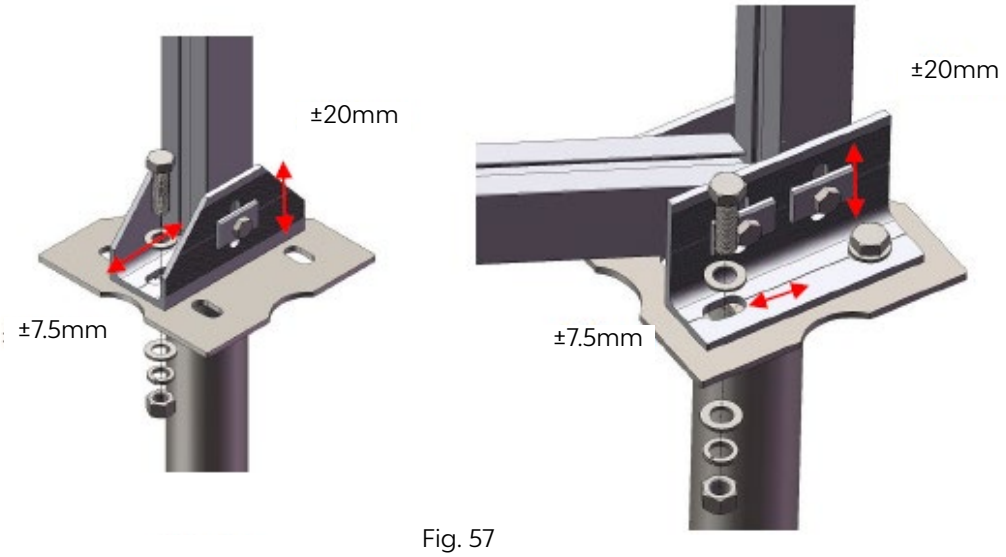


Fig. 57

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. 57 above.

AU Certification (Concrete Foundation)

CLENERGY

Structural Certification
Clenergy PV-ezRack
SolarTerrace III-A
(STIII-A)

Within Australia

For Clenergy Australia
Suite 1/10 Duerdin Street
Clayton, VIC 3168

Clenergy Reference Number: CL-1069-Y

Job No. **11398-2**
Date: **25/08/2023**

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Report Title		General Compliance Letter STIII-A				
Document ID		11398-2/LvS		**Job No.**	11398-2	
File Path		G:\Shared drives\11000\11300 - 11399\11398\03 Certification				
Client		Clenergy Australia PTY LTD		**Client Contact**	Geza Anderson	
Rev	**Date**	**Revision Details**	**Prepared By**	**Author**	**Verifier**	**Approver**
0	20/04/2023	Draft	LvS	LvS	-	LvS
1	27/04/2023	First Issue	LvS	LvS	YK	LvS
2	25/05/2023	Client's comments	LvS	LvS	-	LvS
3	04/08/2023	References, titles, Gamcorp name etc	LvS	LvS	-	LvS
4	25/08/2023	Reference to NCC added	LvS	LvS	-	LvS
Current Revision		4				

Approval			
Author Signature		Approver Signature	
Name	L. Van Spaandonk	Name	L. Van Spaandonk
Title	Structural Engineer	Title	Principal Engineer

PV Array Frame Structural Certification

SolarTerrace III-A Installation in Australia

Gamcorp Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of the PV-ezRack SolarTerrace III-A within Australia. The design check has been based on the information in the *PV-ezRack SolarTerrace III-A Planning and Installation Guide* 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
PV-ezRack SolarTerrace III-A, Double Support (Pre-assembled) 20°, with 3200mm Girder	ER-S-STIIIA/D20
PV-ezRack SolarTerrace III-A, Double Support (Pre-assembled) 30°, with 3200mm 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 Akashi Clamp for Frame Height 30-46mm with Grounding Clip	C-U/30/46-G
PV-ezRack Akashi Clamp for Frame Height 30-46mm	C-U/30/46
PV-ezRack T-Rail Clamp with Grounding	ER-RC-T/G
PV-ezRack Girder Extension for SolarTerrace-A (II and III) 200mm	GE-STA/200
East/West Adjustable - Bracket for T-Rail 110	BR-R110/EW, BR-R110/EW/G

We find the SolarTerrace III-A to be structurally adequate and compliant with NCC 2022 and all relevant Australian Standards listed below - for installation in Australia, provided the conditions listed within this certificate are adhered to:

- NCC and relevant standards:
  - Section B of Vol1, NCC 2022;
  - AS/NZS1170.0:2002 – Structural design actions, Part 0: General principles;
  - AS/NZS1170.1:2002 (R2016) – Structural design actions, Part 1: Permanent, imposed and other actions;
  - AS/NZS1170.2:2021 – Structural design actions, Part 2: Wind actions:
    - Wind Terrain Category 2;
    - Wind average recurrence interval of 100 years (ultimate), 25 years (serviceability);
    - Wind regions A, B1, B2, C & D;
    - Ms=1, Mt=1, Md=1;
- PV panels width up to 1400mm, mass 15kg/m^2. Panels length (Lp), panels clearance above ground (Cl) and footing height above ground (h): refer further pages;
- Tilt angles considered 20 and 30 degrees for wind regions A and B1, and only 20 degrees for wind regions B2, C and D. Other tilt angles are also possible but with other frame dimensions;
- Materials Strength calculated: aluminium members 240MPa (AL6005-T5), concrete 25MPa.
- For ground screws option see Gamcorp letter 13352.

CONTENT

Table 1. Maximum Frame Spacing (S) and Footing Options for STIII-A installation in Australia: standard girder **2800 mm** long / solar panels **up to 1800 mm** long (**superseding** letter **5510-1**)

Table 2. Maximum Frame Spacing (S) and Footing Options for STIII-A installation in Australia: girder **3200 mm** long (standard or extended, 200+2800+200mm) / solar panels **up to 2000 mm** long (**superseding** letter **5510-2** and **7802-2**)

Table 3. Maximum Frame Spacing (S) and Footing Options for STIII-A installation in Australia: extended girder **3600 (=200+3200+200) mm** long / solar panels **2001 - 2200 mm** long (**superseding** letter **7375-2 - Table 1**)

Table 4. Maximum Frame Spacing (S) and Footing Options for STIII-A installation in Australia: extended girder **3600 (=200+3200+200) mm** long / solar panels **2201 - 2400 mm** long (**superseding** letter **7375-2 - Table 2**)

General Notes.

Pictures.
Frames pictures (by Clenergy):
- SolarTerrace III-A: standard girder 2800 mm long / solar panels up to 1800 mm long / tilt angle 20 degrees;
- As previous but 30 degrees;
- SolarTerrace III-A: standard girder 3200 mm long / solar panels up to 2000 mm long / tilt angle 20 degrees;
- As previous but 30 degrees;
- SolarTerrace III-A: extended girder 3200 (200+2800+200)mm long / solar panels up to 2000 mm long / tilt angle 20 degrees;
- As previous but 30 degrees;

Footing drawings (by Gamcorp, NTS):
1 - Continuous Paving Slab;
2 - Continuous Strip Footing;
3 - Individual Pad footing per leg;
4 - Transverse Strip Footing;

Frame+Footing pictures, showing *Cl* (panels clearance above ground level) and *h* (footing height above ground level).

Appendices
A1. Explanation of Importance Levels
A2. Map of Australian Wind Regions

Table 1: Maximum Support Frame Spacing and Footing Options for Solar Terrace III-A with Panels up to 1800 mm long and standard girder 2800mm (forces in kN, dimensions in m)

Wind region	**A**				**B1**				**B2**		**C**		**D**	
Regional wind speed (VR, m/s)	**41**				**48**				**48**		**56**		**66**	
Panels Tilt angle	**20°**		**30°**		**20°**		**30°**		**20°**		**20°**		**20°**	
(Lp ≤ 2000mm)	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg
Maximum spacing (S)	**3.60**		**3.10**		**3.50**		**2.90**		**3.50**		**3.00**		**2.20 (2.10*)**	
Uplift force	0.0	9.7	0.0	17.0	0.3	13.1	0.0	22.0	0.4	14.5	0.7	17.1	0.9	17.5
Down force	5.4	4.7	3.6	8.0	6.8	6.0	4.2	10.0	7.3	6.6	8.2	7.4	8.1	7.4
Total horizontal force at leg base	4.0		7.7		5.4		9.9		5.9		6.9		7.0	
Footing Type (1 - 4)														
1 - Continuous Paving Slab, Length x Thickness (L x T). Cl=0.50, h=0	2.20 x 0.15		2.20 x 0.20		2.20 x 0.15		2.30 x 0.25		2.20 x 0.20		2.20 x 0.25		2.20 x 0.30	
Adopt reinforcement	mesh N8-125, or SL-81		mesh N8-125, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
2 - Continuous Strip Footing, Width x Depth (W x D). Cl=0.70, h=0.20	0.40 x 0.40	0.45 x 0.45	0.40 x 0.40	0.65 x 0.65	0.40 x 0.40	0.55 x 0.55	0.40 x 0.40	0.80 x 0.80	0.40 x 0.40	0.60 x 0.60	0.40 x 0.40	0.65 x 0.65	0.40 x 0.40	0.80 x 0.80
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
3 - Individual Pad footing per leg, Length (=Width) x Depth (B x C x X). Cl=0.70, h=0.20	0.55 x 0.55 x 0.55	0.95 x 0.95 x 0.95	0.65 x 0.65 x 0.65	1.10 x 1.10 x 1.10	0.60 x 0.60 x 0.60	1.00 x 1.00 x 1.00	0.70 x 0.70 x 0.70	1.20 x 1.20 x 1.20	0.60 x 0.60 x 0.60	1.05 x 1.05 x 1.05	0.65 x 0.65 x 0.65	1.10 x 1.10 x 1.10	0.65 x 0.65 x 0.65	1.10 x 1.10 x 1.10
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
4 - Transverse Strip Footing, Length x Width x Depth (L x A x D). Cl=0.60, h=0.10	2.20 x 0.65 x 0.65		2.35 x 0.80 x 0.80		2.30 x 0.75 x 0.75		2.60 x 0.85 x 0.85		2.60 x 0.70 x 0.70		2.50 x 0.80 x 0.80		2.60 x 0.80 x 0.80	
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	

Note(*): When using east west adaptor

Table 2: Maximum Support Frame Spacing and Footing Options for Solar Terrace III-A with Panels up to 2000 mm long and girder 3200mm long (standard or extended) (forces in kN, dimensions in m)

Wind region	**A**				**B1**				**B2**		**C**		**D**	
Regional wind speed (VR, m/s)	**41**				**48**				**48**		**56**		**66**	
Panels Tilt angle	**20°**		**30°**		**20°**		**30°**		**20°**		**20°**		**20°**	
(Lp ≤ 2000mm)	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg
Maximum spacing (S)	**3.50**		**3.00**		**3.50**		**2.80**		**3.40**		**2.90**		**2.10 (2.00*)**	
Uplift force	0.8	9.8	0.0	16.6	1.4	13.6	0.0	21.5	1.6	14.6	2.1	17.2	2.3	17.4
Down force	5.7	5.1	4.1	8.1	7.4	6.6	4.9	10.1	7.8	7.0	8.7	7.9	8.5	7.7
Total horizontal force at leg base	4.4		8.3		6		10.6		6.4		7.4		7.5	
Footing Type (1 - 4)														
1 - Continuous Paving Slab, Length x Thickness (L x T). Cl=0.50, h=0	2.20 x 0.15		2.35 x 0.20		2.20 x 0.20		2.50 x 0.25		2.20 x 0.20		2.20 x 0.25		2.45 x 0.30	
Adopt reinforcement	mesh N8-125, or SL-81		mesh N8-125, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
2 - Continuous Strip Footing, Width x Depth (W x D). Cl=0.70, h=0.20	0.40 x 0.40	0.50 x 0.50	0.40 x 0.40	0.70 x 0.70	0.40 x 0.40	0.60 x 0.60	0.40 x 0.40	0.85 x 0.85	0.40 x 0.40	0.60 x 0.60	0.40 x 0.40	0.70 x 0.70	0.40 x 0.40	0.85 x 0.85
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
3 - Individual Pad footing per leg, Length (=Width) x Depth (B x C x X). Cl=0.70, h=0.20	0.55 x 0.55 x 0.55	0.95 x 0.95 x 0.95	0.65 x 0.65 x 0.65	1.15 x 1.15 x 1.15	0.60 x 0.60 x 0.60	1.05 x 1.05 x 1.05	0.70 x 0.70 x 0.70	1.25 x 1.25 x 1.25	0.60 x 0.60 x 0.60	1.10 x 1.10 x 1.10	0.65 x 0.65 x 0.65	1.15 x 1.15 x 1.15	0.65 x 0.65 x 0.65	1.15 x 1.15 x 1.15
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
4 - Transverse Strip Footing, Length x Width x Depth (L x A x D). Cl=0.60, h=0.10	2.30 x 0.65 x 0.65		2.35 x 0.80 x 0.80		2.35 x 0.80 x 0.80		2.60 x 0.90 x 0.90		2.60 x 0.75 x 0.75		2.60 x 0.80 x 0.80		2.50 x 0.85 x 0.85	
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	

Note(*): When using east west adaptor

Table 3: Maximum Support Frame Spacing and Footing Options for Solar Terrace III-A with Panels 2001 - 2200 mm long and extended girder 3600(=200+3200+200)mm
(forces in kN, dimensions in m)

Wind region	**A**				**B1**				**B2**		**C**		**D**	
Regional wind speed (VR, m/s)	**41**				**48**				**48**		**56**		**66**	
Panels Tilt angle	**20°**		**30°**		**20°**		**30°**		**20°**		**20°**		**20°**	
(Lp ≤ 2200mm)	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg
Maximum spacing (S)	**3.40**		**2.60**		**3.20**		**1.90**		**2.90**		**2.00**		**1.40 (1.30*)**	
Uplift force	0.5	10.9	0.0	16.7	0.9	14.2	0.0	16.9	1.0	14.3	1.1	13.5	1.2	13.3
Down force	6.0	5.3	3.7	7.8	7.4	6.5	3.5	7.6	7.3	6.4	6.6	5.9	6.3	5.6
Total horizontal force at leg base	4.7		7.9		6		7.9		6		5.6		5.5	
Footing Type (1 - 4)														
1 - Continuous Paving Slab, Length x Thickness (L x T). Cl=0.50, h=0	2.20 x 0.15		2.30 x 0.25		2.20 x 0.20		2.45 x 0.30		2.30 x 0.20		2.40 x 0.25		2.65 x 0.30	
Adopt reinforcement	mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
2 - Continuous Strip Footing, Width x Depth (W x D). Cl=0.70, h=0.20	0.40 x 0.40	0.55 x 0.55	0.40 x 0.40	0.75 x 0.75	0.40 x 0.40	0.60 x 0.60	0.40 x 0.40	0.60 x 0.60	0.40 x 0.40	0.65 x 0.65	0.40 x 0.40	0.75 x 0.75	0.40 x 0.40	0.90 x 0.90
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
3 - Individual Pad footing per leg, Length (=Width) x Depth (B x C x X). Cl=0.70, h=0.20	0.55 x 0.55 x 0.55	1.00 x 1.00 x x1.00	0.65 x 0.65 x 0.65	1.15 x 1.15 x 1.15	0.60 x 0.60 x 0.60	1.05 x 1.05 x 1.05	0.65 x 0.65 x 0.65	1.15 x 1.15 x 1.15	0.60 x 0.60 x 0.60	1.05 x 1.05 x 1.05	0.65 x 0.65 x 0.65	1.05 x 1.05 x 1.05	0.60 x 0.60 x 0.60	1.05 x 1.05 x 1.05
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
4 - Transverse Strip Footing, Length x Width x Depth (L x A x D). Cl=0.60, h=0.10	2.35 x 0.70 x 0.70		2.50 x 0.80 x 0.80		2.30 x 0.80 x 0.80		2.50 x 0.80 x 0.80		2.50 x 0.75 x 0.75		2.40 x 0.75 x 0.75		2.35 x 0.75 x 0.75	
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	

Note(*): When using east west adaptor

Table 4: Maximum Support Frame Spacing and Footing Options for Solar Terrace III-A with Panels 2201 - 2400 mm long and extended girder 3600(=200+3200+200)mm
(forces in kN, dimensions in m)

Wind region	**A**				**B1**				**B2**		**C**		**D**	
Regional wind speed (VR, m/s)	**41**				**48**				**48**		**56**		**66**	
Panels Tilt angle	**20°**		**30°**		**20°**		**30°**		**20°**		**20°**		**20°**	
(Lp ≤ 2400mm)	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg
Maximum spacing (S)	**2.00**		**1.25**		**1.80**		**1.15**		**1.65**		**1.00**		**0.85 (0.75*)**	
Uplift force	0.0	7.4	0.0	9.2	0.2	9.2	0.0	11.7	0.2	9.3	0.3	7.7	0.4	9.2
Down force	3.8	3.3	1.8	4.1	4.5	3.9	2.2	5.1	4.5	3.9	3.6	3.1	4.2	3.6
Total horizontal force at leg base	3.0		4.2		3.7		5.2		3.7		3.1		3.6	
Footing Type (1 - 4)														
1 - Continuous Paving Slab, Length x Thickness (L x T). Cl=0.50, h=0	2.20 x 0.15		2.40 x 0.25		2.25 x 0.20		2.60 x 0.30		2.40 x 0.20		2.60 x 0.25		2.90 x 0.30	
Adopt reinforcement	mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
2 - Continuous Strip Footing, Width x Depth (W x D). Cl=0.70, h=0.20	0.40 x 0.40	0.55 x 0.55	0.40 x 0.40	0.80 x 0.80	0.40 x 0.40	0.65 x 0.65	0.40 x 0.40	0.65 x 0.65	0.40 x 0.40	0.70 x 0.70	0.40 x 0.40	0.80 x 0.80	0.40 x 0.40	0.95 x 0.95
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
3 - Individual Pad footing per leg, Length (=Width) x Depth (B x C x X). Cl=0.70, h=0.20	0.45 x 0.45 x 0.45	0.60 x 0.60 x 0.60	0.50 x 0.50 x 0.50	0.65 x 0.65 x 0.65	0.50 x 0.50 x 0.50	0.65 x 0.65 x 0.65	0.55 x 0.55 x 0.55	0.70 x 0.70 x 0.70	0.50 x 0.50 x 0.50	0.65 x 0.65 x 0.65	0.45 x 0.45 x 0.45	0.65 x 0.65 x 0.65	0.50 x 0.50 x 0.50	0.65 x 0.65 x 0.65
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
4 - Transverse Strip Footing, Length x Width x Depth (L x A x D). Cl=0.60, h=0.10	2.30 x 0.55 x 0.55		2.35 x 0.60 x 0.60		2.40 x 0.60 x 0.60		2.50 x 0.65 x 0.65		2.40 x 0.65 x 0.65		2.40 x 0.55 x 0.55		2.40 x 0.60 x 0.60	
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	

Note(*): When using east west adaptor

General 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 a more cost effective solution is possible).
2. Concrete footings cover: 50mm.
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 anchor's embedment depth according to 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 to find out whether a more cost effective solution is possible, based on site specific conditions.
5. Reactions in the tables are ultimate values at the leg base.
6. The length of the T-Rails overhang shall be up to 0.4x installed spacing;

Construction is to be carried out strictly in accordance with the instruction manual. This work was designed by **L. Van Spaandonk**, 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 **August 31, 2025,** unless any of the relevant Australian Standards becomes updated before the due date.

Yours faithfully,
Gamcorp Pty Ltd

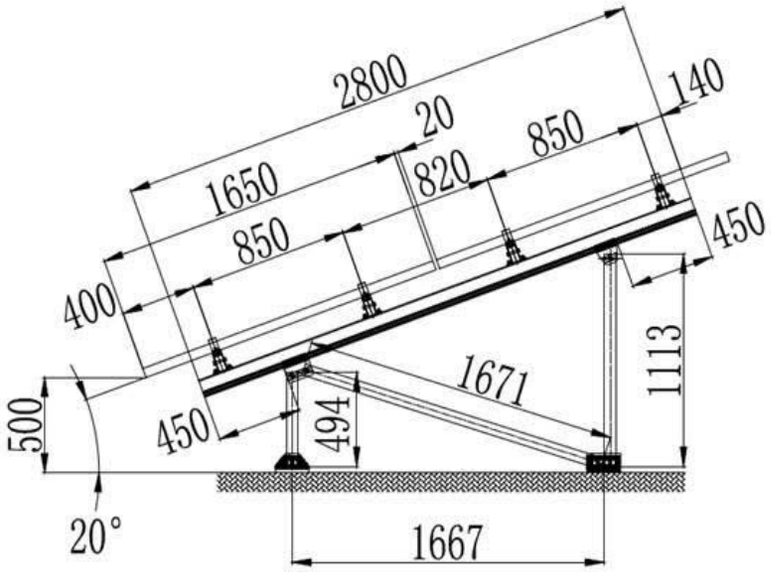
L. Van Spaandonk
Principal Engineer
FIEAust CPEng NER 5038980

Attachments
- Frames pictures by Clenergy
- Footing drawings by Gamcorp

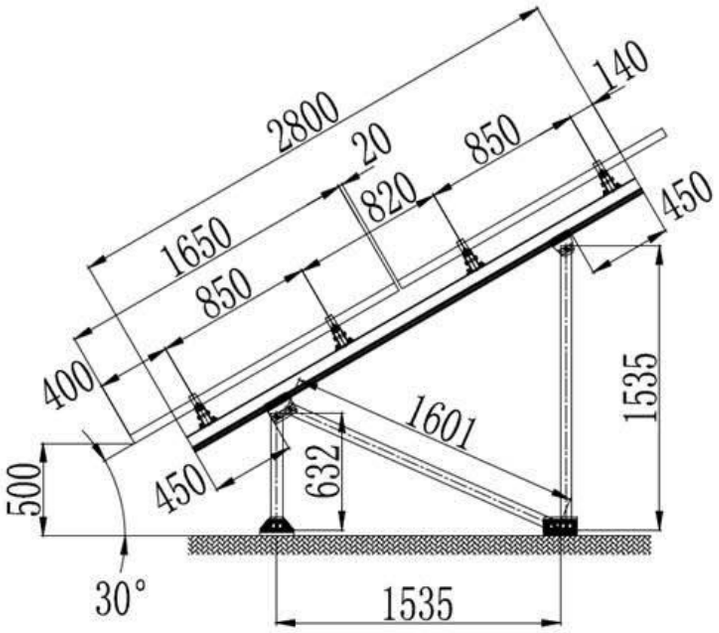
Appendices
A1. Explanation of Importance Levels
A2. Map of Australian Wind Regions

Frames pictures (by Clenergy)

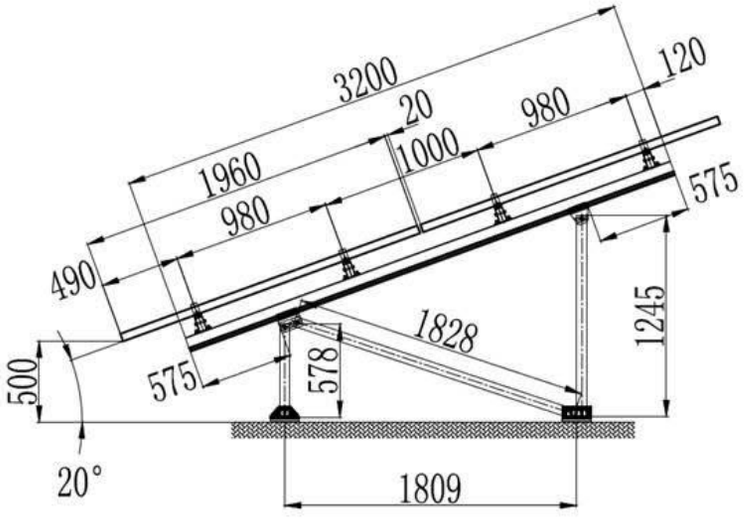
Part Number: ER-S-STIIIA/S20
(Standard STIII-A with girder 2800mm, 20 degrees tilt)



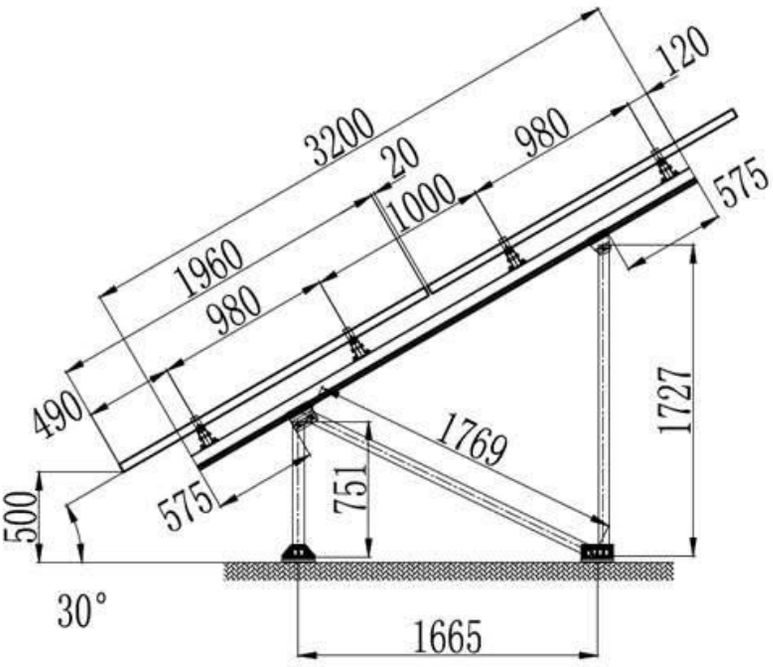
Part Number: ER-S-STIIIA/S30
(Standard STIII-A with girder 2800mm, 30 degrees tilt)



Part Number: ER-S-STIIIA/D20
(Standard STIII-A with girder 3200mm, 20 degrees tilt)

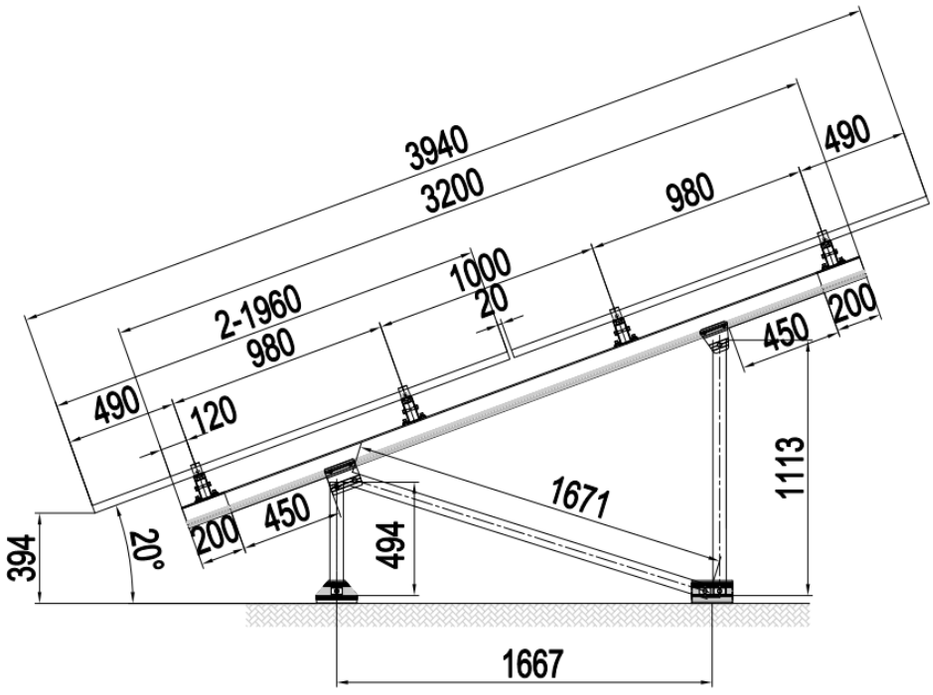


Part Number: ER-S-STIIIA/D30
(Standard STIII-A with girder 3200mm, 30 degrees tilt)



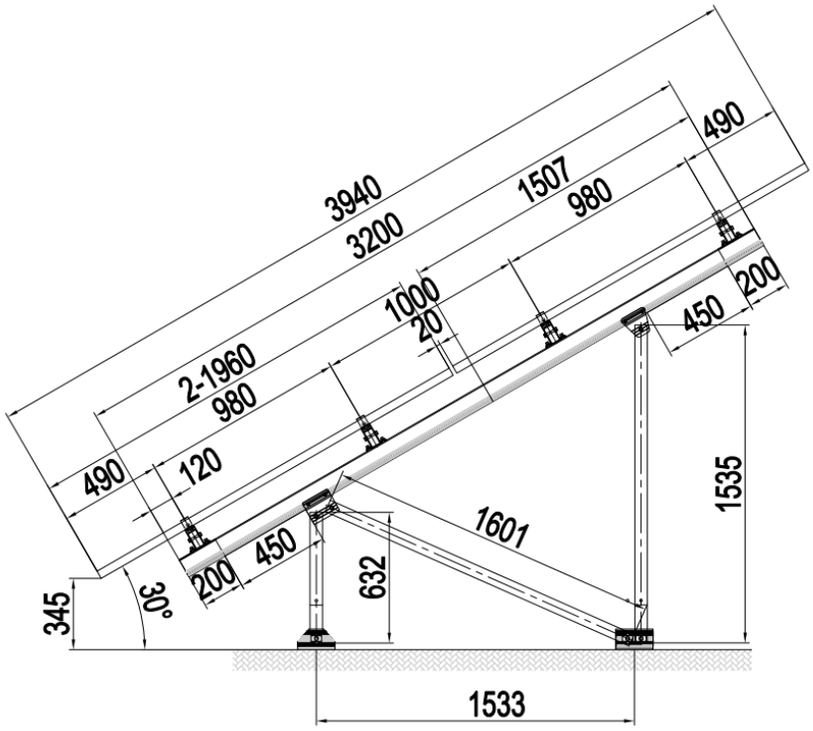
Part Number: ER-S-STIIIA/S20 with 2 x GE-STA/200

[STIII-A with extended girder 3200mm (200+2800+200), 20 degrees tilt]



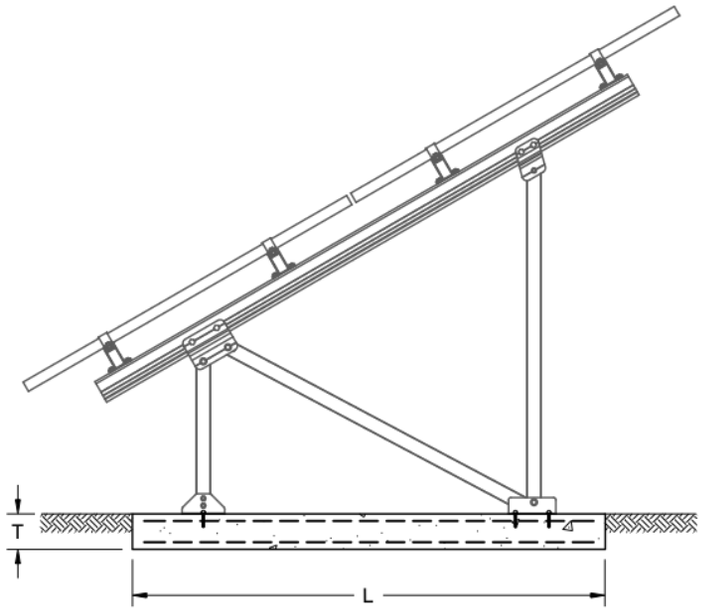
Part Number: ER-S-STIIIA/S30 with 2 x GE-STA/200

[STIII-A with extended girder 3200mm (200+2800+200), 30 degrees tilt]

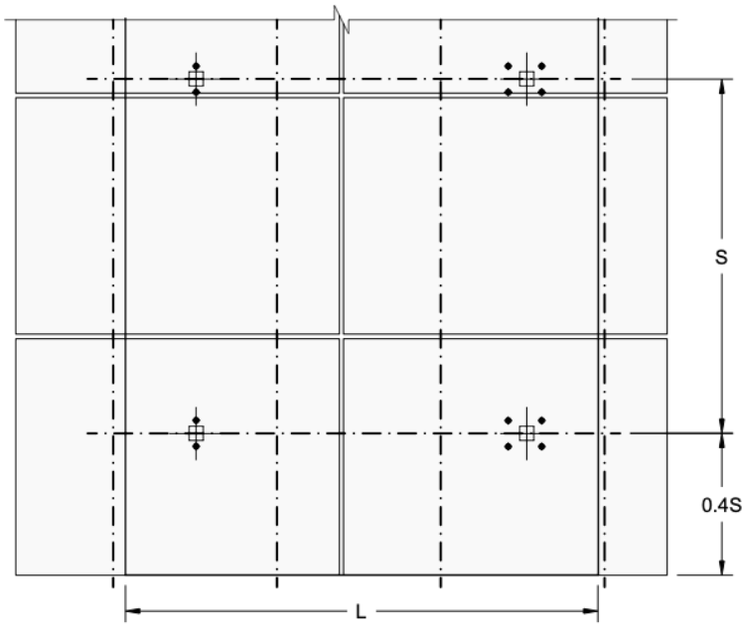


Footing drawings (by Gamcorp, NTS)

1. Continuous Paving Slab

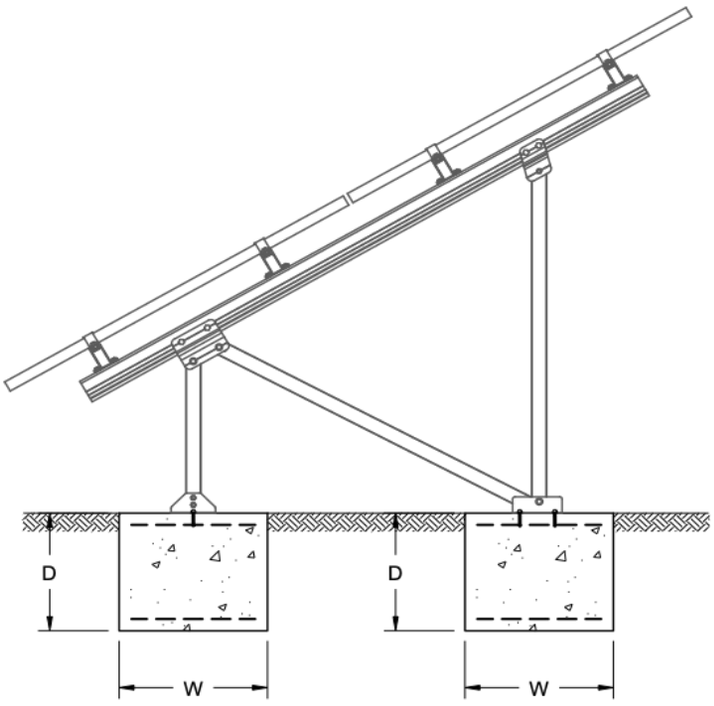


SECTION



PLAN

2. Continuous Strip Footing



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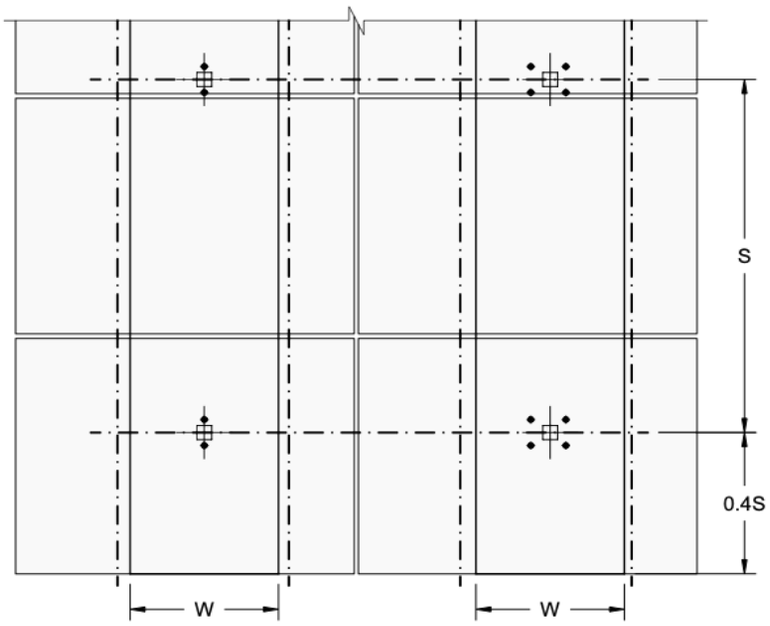
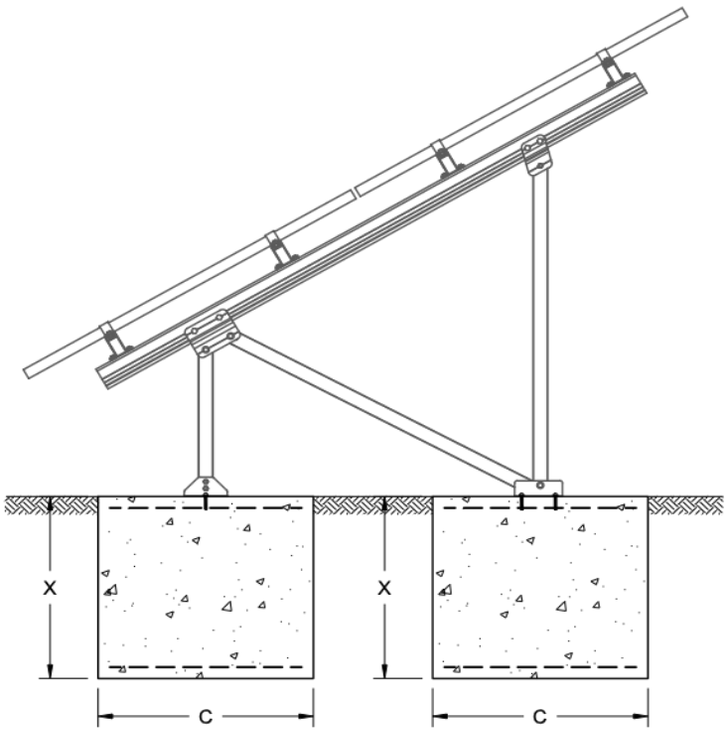


PLAN

3. Individual Pad footing per leg



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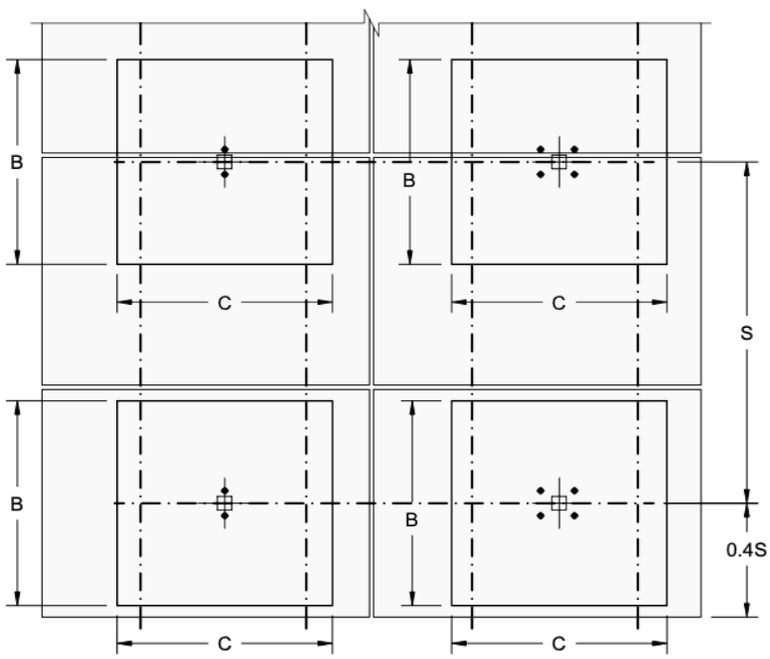
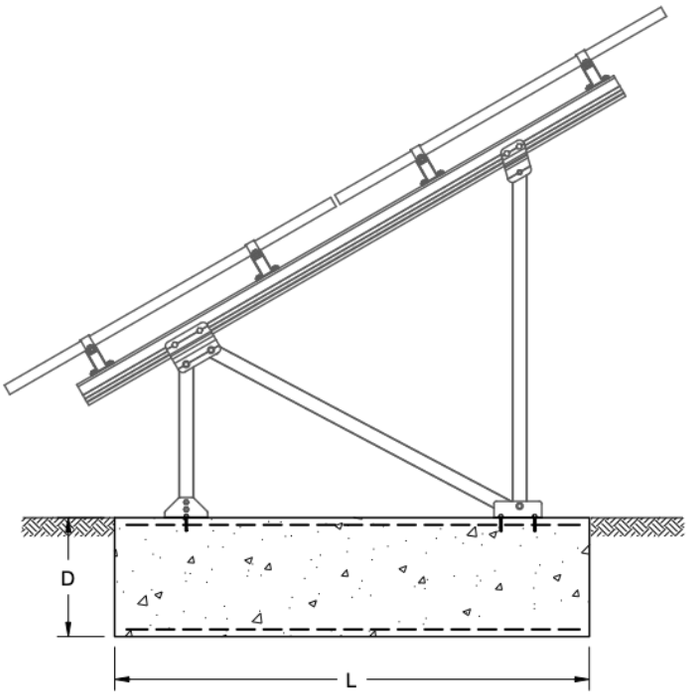
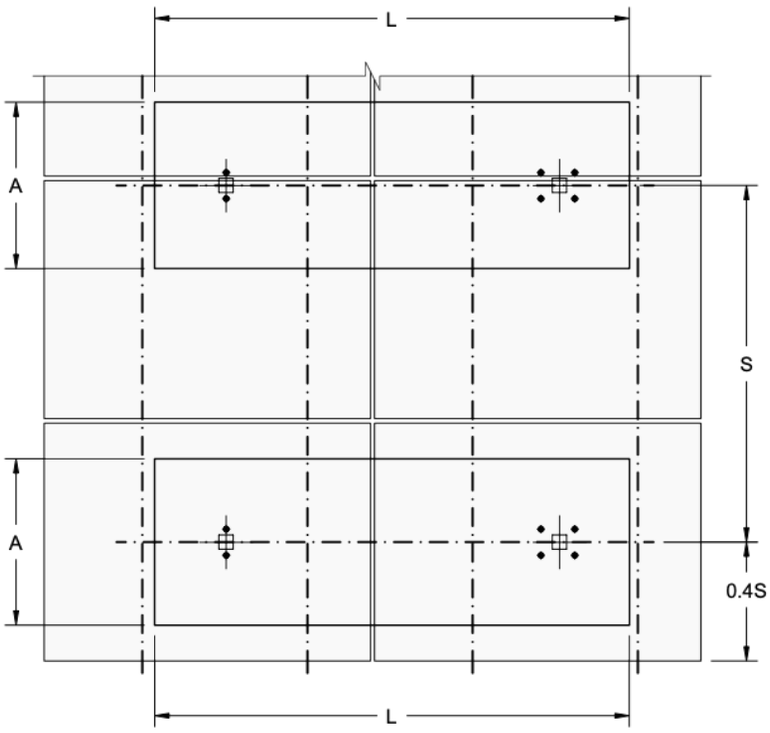


PLAN

4. Transverse Strip Footing

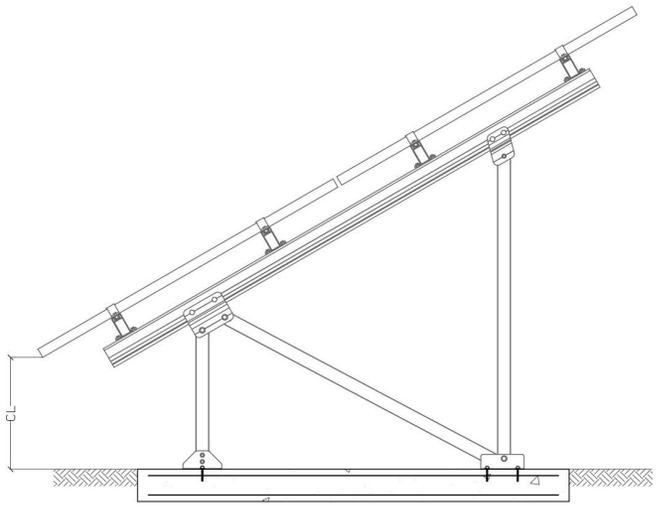


SECTION

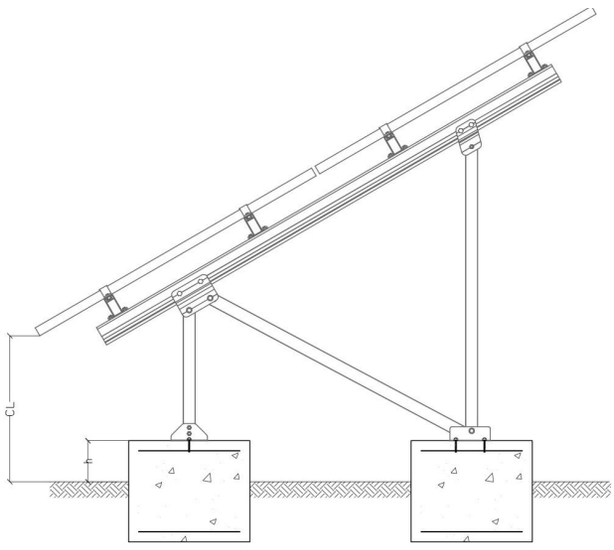


PLAN

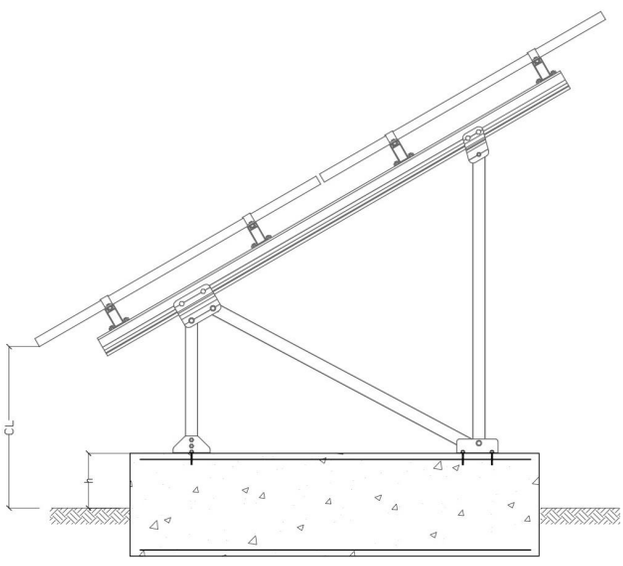
Sections showing Cl and h



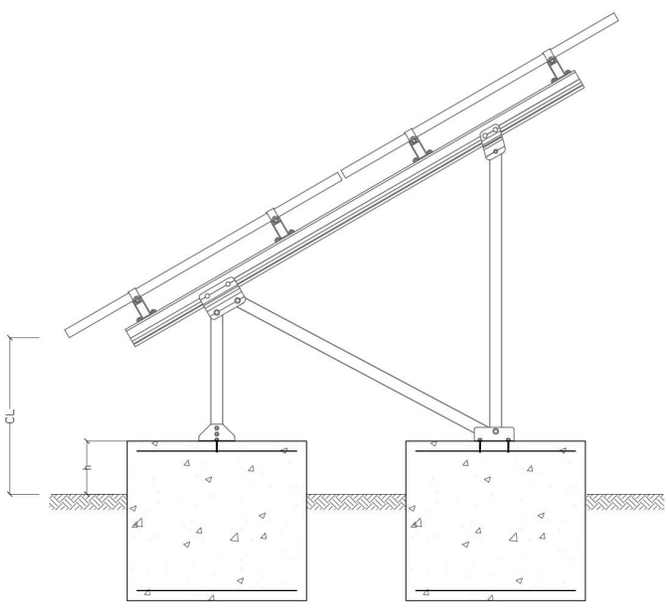
1 - Continuous Paving Slab



2 - Continuous Strip Footing



3 - Transverse Strip Footing



4 - Individual Pad footing

Appendices

A1. Explanation of Importance Level

(from AS/NZS-1170_0-2002 - Structural design actions - General principles - amendments 1-5 incorporated)

TABLE F1

STRUCTURE TYPES FOR IMPORTANCE LEVELS

Consequences of failure	Description	Importance level	Comment
Low	**Low** consequence for loss of human life, *or* **small or moderate** economic, social *or* environmental consequences	1	Minor structures (failure not likely to endanger human life)
Ordinary	**Medium** consequence for loss of human life, *or* **considerable** economic, social *or* environmental consequences	2	Normal structures and structures not falling into other levels
High	**High** consequence for loss of human life, *or* **very great** economic, social or environmental consequences	3	Major structures (affecting crowds)
		4	Post-disaster structures (post-disaster functions or dangerous activities)
Exceptional	Circumstances where reliability must be set on a case by case basis	5	Exceptional structures

TABLE F2

ANNUAL PROBABILITY OF EXCEEDANCE OF THE DESIGN EVENTS FOR ULTIMATE LIMIT STATES

Design working life	Importance level	Design events for safety in terms of annual probability of exceedance		
		Wind	Snow	Earthquake (see Note 1)
Construction equipment (e.g. props, scaffolding, braces and similar)	2	1/100	1/50	Not required (see Note 3)
5 years or less (only for structures whose failure presents no risk to human life, see Note 2)	1 2 3	1/25 1/50 1/100	1/25 1/50 1/100	Not required (see Note 3)
25 years	1 2 3 4	1/100 1/200 1/500 1/1000	1/25 1/50 1/100 1/250	Not required (see Note 3) 1/250 1/500 1/1000
50 years	1 1 2 3 4	1/100 (non-cyclonic) 1/200 (cyclonic) 1/500 1/1000 1/2500	1/100 1/150 1/200 1/500	1/250 1/500 1/1000 1/2500
100 years or more	1 2 3 4	1/500 1/1000 1/2500 (see Paragraph F3)	1/200 1/250 1/500 (see Paragraph F3)	1/250 1/1000 1/2500 (see Paragraph F3)

A2. Map of Australian Wind Regions

(from AS/NZS-1170_2-2021 - Structural design actions - Part 2: WInd actions)

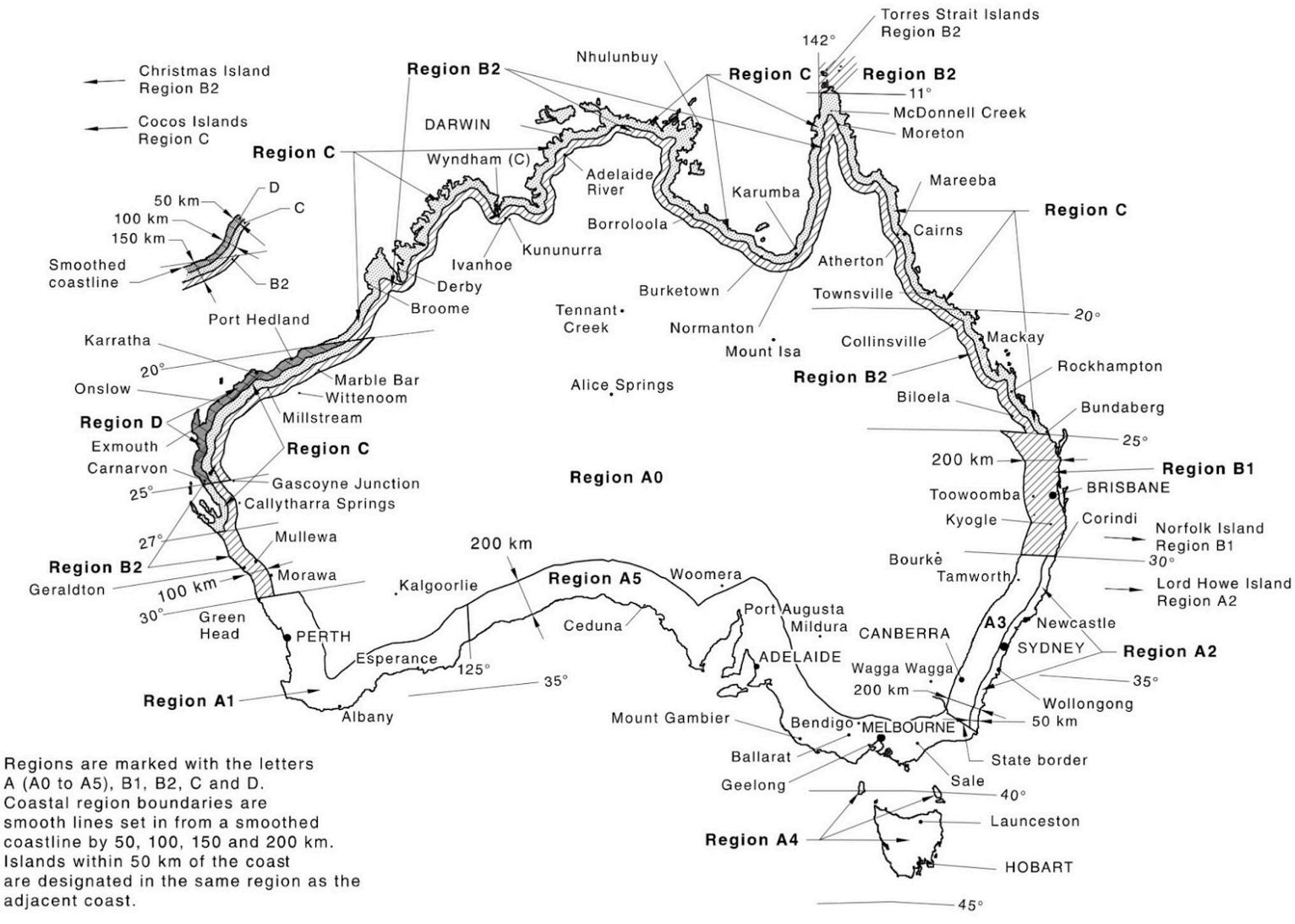


Figure 3.1(A) — Wind regions — Australia

AU Certification (Ground Screws Foundation)

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CLENERGY

Structural Certification Ground Screw Foundation for Clenergy PV-ezRack SolarTerrace III-A (STIII-A)

Within Australia

For Clenergy Australia
Suite 1/10 Duerdin Street
Clayton, VIC 3168

Job No. **13352**
Date: **18/07/2023**

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Document ID		13352/AA		**Job No.**	13352	
File Path		G:\Shared drives\13000\13300 - 13399\13352\03 Certification				
Client		Clenergy Australia PTY LTD		**Client Contact**	Yuneska Harris	
Rev	**Date**	**Revision Details**	**Prepared By**	**Author**	**Verifier**	**Approver**
0	18/07/2023	First Issue	AA	AA	HS	LvS
Current Revision		0				

Approval			
Author Signature	*AA*	Approver Signature	
Name	Ali Askari	Name	L. Van Spaandonk
Title	Structural Engineer	Title	Principal Engineer

Structural Certification

Ground Screw Foundation for SolarTerrace III-A Installation in Australia

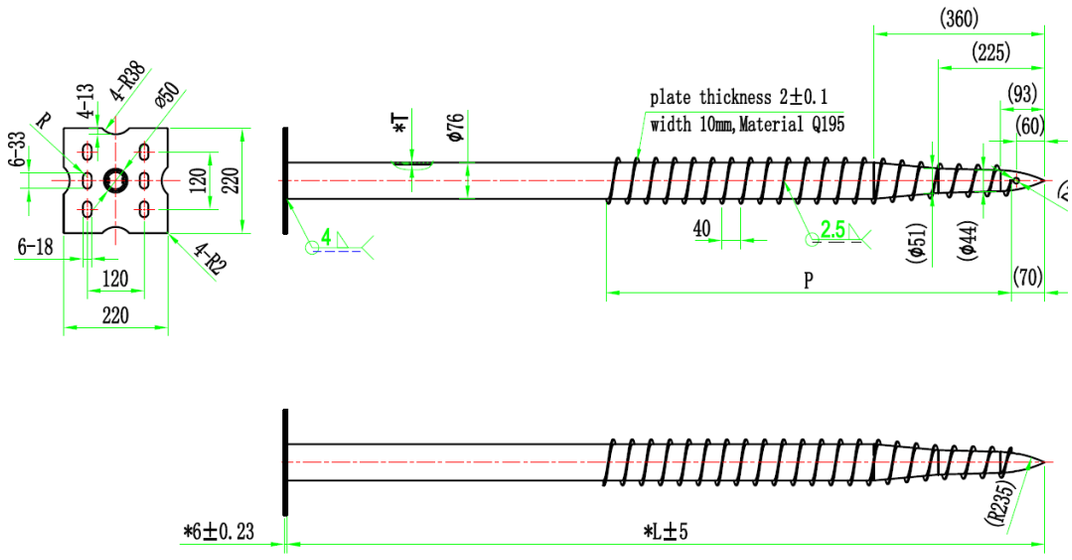
Gamcorp Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of the Ground Screw Foundation for PV-ezRack SolarTerrace III-A within Australia. The design check has been based on the information and schematic drawings of the system component, provided by Clenergy Australia.

Component	Part No.	Description
13-14028-200	GS-76/3.5/13-F0	Ground Screw ϕ76*3.5*1300
13-14028-201	GS-76/3.5/16-F0	Ground Screw ϕ76*3.5*1600

This certification shall be read in conjunction with 11398-2 - General Compliance Letter - STIII-A in Australia Rev2, dated 25/05/2023, prepared by Gamcorp.

We find the Ground Screw to be structurally sufficient for installation in Australia, based on the following conditions:

- Maximum height above ground **150mm;**
- Ignored top soil **200mm;**
- Non-aggressive soil;
- Shaft and end plate material steel **Q235B**;
- Threads material steel **Q195**;
- **85µm** hot dip galvanization;
- Steel design according to AS4100:2020 & AS4600:2018;
- Front leg ground screw L=1300mm (Min.) & Rear leg ground screw L=1600mm;



No.	BarCode	L	P	T	Weight (Kg)
1	13-14028-200	1300	860	3.5±0.2	10.351
2	13-14028-201	1600	860	3.5±0.2	12.126

Table 1: Maximum Support Frame Spacing for Solar Terrace III-A with Panels up to 1800 mm long and standard girder 2800mm

Wind region	A				B1				B2		C		D	
Regional wind speed (VR, m/s)	41				48				48		56		66	
Panels Tilt angle	20°		30°		20°		30°		20°		20°		20°	
Soil Type	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm
Maximum spacing (S, m)	3.60	3.25	2.55	1.60	3.50	2.35	1.85	1.15	3.40	2.10	2.45	1.55	1.75 (1.70*)	1.10 (1.05*)

Note(*): When using east west adaptor

Table 2: Maximum Support Frame Spacing for Solar Terrace III-A with Panels 1801 to 2000 mm long and standard/extended girder 3200mm

Wind region	A				B1				B2		C		D	
Regional wind speed (VR, m/s)	41				48				48		56		66	
Panels Tilt angle	20°		30°		20°		30°		20°		20°		20°	
Soil Type	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm
Maximum spacing (S, m)	3.50	3.15	2.30	1.40	3.50	2.25	1.65	1.05	3.30	2.05	2.35	1.45	1.70 (1.60*)	1.05 (1.00*)

Note(*): When using east west adaptor

Table 3: Maximum Support Frame Spacing for Solar Terrace III-A with Panels 2001 to 2200 mm long and extended girder 3600mm

Wind region	A				B1				B2		C		D	
Regional wind speed (VR, m/s)	41				48				48		56		66	
Panels Tilt angle	20°		30°		20°		30°		20°		20°		20°	
Soil Type	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm
Maximum spacing (S, m)	3.40	2.75	2.10	1.30	3.20	2.00	1.50	0.95	2.85	1.80	2.00	1.30	1.40 (1.30*)	0.90 (0.85*)

Note(*): When using east west adaptor

Table 4: Maximum Support Frame Spacing for Solar Terrace III-A with Panels 2201 to 2400 mm long and extended girder 3600mm

Wind region	A				B1				B2		C		D	
Regional wind speed (VR, m/s)	41				48				48		56		66	
Panels Tilt angle	20°		30°		20°		30°		20°		20°		20°	
Soil Type	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm	Hard	Very Firm
Maximum spacing (S, m)	2.00	2.00	1.25	1.15	1.80	1.70	1.15	0.85	1.65	1.55	1.00	1.00	0.85 (0.75*)	0.80 (0.70*)

Note(*): When using east west adaptor

Table 5: Ultimate Design Load Capacities for Ground Screws

Load	Uplift (kN)		Compression (kN)		Lateral (kN)	
Soil Type	**Hard**	**Very Firm**	**Hard**	**Very Firm**	**Hard**	**Very Firm**
Ground Screw L=1600	**14.15**	**8.85**	**22.90**	**14.30**	**6.35**	**3.95**
Ground Screw L=1300	**12.45**	**7.80**	**20.30**	**12.70**	**4.25**	**2.65**

General Notes:
1. The frame spacing, recommended for 'Very Firm' & 'Hard' soils with minimum allowable bearing capacity of **150 kPa** (dry stiff clays, clayey sands, coarse sands, compact sands) & **240 kPa** (gravels, dry hard clays) respectively. Contact Gamcorp for site specific conditions (to find out whether a more cost effective solution is possible).
2. For the fixing of STIII-A to the ground screws we recommend using M16 (Grade 4.6 HDG Carbon Steel or SS). Clenergy STIII-A has 6 bolts per frame, 2 at front and 4 at rear.

Construction is to be carried out strictly in accordance with the instruction manual. This work was designed **by Ali Askari** 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 **July 31, 2025,** unless any of the relevant Australian Standards becomes updated before the due date.

Yours faithfully,
Gamcorp Pty Ltd

L. Van Spaandonk
Principal Engineer
FIEAust CPEng NER 5038980

NZ Certification (Concrete Foundation)

CLENERGY

Structural Certification
Clenergy PV-ezRack
SolarTerrace III-A
(STIII-A)

Within New Zealand

For Clenergy Australia
Suite 1/10 Duerdin Street
Clayton, VIC 3168

Clenergy Reference Number: CL-1069-Y

Job No. **12822-2**
Date: **25/08/2023**

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Document ID		12822-2/LvS		**Job No.**	12822-2	
File Path		G:\Shared drives\12000\12800 - 12899\12822\03 Certification				
Client		Clenergy Australia PTY LTD		**Client Contact**	Geza Anderson	
Rev	**Date**	**Revision Details**	**Prepared By**	**Author**	**Verifier**	**Approver**
0	28/04/2023	Draft	LvS	LvS	BG/YK	LvS
1	25/08/2023	Comments to 11398, references, Gamcorp name etc	LvS	LvS	-	LvS
Current Revision		1				

Approval			
Author Signature		Approver Signature	
Name	L. Van Spaandonk	Name	L. Van Spaandonk
Title	Structural Engineer	Title	Principal Engineer

PV Array Frame Structural Certification

SolarTerrace III-A Installation in New Zealand

Gamcorp Pty Ltd, being Structural Engineers within the meaning of Australian Building Regulations, have carried out a structural design check of the PV-ezRack SolarTerrace III-A for installation within New Zealand. The design check has been based on the information in the *PV-ezRack SolarTerrace III-A Planning and Installation Guide* 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
PV-ezRack SolarTerrace III-A, Double Support (Pre-assembled) 20°, with 3200mm Girder	ER-S-STIIIA/D20
PV-ezRack SolarTerrace III-A, Double Support (Pre-assembled) 30°, with 3200mm 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 Akashi Clamp for Frame Height 30-46mm with Grounding Clip	C-U/30/46-G
PV-ezRack Akashi Clamp for Frame Height 30-46mm	C-U/30/46
PV-ezRack T-Rail Clamp with Grounding	ER-RC-T/G
PV-ezRack Girder Extension for SolarTerrace-A (II and III) 200mm	GE-STA/200
East/West Adjustable - Bracket for T-Rail 110	BR-R110/EW, BR-R110/EW/G

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

- Wind Loads to **AS/NZS 1170.2:2021**;
  - Wind Terrain Category **2**;
  - Wind average recurrence interval of **50** years (ultimate), **25** years (serviceability);
  - Wind regions **NZ1, NZ2, NZ3, NZ4**;
  - Ms=1, Mt=1, Md=1, Mlee=1;
- Earthquake Loads to **NZS 1170.5:2004**;
- PV panels mass **15kg/m^2**. Adopted panels width up to **1400mm**, length (**Lp**), panels clearance above ground (**Cl**) and footing height above ground (**h**): refer further pages;
- Tilt angles considered **20** and **30** degrees. Other tilt angles are also possible but with other frame dimensions;
- Materials Strength calculated: aluminium members 240MPa (AL6005-T5), concrete 25MPa.
- For ground screws option see Gamcorp letter 13352.

CONTENT

Table 1. Maximum Frame Spacing (S) and Footing Options for STIII-A installation in New Zealand: standard girder **2800 mm** long / solar panels **up to 1800 mm** long (**superseding** letter **5510-1**)

Table 2. Maximum Frame Spacing (S) and Footing Options for STIII-A installation in Australia: girder **3200 mm** long (standard or extended, 200+2800+200mm) / solar panels **up to 2000 mm** long (**superseding** letter **5510-2** and **7802-2**)

Table 3. Maximum Frame Spacing (S) and Footing Options for STIII-A installation in Australia: extended girder **3600 (=200+3200+200) mm** long / solar panels **2001 - 2200 mm** long (**superseding** letter **7375-2 - Table 1**)

Table 4. Maximum Frame Spacing (S) and Footing Options for STIII-A installation in Australia: extended girder **3600 (=200+3200+200) mm** long / solar panels **2201 - 2400 mm** long (**superseding** letter **7375-2 - Table 2**)

General Notes.

Pictures.
Frames pictures (by Clenergy):
- SolarTerrace III-A: standard girder 2800 mm long / solar panels up to 1800 mm long / tilt angle 20 degrees;
- As previous but 30 degrees;
- SolarTerrace III-A: standard girder 3200 mm long / solar panels up to 2000 mm long / tilt angle 20 degrees;
- As previous but 30 degrees;
- SolarTerrace III-A: extended girder 3200(=200+2800+200)mm long / solar panels up to 2000 mm long / tilt angle 20 degrees;
- As previous but 30 degrees;

Footing drawings (by Gamcorp, NTS):
1 - Continuous Paving Slab;
2 - Continuous Strip Footing;
3 - Individual Pad footing per leg;
4 - Transverse Strip Footing;

Frame+Footing pictures, showing Cl (panels clearance above ground level) and h (footing height above ground level).

Appendices
A1. Explanation of Importance Levels
A2. Map of Wind Regions in New Zealand

Table 1: Maximum Support Frame Spacing and Footing Options for Solar Terrace III-A with Panels up to 1800 mm long and standard girder 2800mm (forces in kN, dimensions in m)

Wind region	**NZ1 & NZ2**				**NZ3 & NZ4**			
Regional wind speed (V_R, m/s)	**41**				**48 & 46**			
Panels Tilt angle	**20°**		**30°**		**20°**		**30°**	
(Lp ≤ 1800mm)	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg
Maximum spacing (S)	**3.60**		**3.10**		**3.50**		**2.90**	
Uplift force	0.0	9.7	0.0	17.0	0.3	13.1	0.0	22.0
Down force	5.4	4.7	3.6	8.0	6.8	6.0	4.2	10.0
Total horizontal force at leg base	4.0		7.7		5.4		9.9	
Footing Type (1 - 4)								
1 - Continuous Paving Slab, Length x Thickness (L x T). Cl=0.50, h=0	2.20 x 0.15		2.20 x 0.20		2.20 x 0.15		2.30 x 0.25	
Adopt reinforcement	mesh N8-125, or SL-81		mesh N8-125, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81	
2 - Continuous Strip Footing, Width x Depth (W x D). Cl=0.70, h=0.20	0.40 x 0.40	0.45 x 0.45	0.40 x 0.40	0.65 x 0.65	0.40 x 0.40	0.55 x 0.55	0.40 x 0.40	0.80 x 0.80
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
3 - Individual Pad footing per leg, Length (=Width) x Depth (B x C x X). Cl=0.70, h=0.20	0.55 x 0.55 x 0.55	0.95 x 0.95 x 0.95	0.65 x 0.65 x 0.65	1.10 x 1.10 x 1.10	0.60 x 0.60 x 0.60	1.00 x 1.00 x 1.00	0.70 x 0.70 x 0.70	1.20 x 1.20 x 1.20
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
4 - Transverse Strip Footing, Length x Width x Depth (L x A x D). Cl=0.60, h=0.10	2.20 x 0.65 x 0.65		2.35 x 0.80 x 0.80		2.30 x 0.75 x 0.75		2.60 x 0.85 x 0.85	
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	

Table 2: Maximum Support Frame Spacing and Footing Options for Solar Terrace III-A with Panels up to 2000 mm long and girder 3200mm long (standard or extended) (forces in kN, dimensions in m)

Wind region	**NZ1 & NZ2**				**NZ3 & NZ4**			
Regional wind speed (V_R, m/s)	**41**				**48 & 46**			
Panels Tilt angle	**20°**		**30°**		**20°**		**30°**	
(Lp ≤ 2000mm)	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg
Maximum spacing (S)	**3.50**		**3.00**		**3.50**		**2.80**	
Uplift force	0.8	9.8	0.0	16.6	1.4	13.6	0.0	21.5
Down force	5.7	5.1	4.1	8.1	7.4	6.6	4.9	10.1
Total horizontal force at leg base	4.40		8.30		6.00		10.60	
Footing Type (1 - 4)								
1 - Continuous Paving Slab, Length x Thickness (L x T). Cl=0.50, h=0	2.20 x 0.15		2.35 x 0.20		2.20 x 0.20		2.50 x 0.25	
Adopt reinforcement	mesh N8-125, or SL-81		mesh N8-125, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81	
2 - Continuous Strip Footing, Width x Depth (W x D). Cl=0.70, h=0.20	0.40 x 0.40	0.50 x 0.50	0.40 x 0.40	0.70 x 0.70	0.40 x 0.40	0.60 x 0.60	0.40 x 0.40	0.85 x 0.85
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
3 - Individual Pad footing per leg, Length (=Width) x Depth (B x C x X). Cl=0.70, h=0.20	0.55 x 0.55 x 0.55	0.95 x 0.95 x 0.95	0.65 x 0.65 x 0.65	1.15 x 1.15 x 1.15	0.60 x 0.60 x 0.60	1.05 x 1.05 x 1.05	0.70 x 0.70 x 0.70	1.25 x 1.25 x 1.25
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
4 - Transverse Strip Footing, Length x Width x Depth (L x A x D). Cl=0.60, h=0.10	2.30 x 0.65 x 0.65		2.35 x 0.80 x 0.80		2.35 x 0.80 x 0.80		2.60 x 0.90 x 0.90	
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	

Table 3: Maximum Support Frame Spacing and Footing Options for Solar Terrace III-A with Panels 2001 - 2200 mm long and extended girder 3200(=200+2800+200)mm
(forces in kN, dimensions in m)

Wind region	**NZ1 & NZ2**				**NZ3 & NZ4**			
Regional wind speed (V_{R}, m/s)	**41**				**48 & 46**			
Panels Tilt angle	**20°**		**30°**		**20°**		**30°**	
(Lp ≤ 2200mm)	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg
Maximum spacing (S)	**3.40**		**2.60**		**3.20**		**1.90**	
Uplift force	0.5	10.9	0.0	16.7	0.9	14.2	0.0	16.9
Down force	6.0	5.3	3.7	7.8	7.4	6.5	3.5	7.6
Total horizontal force at leg base	4.7		7.9		6		7.9	
Footing Type (1 - 4)								
1 - Continuous Paving Slab, Length x Thickness (L x T). Cl=0.50, h=0	2.20 x 0.15		2.30 x 0.25		2.20 x 0.20		2.45 x 0.30	
Adopt reinforcement	mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81	
2 - Continuous Strip Footing, Width x Depth (W x D). Cl=0.70, h=0.20	0.40 x 0.40	0.55 x 0.55	0.40 x 0.40	0.75 x 0.75	0.40 x 0.40	0.60 x 0.60	0.40 x 0.40	0.60 x 0.60
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
3 - Individual Pad footing per leg, Length (=Width) x Depth (B x C x X). Cl=0.70, h=0.20	0.55 x 0.55 x 0.55	1.00 x 1.00 x x1.00	0.65 x 0.65 x 0.65	1.15 x 1.15 x 1.15	0.60 x 0.60 x 0.60	1.05 x 1.05 x 1.05	0.65 x 0.65 x 0.65	1.15 x 1.15 x 1.15
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
4 - Transverse Strip Footing, Length x Width x Depth (L x A x D). Cl=0.60, h=0.10	2.35 x 0.70 x 0.70		2.50 x 0.80 x 0.80		2.30 x 0.80 x 0.80		2.50 x 0.80 x 0.80	
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	

Table 4: Maximum Support Frame Spacing and Footing Options for Solar Terrace III-A with Panels 2201 - 2400 mm long and extended girder 3600(=200+3200+200)mm
(forces in kN, dimensions in m)

Wind region	**NZ1 & NZ2**				**NZ3 & NZ4**			
Regional wind speed (V_{R}, m/s)	**41**				**48 & 46**			
Panels Tilt angle	**20°**		**30°**		**20°**		**30°**	
(Lp ≤ 2400mm)	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg	Front Leg	Rear Leg
Maximum spacing (S)	**2.00**		**1.25**		**1.80**		**1.15**	
Uplift force	0.0	7.4	0.0	9.2	0.2	9.2	0.0	11.7
Down force	3.8	3.3	1.8	4.1	4.5	3.9	2.2	5.1
Total horizontal force at leg base	3.0		4.2		3.7		5.2	
Footing Type (1 - 4)								
1 - Continuous Paving Slab, Length x Thickness (L x T). Cl=0.50, h=0	2.20 x 0.15		2.40 x 0.25		2.25 x 0.20		2.60 x 0.30	
Adopt reinforcement	mesh N8-125, or SL-81		mesh N8-100, or SL-81		mesh N8-125, or SL-81		mesh N8-100, or SL-81	
2 - Continuous Strip Footing, Width x Depth (W x D). Cl=0.70, h=0.20	0.40 x 0.40	0.55 x 0.55	0.40 x 0.40	0.80 x 0.80	0.40 x 0.40	0.65 x 0.65	0.40 x 0.40	0.65 x 0.65
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
3 - Individual Pad footing per leg, Length (=Width) x Depth (B x C x X). Cl=0.70, h=0.20	0.45 x 0.45 x 0.45	0.60 x 0.60 x 0.60	0.50 x 0.50 x 0.50	0.65 x 0.65 x 0.65	0.50 x 0.50 x 0.50	0.65 x 0.65 x 0.65	0.55 x 0.55 x 0.55	0.70 x 0.70 x 0.70
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	
4 - Transverse Strip Footing, Length x Width x Depth (L x A x D). Cl=0.60, h=0.10	2.30 x 0.55 x 0.55		2.35 x 0.60 x 0.60		2.40 x 0.60 x 0.60		2.50 x 0.65 x 0.65	
Adopt reinforcement	mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81		mesh N8-100, or SL-81	

General 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 a more cost effective solution is possible).
2. Concrete footings cover: 50mm.
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 anchor's embedment depth according to 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 to find out whether a more cost effective solution is possible, based on site specific conditions.
5. Reactions in the tables are ultimate values at the leg base.
6. The length of the T-Rails overhang shall be up to 0.4x installed spacing.

Construction is to be carried out strictly in accordance with the instruction manual. This work was designed by **L. Van Spaandonk**, in accordance with the provisions of New Zealand's Building Regulations and in accordance with sound, widely accepted engineering principles. This certification excludes assessment of the members durability/corrosion and PV panels. This certification is valid till **May 31, 2025,** unless any of the relevant Standards/Regulations become updated before the due date.

Yours faithfully,
Gamcorp Pty Ltd

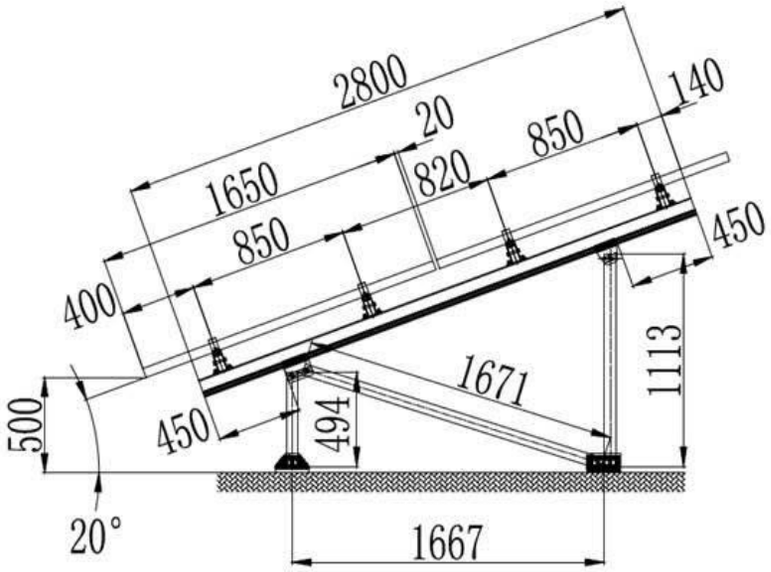
L. Van Spaandonk
Principal Engineer
FIEAust CPEng NER APEC Engineer IntPE(Aus) CMEngNZ 2003796

Attachments
- Frames pictures by Clenergy
- Footing drawings by Gamcorp

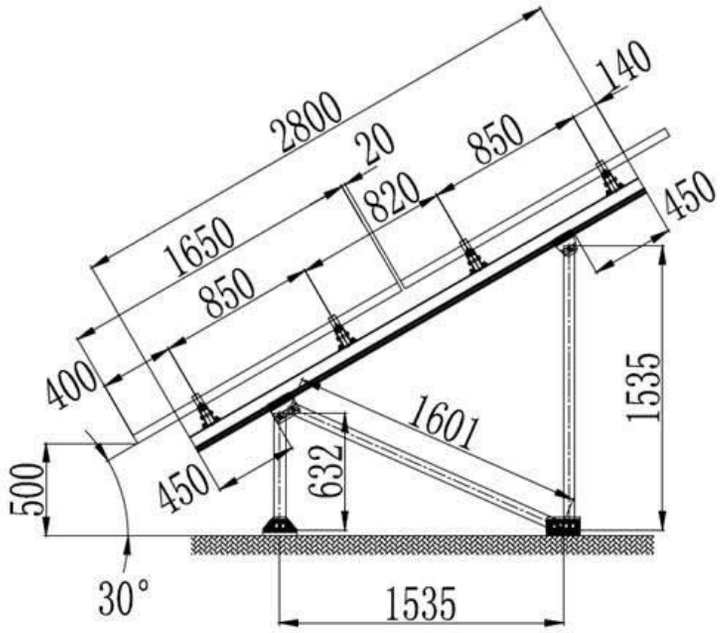
Appendices
A1. Explanation of Importance Levels
A2. Map of Wind Regions in New Zealand

Frames pictures (by Clenergy)

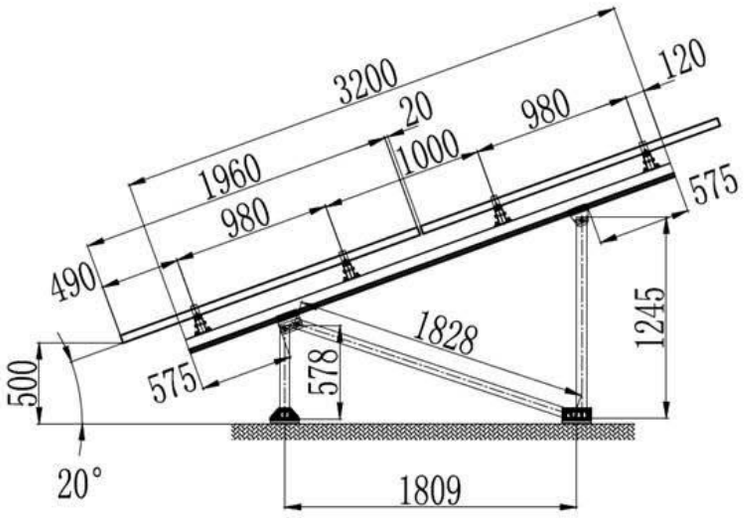
Part Number: ER-S-STIIIA/S20
(Standard STIII-A with girder 2800mm, 20 degrees tilt)



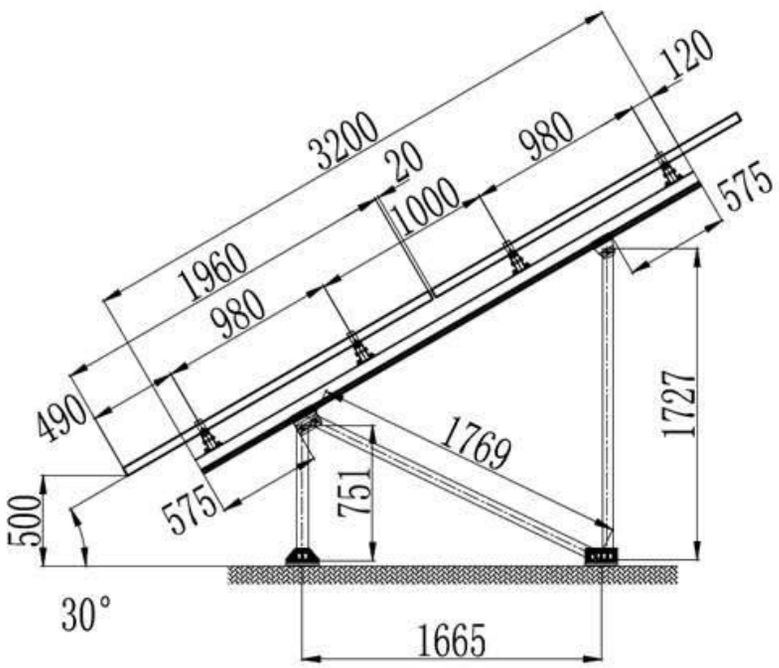
Part Number: ER-S-STIIIA/S30
(Standard STIII-A with girder 2800mm, 30 degrees tilt)



Part Number: ER-S-STIIIA/D20
(Standard STIII-A with girder 3200mm, 20 degrees tilt)

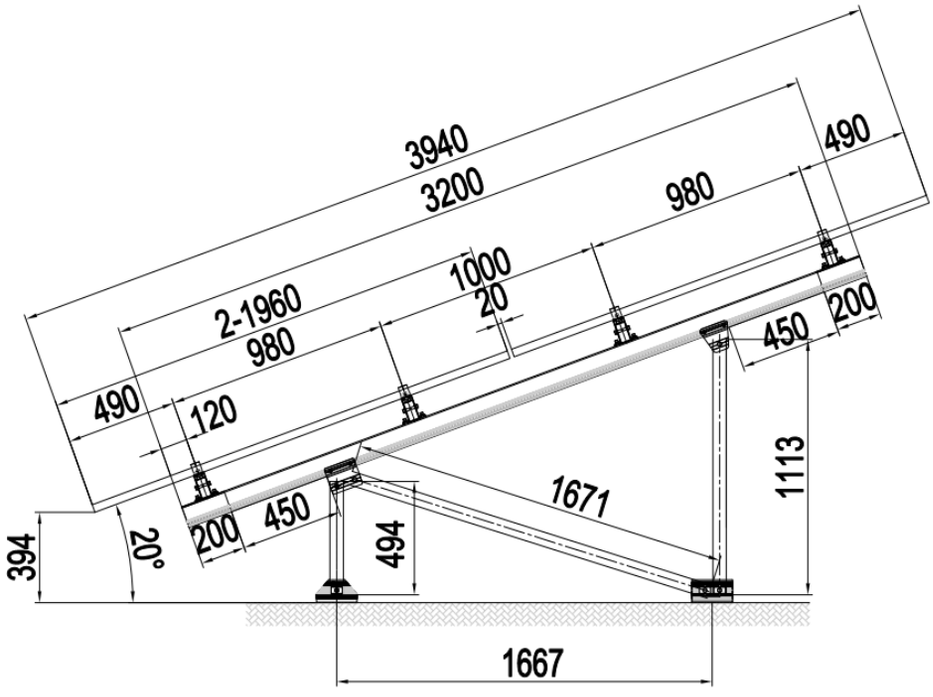


Part Number: ER-S-STIIIA/D30
(Standard STIII-A with girder 3200mm, 30 degrees tilt)



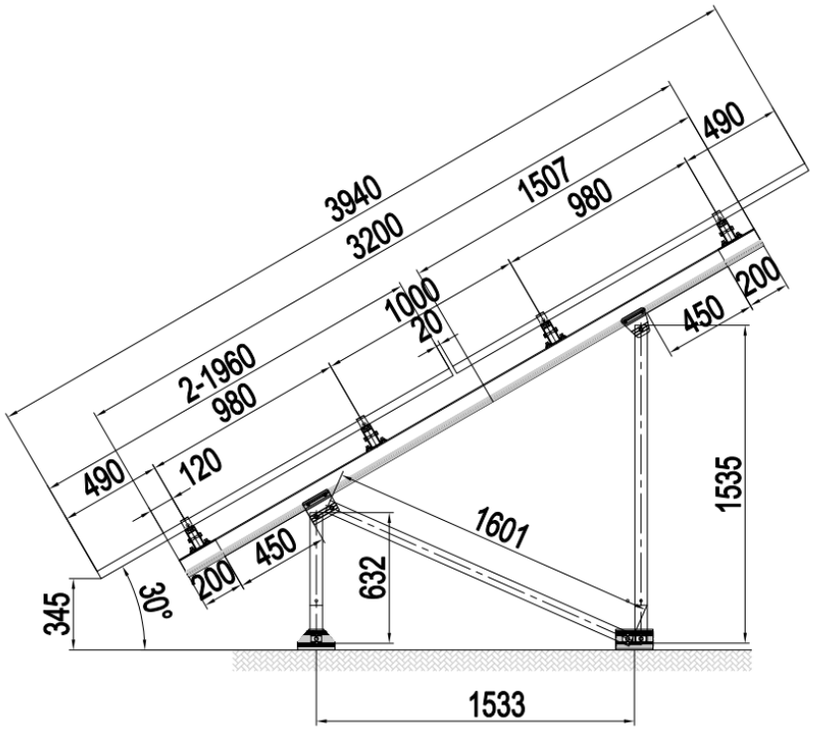
Part Number: ER-S-STIIIA/S20 with 2 x GE-STA/200

[STIII-A with extended girder 3200mm (200+2800+200), 20 degrees tilt]



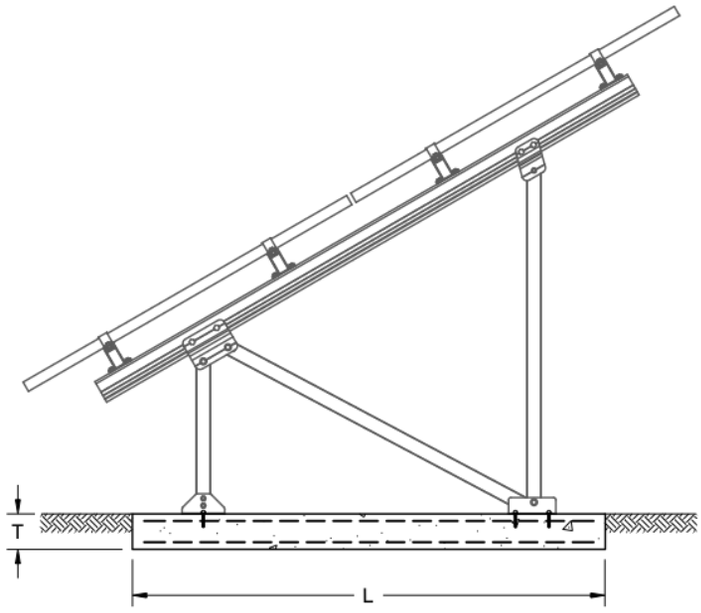
Part Number: ER-S-STIIIA/S30 with 2 x GE-STA/200

[STIII-A with extended girder 3200mm (200+2800+200), 30 degrees tilt]

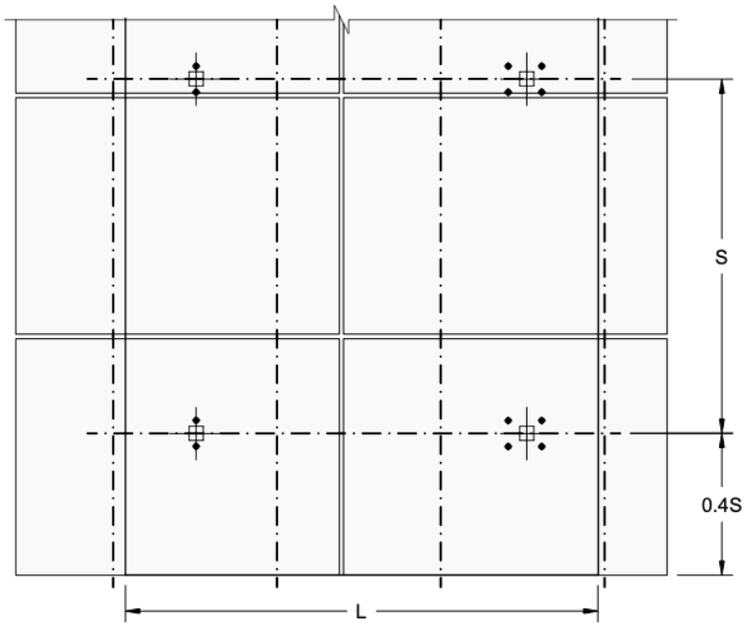


Footing drawings (by Gamcorp, NTS)

1. Continuous Paving Slab

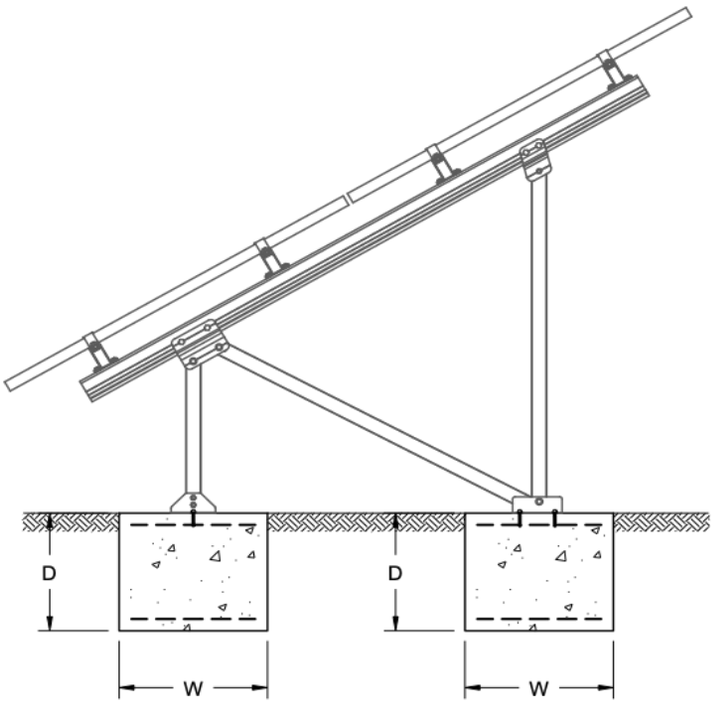


SECTION

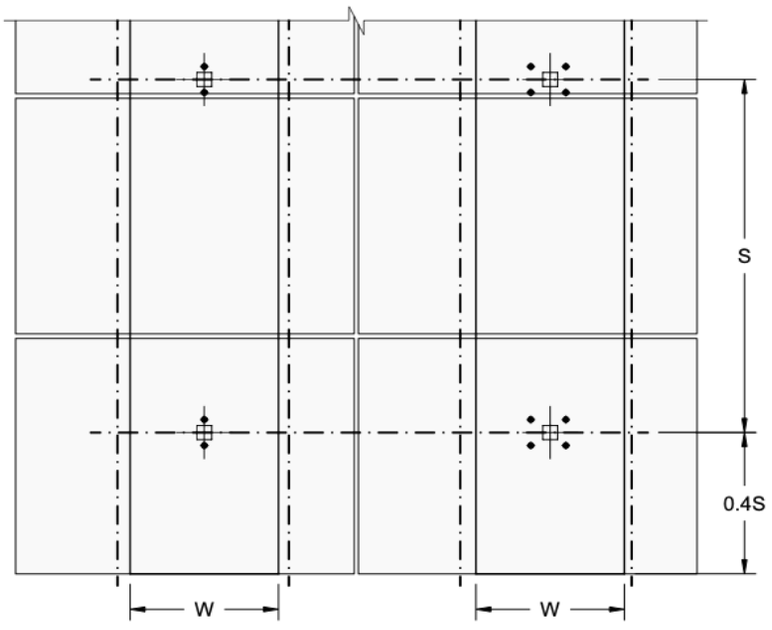


PLAN

2. Continuous Strip Footing

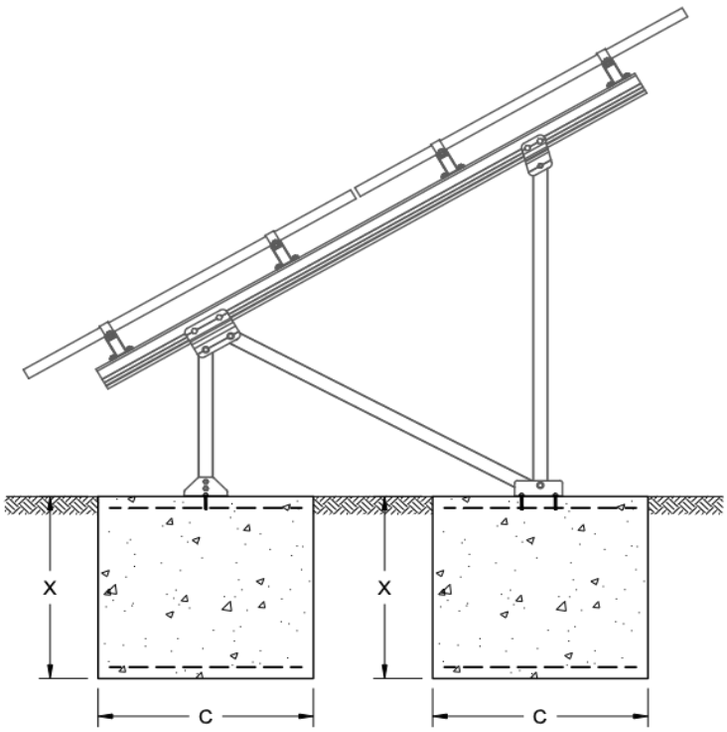


SECTION

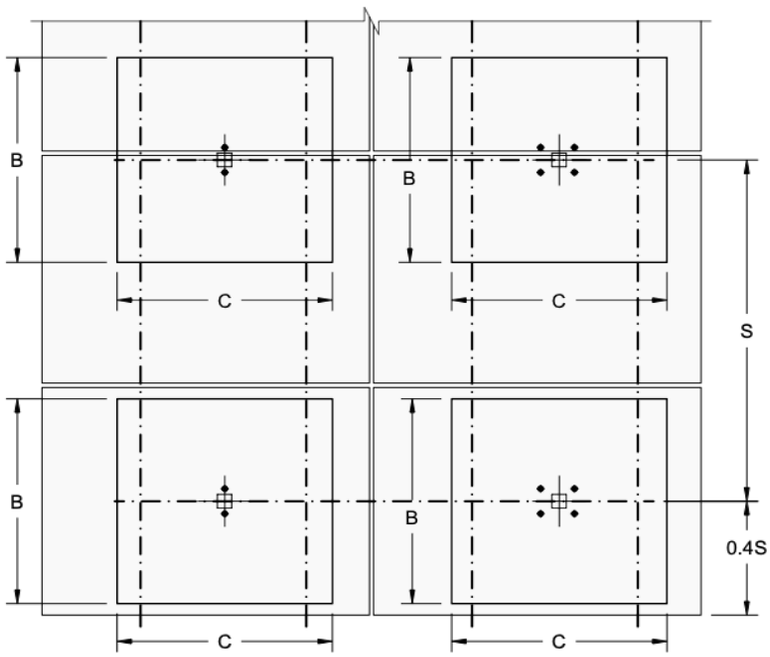


PLAN

3. Individual Pad footing per leg

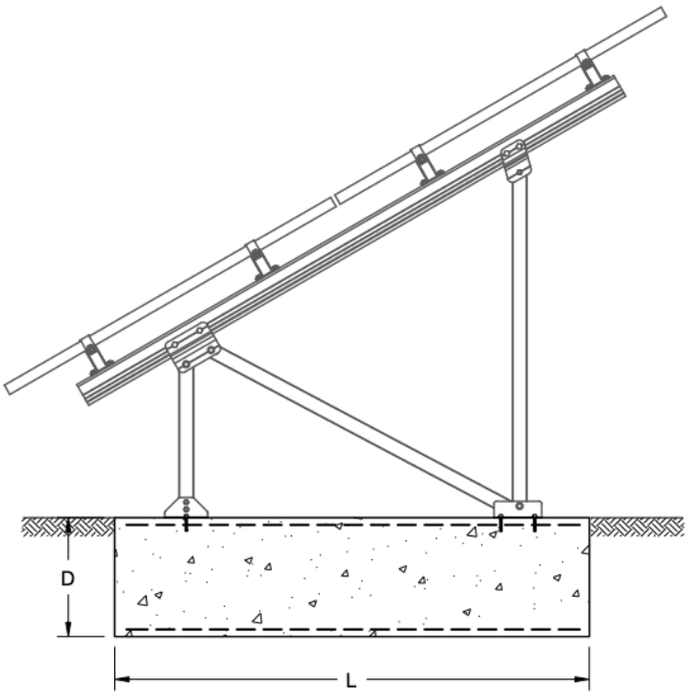


SECTION

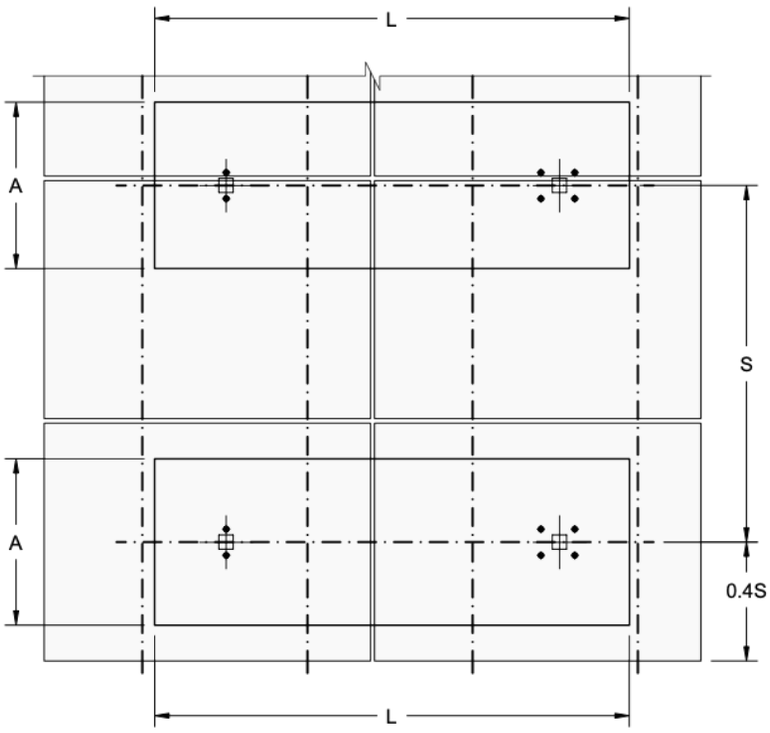


PLAN

4. Transverse Strip Footing

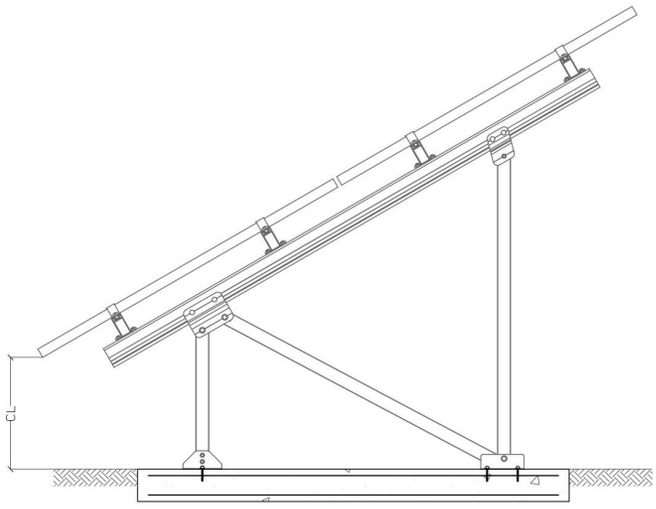


SECTION

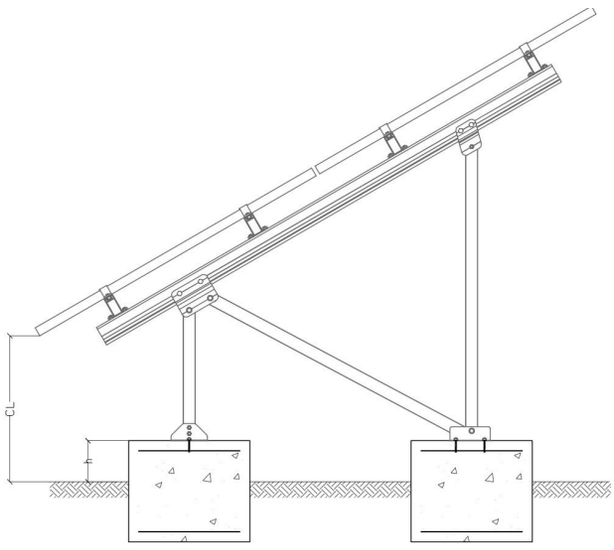


PLAN

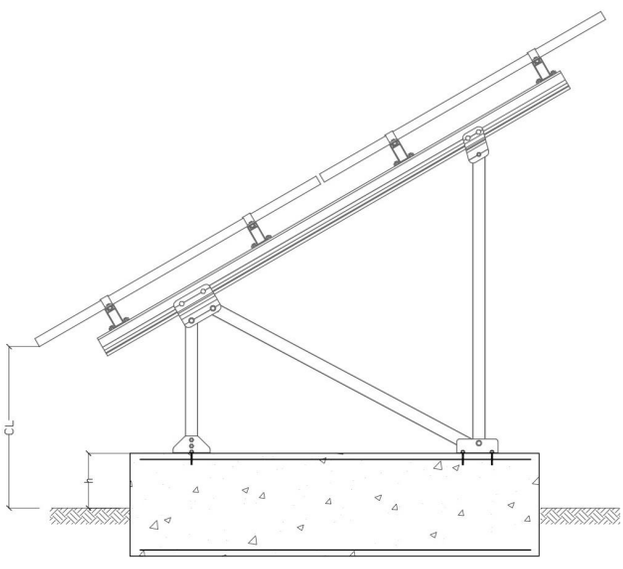
Sections showing Cl and h



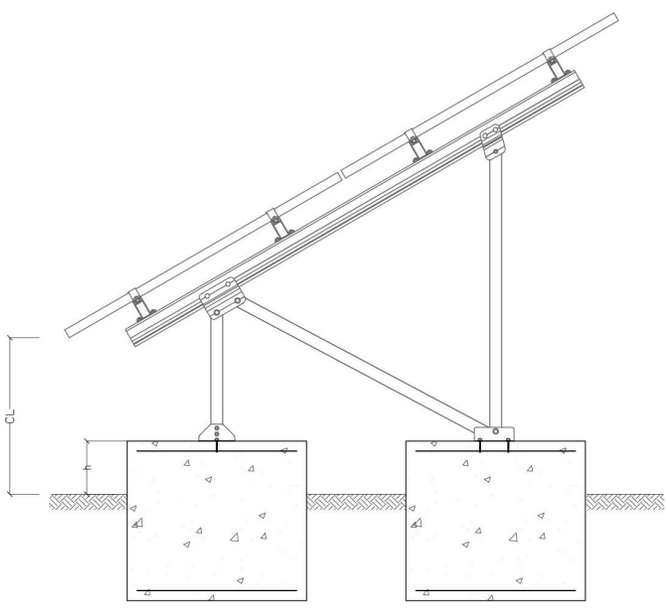
1 - Continuous Paving Slab



2 - Continuous Strip Footing



3 - Transverse Strip Footing



4 - Individual Pad footing

Appendices

A1. Explanation of Importance Level

(Tables 3.1, 3.3 from AS/NZS-1170_0-2002 - Structural design actions - General principles - amendments 1-5 incorporated)

TABLE 3.1

CONSEQUENCES OF FAILURE FOR IMPORTANCE LEVELS

Consequences of failure	Description	Importance level	Comment
Low	**Low** consequence for loss of human life, *or* **small or moderate** economic, social or environmental consequences	1	Minor structures (failure not likely to endanger human life)
Ordinary	**Medium** consequence for loss of human life, *or* **considerable** economic, social or environmental consequences	2	Normal structures and structures not falling into other levels
High	**High** consequence for loss of human life, *or* **very great** economic, social or environmental consequences	3	Major structures (affecting crowds)
		4	Post-disaster structures (post disaster functions or dangerous activities)
Exceptional	Circumstances where reliability must be set on a case by case basis	5	Exceptional structures

New Zealand only

TABLE 3.3

12b

ANNUAL PROBABILITY OF EXCEEDANCE

Design working life	Importance level	Annual probability of exceedance for ultimate limit states			Annual probability of exceedance for serviceability limit states	
		Wind	Snow	Earthquake	SLS1	SLS2 Importance level 4 only
Construction equipment, e.g., props, scaffolding, braces and similar	2	1/100	1/50	1/100	1/25	
Less than 6 months	1 2 3 4	1/25 1/100 1/250 1/1000	1/25 1/50 1/100 1/250	1/25 1/100 1/250 1/1000	— 1/25 1/25 1/25	
5 years	1 2 3 4	1/25 1/250 1/500 1/1000	1/25 1/50 1/100 1/250	1/25 1/250 1/500 1/1000	— 1/25 1/25 1/25	— — — 1/250
25 years	1 2 3 4	1/50 1/250 1/500 1/1000	1/25 1/50 1/100 1/250	1/50 1/250 1/500 1/1000	— 1/25 1/25 1/25	— — — 1/250
50 years	1 2 3 4	1/100 1/500 1/1000 1/2500	1/50 1/150 1/250 1/500	1/100 1/500 1/1000 1/2500	— 1/25 1/25 1/25	— — — 1/500
100 years or more	1 2 3 4	1/250 1/1000 1/2500 *	1/150 1/250 1/500 *	1/250 1/1000 1/2500 *	— 1/25 1/25 1/25	— — — *

A1. Explanation of Importance Level (continued)

(Table 3.2 from AS/NZS-1170_0-2002 - Structural design actions - General principles - amendments 1-5 incorporated)

TABLE 3.2

IMPORTANCE LEVELS FOR BUILDING TYPES—NEW ZEALAND STRUCTURES

Importance level	Comment	Examples
1	Structures presenting a low degree of hazard to life and other property	Structures with a total floor area of <30 m^2 Farm buildings, isolated structures, towers in rural situations Fences, masts, walls, in-ground swimming pools
2	Normal structures and structures not in other importance levels	Buildings not included in Importance Levels 1, 3 or 4 Single family dwellings Car parking buildings
3	Structures that as a whole may contain people in crowds or contents of high value to the community or pose risks to people in crowds	Buildings and facilities as follows: (a) Where more than 300 people can congregate in one area (b) Day care facilities with a capacity greater than 150 (c) Primary school or secondary school facilities with a capacity greater than 250 (d) Colleges or adult education facilities with a capacity greater than 500 (e) Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities (f) Airport terminals, principal railway stations with a capacity greater than 250 (g) Correctional institutions (h) Multi-occupancy residential, commercial (including shops), industrial, office and retailing buildings designed to accommodate more than 5000 people and with a gross area greater than 10 000 m^2 (i) Public assembly buildings, theatres and cinemas of greater than 1000 m^2 Emergency medical and other emergency facilities not designated as post-disaster Power-generating facilities, water treatment and waste water treatment facilities and other public utilities not designated as post-disaster Buildings and facilities not designated as post-disaster containing hazardous materials capable of causing hazardous conditions that do not extend beyond the property boundaries
4	Structures with special post-disaster functions	Buildings and facilities designated as essential facilities Buildings and facilities with special post-disaster function Medical emergency or surgical facilities Emergency service facilities such as fire, police stations and emergency vehicle garages Utilities or emergency supplies or installations required as backup for buildings and facilities of Importance Level 4 Designated emergency shelters, designated emergency centres and ancillary facilities Buildings and facilities containing hazardous materials capable of causing hazardous conditions that extend beyond the property boundaries
5	Special structures (outside the scope of this Standard—acceptable probability of failure to be determined by special study)	Structures that have special functions or whose failure poses catastrophic risk to a large area (e.g. 100 km^2) or a large number of people (e.g., 100 000) Major dams, extreme hazard facilities

A2. Map of Wind Regions in New Zealand

(from AS/NZS-1170_2-2021 - Structural design actions - Part 2: Wind actions)

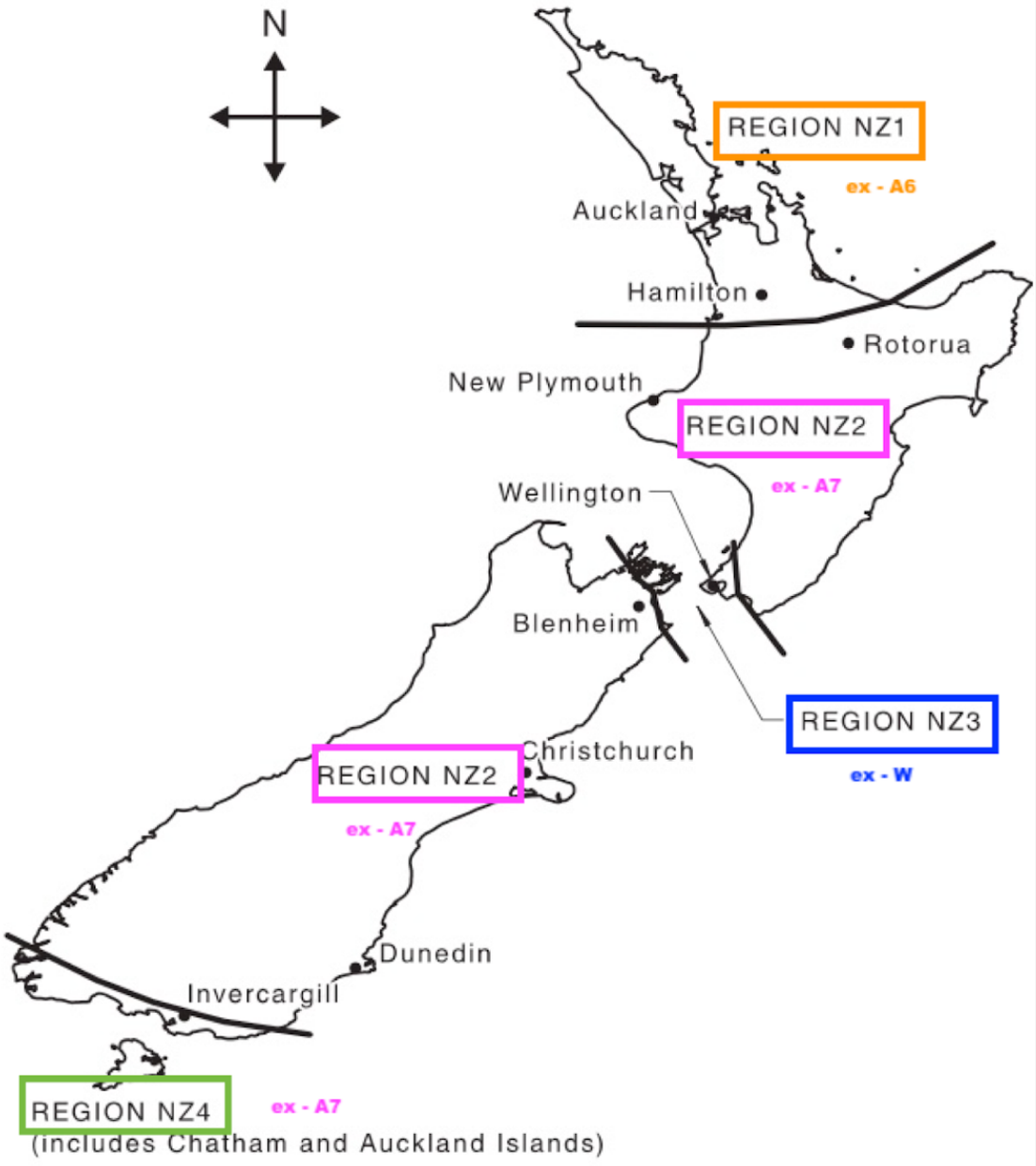


Figure 3.1(B) — Wind regions — New Zealand

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