For year 2018 v01

Installation Manual

Solar Mounting System

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General Introduction

Jiangyin PVSolver Photovoltaic System Engineering Co., Ltd., hereinafter referred as PVSolver, was stablished in year 2012, with a registered capital of RMB 5 Million, focusing on the development and fabrication of solar PV mounting systems with value added technical services.

PVSolver has developed universal PV mounting systems for different applications, including but not limited to metal roof, tile roof, concrete roof, grounded installations, solar carport, etc.

This manual covers a general description of the installation process for different types of roofs.

During installation and especially when working on the roof please comply with the appropriate occupational health and safety regulations. Please also pay attention to other relevant regulations of your local region. Please check that you are using the latest version of the installation manual, which you can do by contacting PVSolver via email or phone [catherine@pvsolver.com | Tel: +86 510 8615 8815].

This manual applies to most of mounting system designed and provided by PVSolver in general, and it shall follow the detailed design and shop drawings for particular projects particularly.

General Safety

All installation work must comply with applicable regional and local regulations or other national or international electrical standards.

Protective clothing (non-slip gloves, clothes, etc.) must be worn during installation to prevent direct contact with 30 V DC or greater, and to protect your hands against sharp edges.

When installing modules in light rain, morning dew, take appropriate measures to avoid water permeate into the connector.

Prior to installation, remove all metallic jewelry to prevent accidental exposure to live circuits.

Do not allow children or unauthorized persons near the installation site or storage area of modules.

Planning

The installer is solely responsible for:

- Complying with all applicable local or national building codes and Clean Energy Council guidelines including any that may superseded this manual;
- Ensuring that the mounting system and other products you use are appropriate for the particular installation and the installation environment;
- Ensuring that the roof, its rafters, connections, and other structural support members can support the array under building live load conditions (this total assembly is hereafter referred to as the roof rafter assembly);
- Ensuring that lag screws have adequate pull-out strength and shear capacities as installed;
- Maintaining the waterproof integrity of the roof, including selection of appropriate flashing;
- Ensuring safe installation of all electrical aspects of the PV array

This document is designed to support for installations using mounting system manufactured by PVSOLVER. Follow the steps as specified in this document and do the installation accordingly. Before proceeding, please note the following:

- This document addresses only wind loads on the assumption that wind produces the maximum load factor affecting an installation. Verify that other local factors, such as snow loads and earth quake effects, do not exceed the wind loads. Give precedence to any factor that does. Wind loads are considered to act on the entire projected area, or may be perpendicular to any surface.
- The safety of the structures have been verified and calculated. However, the roof on which the mounting systems will be installed must be able to take the combined Design Dead Load and Live Load per square meter.
- The exact parts and quantity will be provided in separate BOM for particular project by PVSolver.

Disclaimer

The information contained in this manual is subject to change by Jiangyin PVSolver without prior notice. Jiangyin PVSolver gives no warranty of any kind whatsoever, either explicitly or implicitly, with respect to the information contained herein.

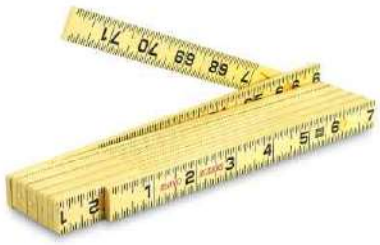
This Manual (or document) is written in Chinese with English translation for reference only. In case there are inconsistencies or conflicts between the Chinese version and the English version (or other language version) of this Manual (or document), the Chinese version shall prevail and take control in all respects.

What you need - Toos

Cordless screwdriver
with wrench socket and
a variety of bits

Drill bits
(up to Ø 15 mm)

Tape for
Site Measurement



Fold Rule

Pencil

6# Hex Wrench

Angle Grinder
with Diamond Cutting Disk

Nylon Sewing
Thread

Open Ended
Wrench

Power Drill
with Bits and Wrench Sockets

Torx screwdriver
with T-grip, size TX40, TX25

Plumb Line

Marker Pen

Torque Wrench

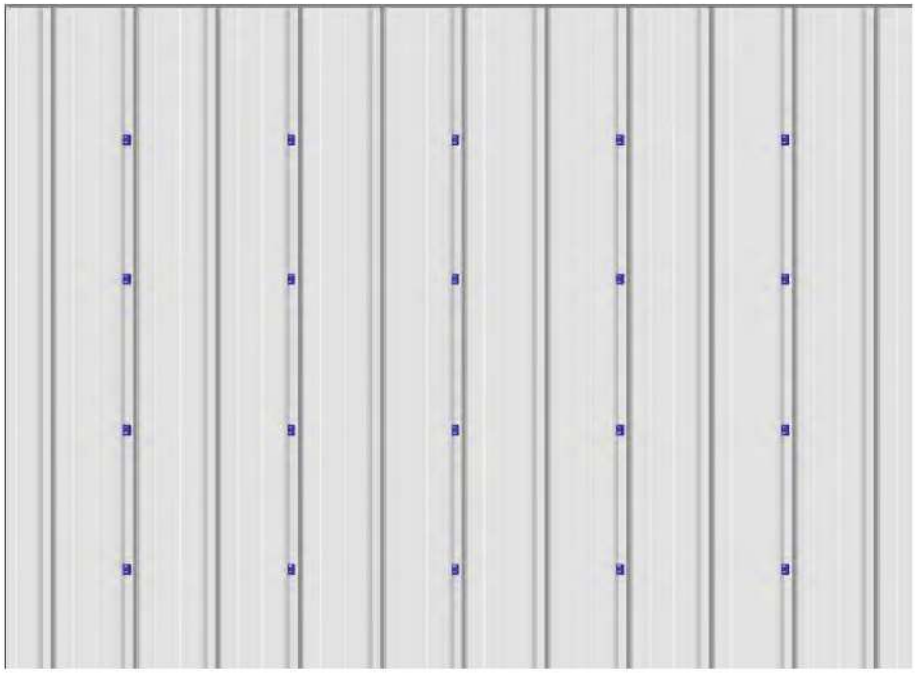
Metal Roof 0°

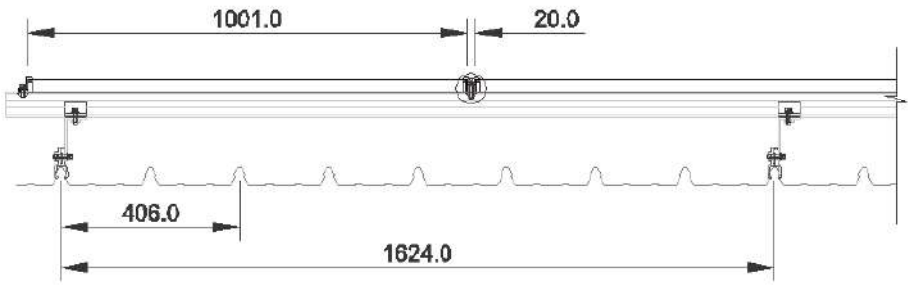
Step 1

Check all the materials are available on site with the BOM provided by PVSolver

Step 2

Read the design and shop drawing carefully to identify the clamping locations



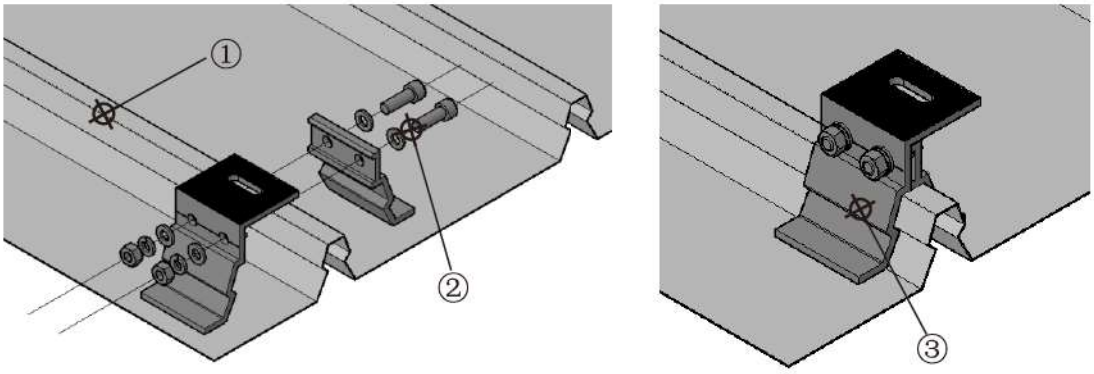


The dimension here is for reference only, and the exact spacing and dimension shall follow the drawing of that particular project.

Metal Roof 0°

Step 3

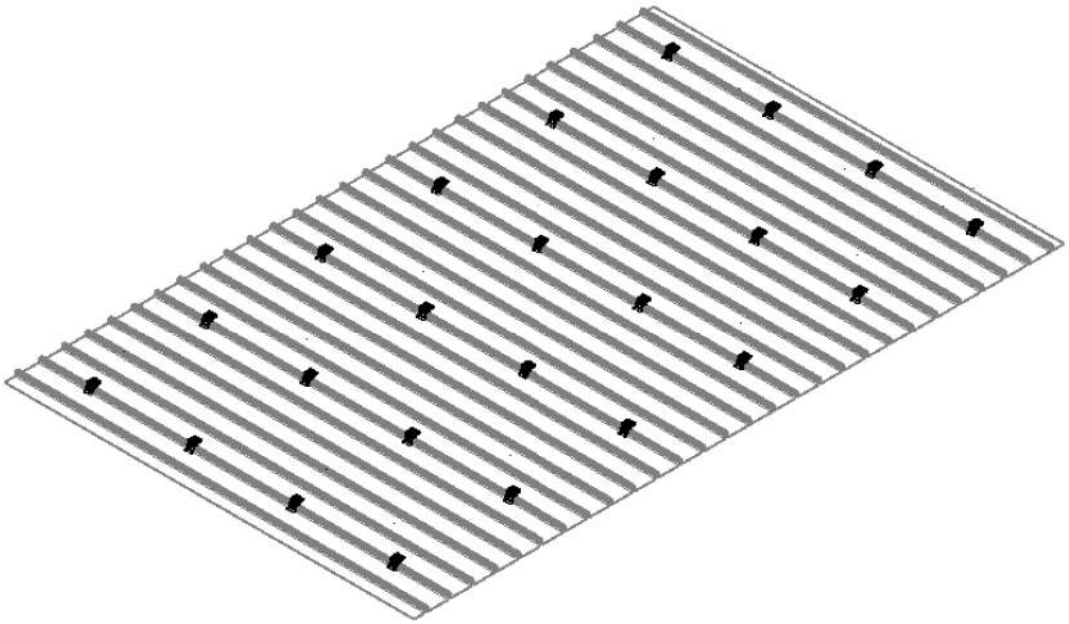
Mount the RIGHT type seam clamp on the metal roof seam at the location specified in the design and shop drawing, there are many types of seam clamps, here is just an example for Kliplok 406 roof.



① Roof Seam, there are many type of seams, like kalzip, standing seam, kliplok, etc, here it is only an example with Kliplok 406 metal roof, right seam clamp shall be selected for different types of roofs.

② Socket screw sets to tighten the two pieces of the seam clamps

③ Tightened seam clamp on the seam

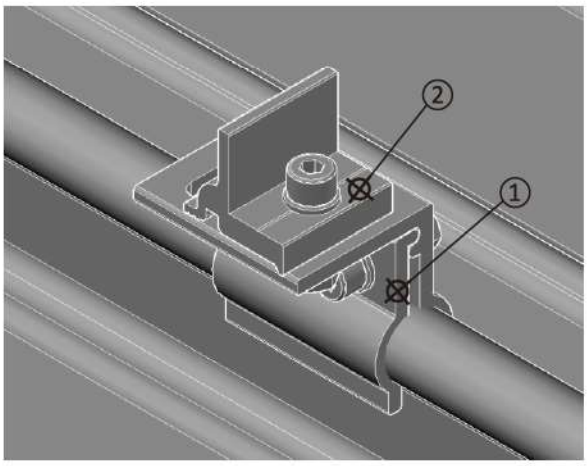


This is the general view after locate the seam clamps. Here we'd like to highlight that the positions and spacing must follow the design drawings.

Metal Roof 0°

Step 4

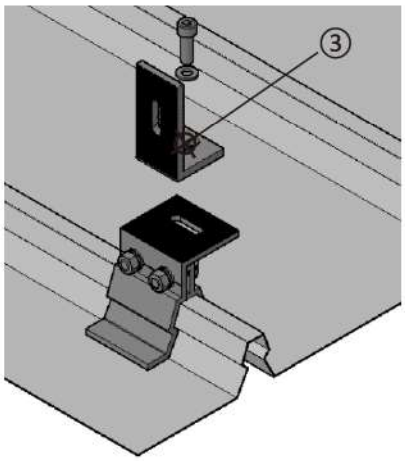
Secure the rail clip or L feet above the seam clamp for rail installations.

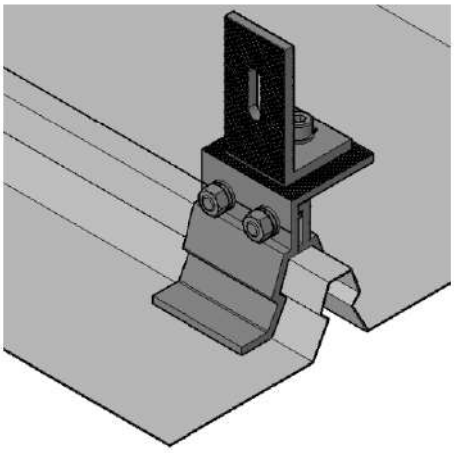


① Kalzip Roof Seam Clamp, this is an example with clamp for Kalzip Metal Roof

② Rail clip, this a apart to secure rails

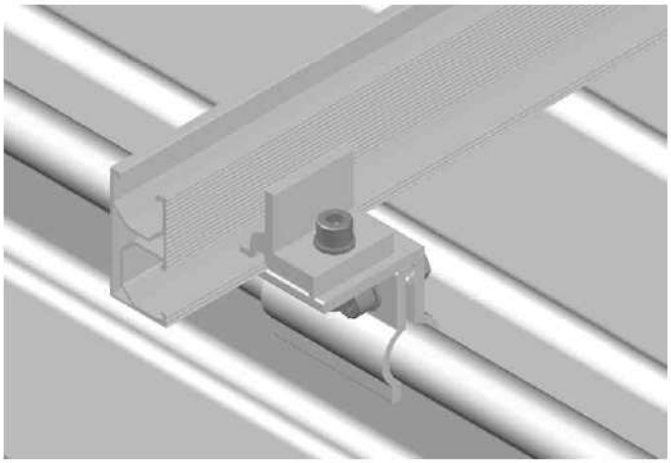
③ L Feet: this is part the secure rails (there are different ways to mount the rails on the seam clamp, and the exact method shall firmly follow the design drawing)

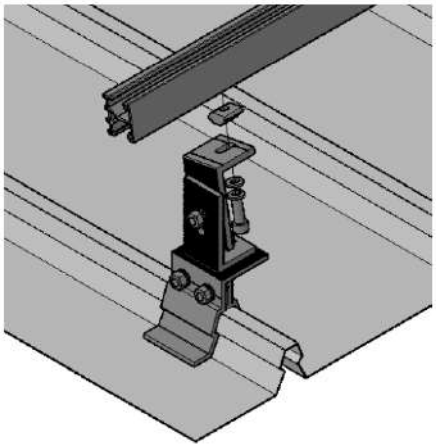




Step 5

Mount the rails on above the seam clamp or L feet (different connection way will apply for different designs)

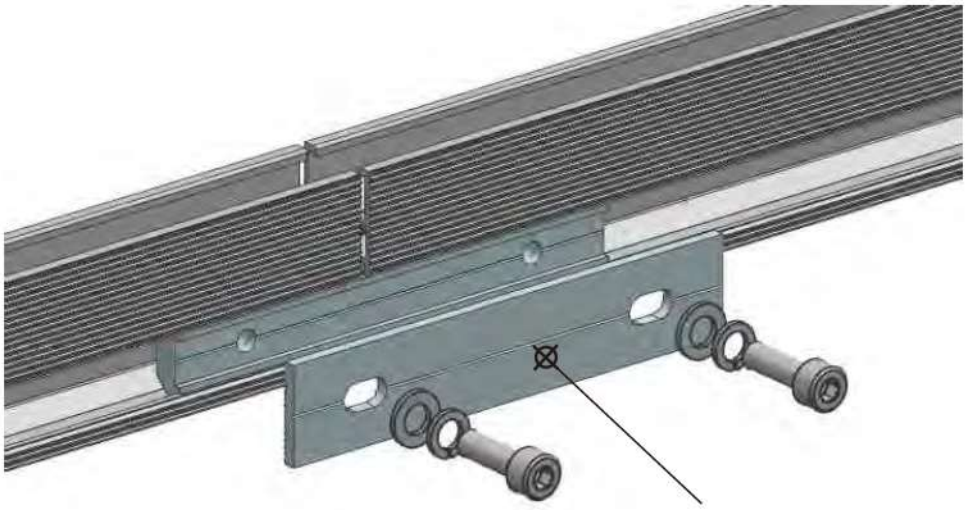




Metal Roof 0°

Step 6

Join the rails with different lengths to meet the array design (do remember to locate the joints at diagonal direction to increase the structural strength).

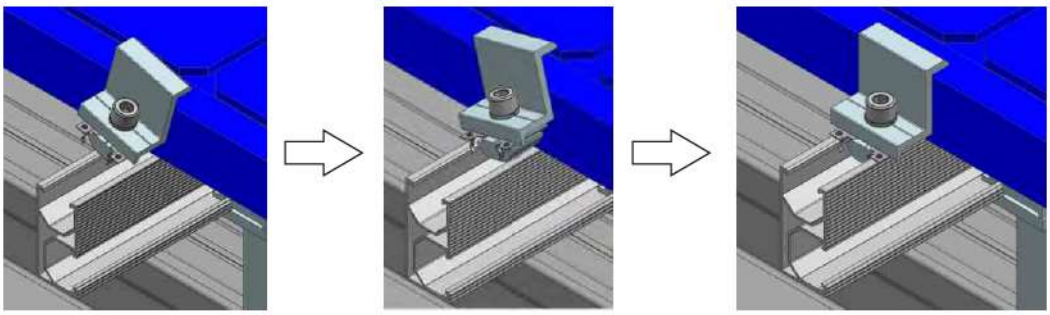


Rail joiner with screw sets
different rails shall use
different rail joiners

Location of Joints (Located at diagonal directions to
increase structural strength)

Step 7

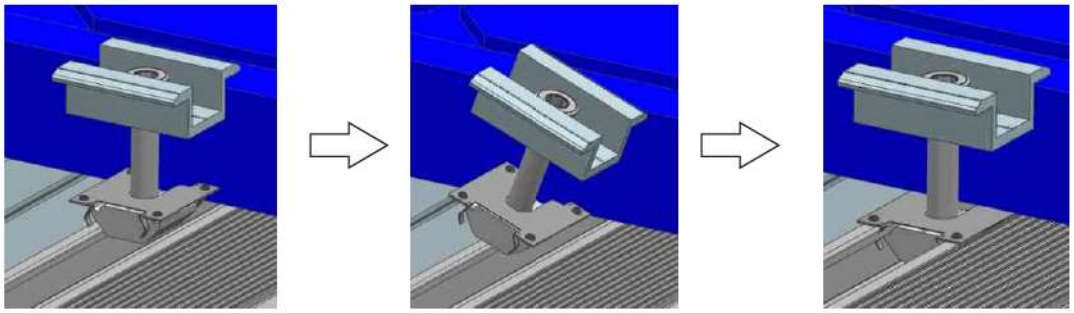
Installation of End Clamp Set: mount the solar modules on the rails via the End Clamp Set. The location of 1st End Clamp Set must follow the drawing design to avoid uneven force distributions which may lead tilt of solar arrays.



Metal Roof 0°

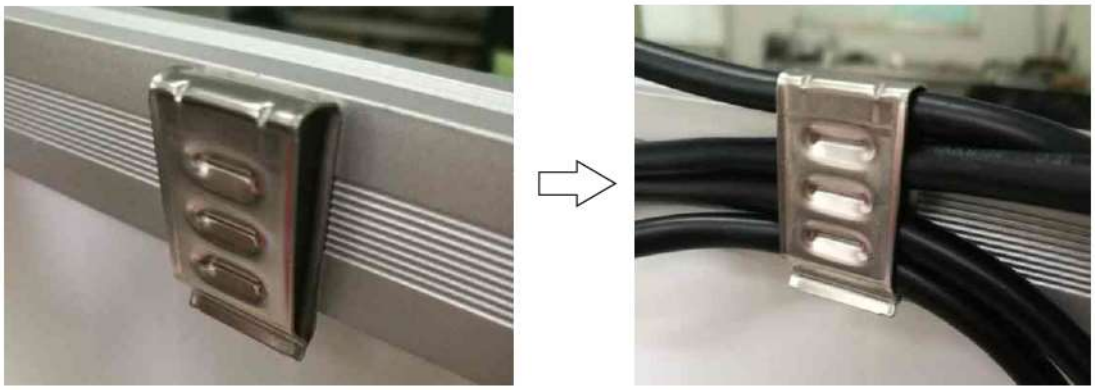
Step 8

Mount the solar modules on the rails via the Mid Clamp Set by using M8X50socket screw set (incl 1 no. spring washer and 1 no. Al nut). Meanwhile, also insert the grounding clip between the Mid Clamp and the Al Nut, tighten the hex screw to secure the solar module and push the Grounding Clip to penetrate the rail and the module frame for electrical continuity.

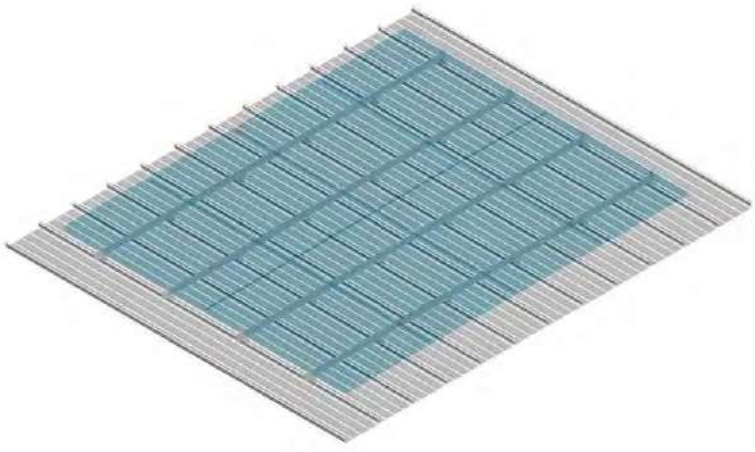


Step 9

Installation of the Cable Clips: Clamp the cable clip on the module frame and then secure the DC cables inside the cable clip (there are many types of cable clip and the exact type or model shall follow the design drawing of that particular project)



Overall View



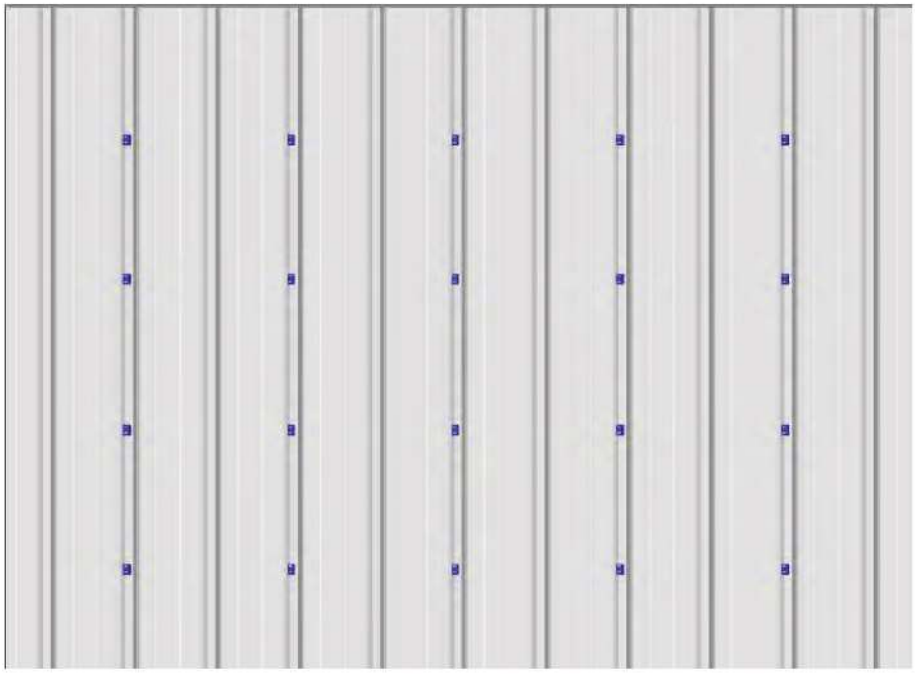
Metal Roof Angle

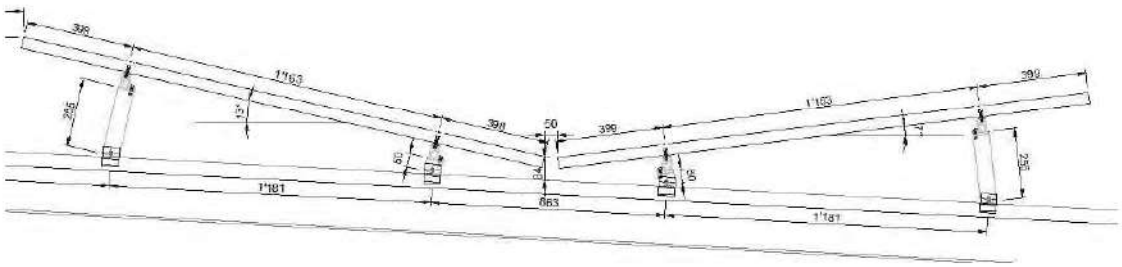
Step 1

Check all the materials are available on site with the BOM provided by PVSolver

Step 2

Read the design and shop drawing carefully to identify the clamping locations





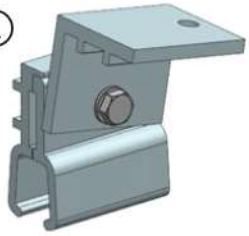
The dimension here is for reference only, and the exact spacing and dimension shall follow the drawing of that particular project.

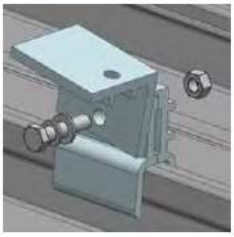
Metal Roof Angle

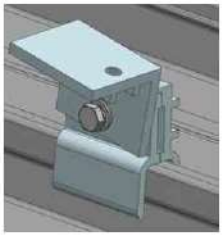
Step 3

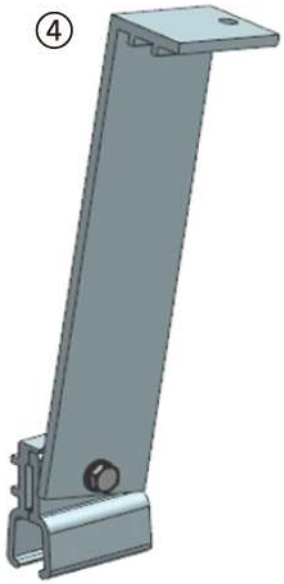
Mount the RIGHT type seam clamp on the metal roof seam at the location specified in the design and shop drawing, there are many types of seam clamps, here is just an example for Kliplok 406 roof.

Do remember to sort out the front and rear feet to form the angle to the roof profile.

① 

② 

③ 

④ 

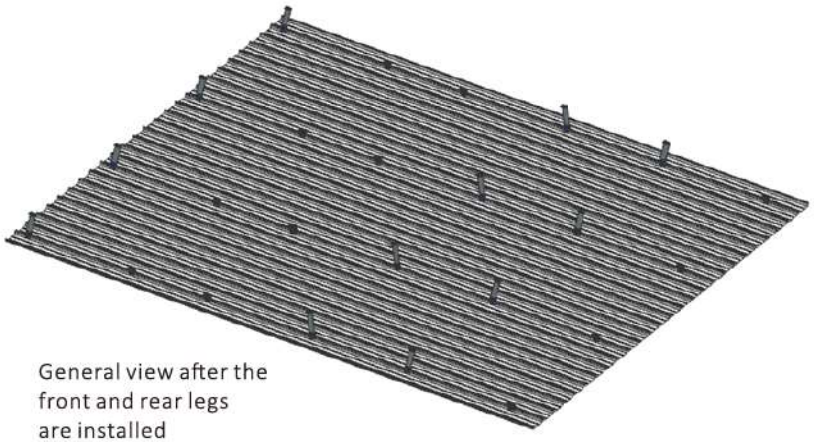
① Front Leg with Seam Clamp set and lower L Feet

② Tighten the screw sets to mount the Seam Clamp and L feet on metal roof

③ Front Leg set is installed and make sure the locations are firmly following the design drawings

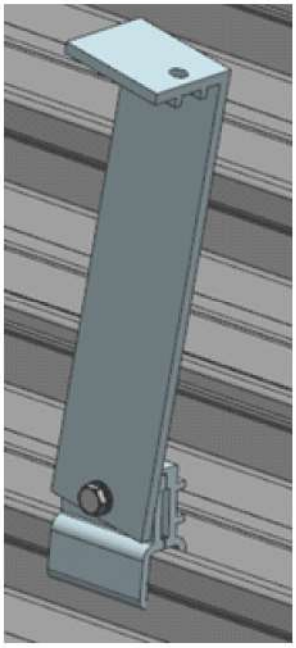
④ Rear Leg with Seam Clamp set and higher L Feet

⑤ Rear Leg set is installed and make sure the locations are firmly following the design drawings



General view after the front and rear legs are installed

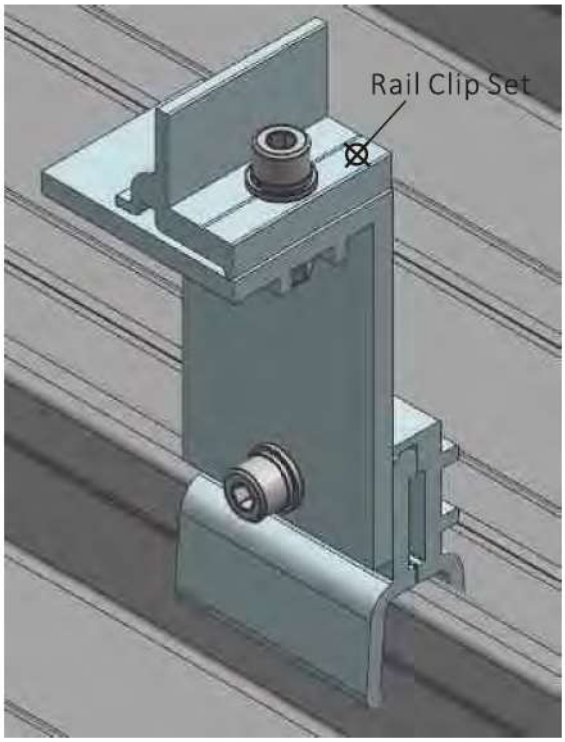
⑤



Metal Roof Angle

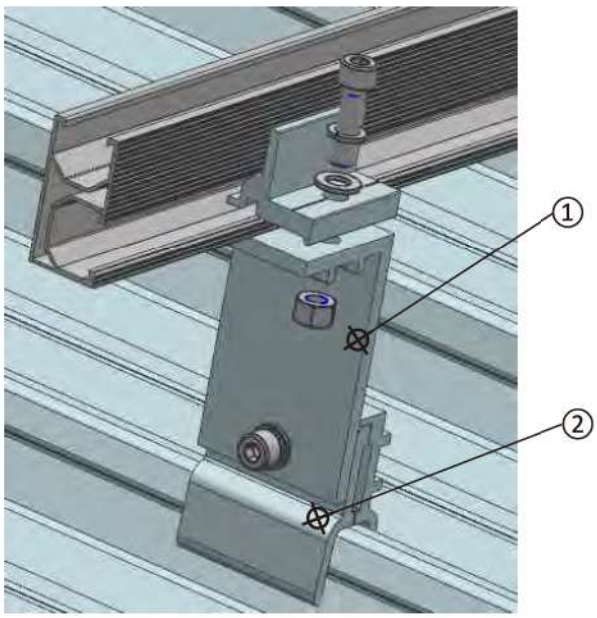
Step 4

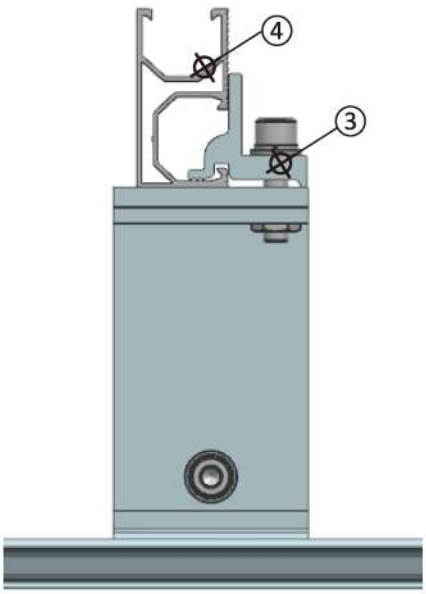
Mount the rail clip above the L Feet to secure rails in next step.



Step 5

Secure the rails above the L feets by fastening the rail clips.



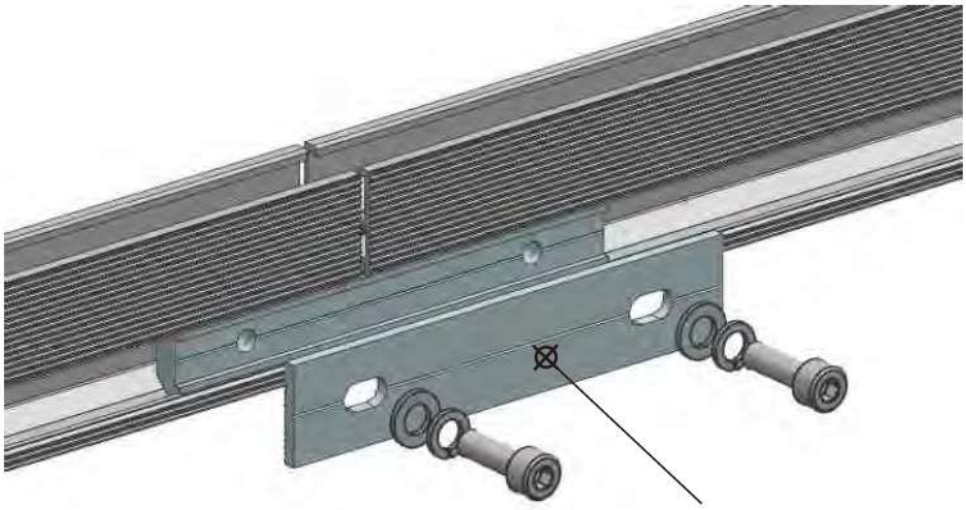


① L Feet ② Seam Clamp ③ Rail Clip ④ Rail

Metal Roof Angle

Step 6

Join the rails with different lengths to meet the array design (do remember to locate the joints at diagonal direction to increase the structural strength).

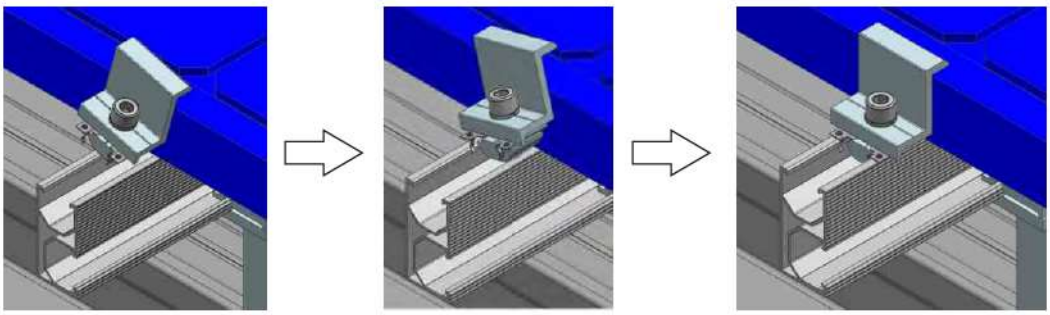


Rail joiner with screw sets
different rails shall use
different rail joiners

Location of Joints (Located at diagonal directions to
increase structural strength)

Step 7

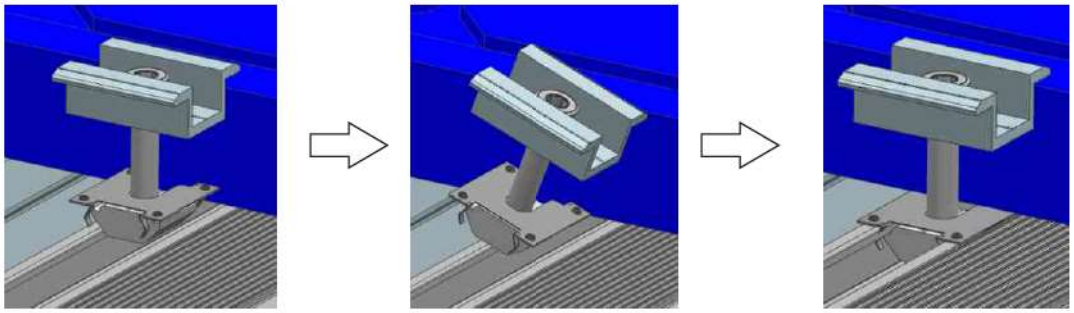
Installation of End Clamp Set: mount the solar modules on the rails via the End Clamp Set. The location of 1st End Clamp Set must follow the drawing design to avoid uneven force distributions which may lead tilt of solar arrays.



Metal Roof Angle

Step 8

Mount the solar modules on the rails via the Mid Clamp Set by using M8X50socket screw set (incl 1 no. spring washer and 1 no. Al nut). Meanwhile, also insert the grounding clip between the Mid Clamp and the Al Nut, tighten the hex screw to secure the solar module and push the Grounding Clip to penetrate the rail and the module frame for electrical continuity.



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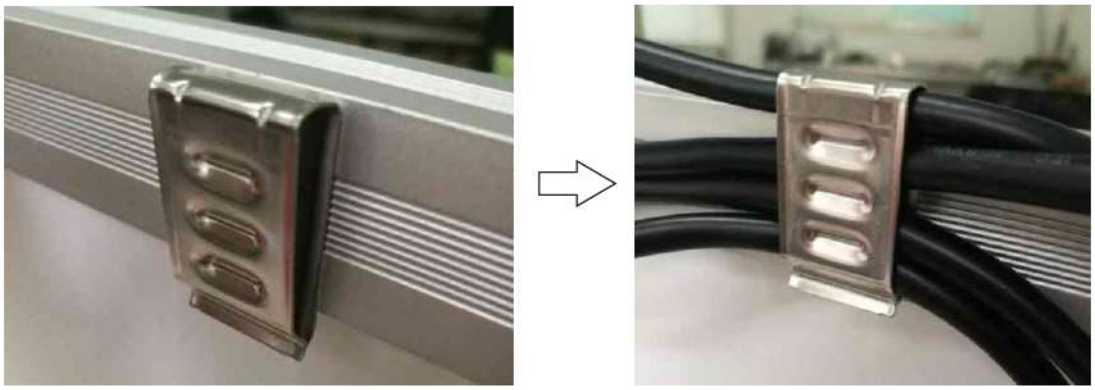
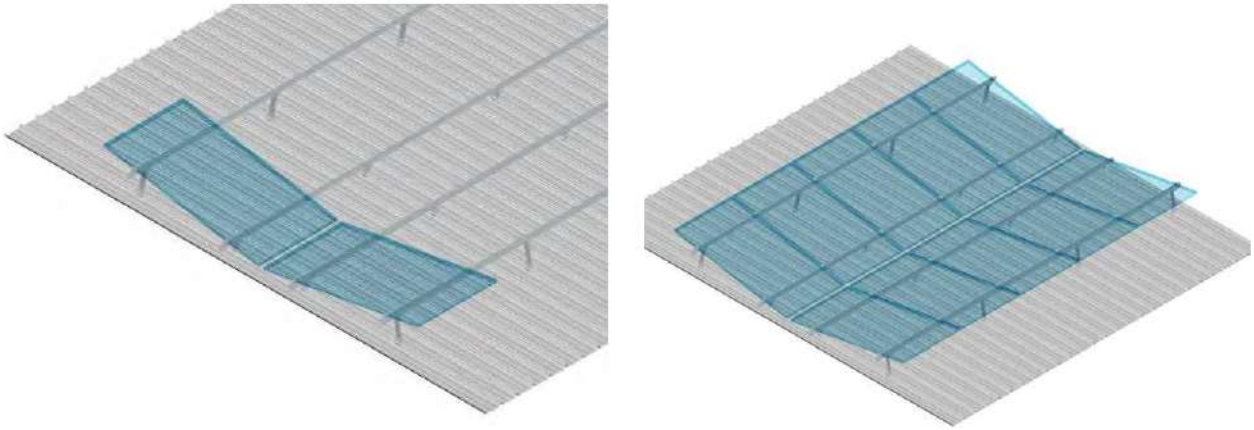
Installation of the Cable Clips: Clamp the cable clip on the module frame and then secure the DC cables inside the cable clip (there are many types of cable clip and the exact type or model shall follow the design drawing of that particular project)



Overall View



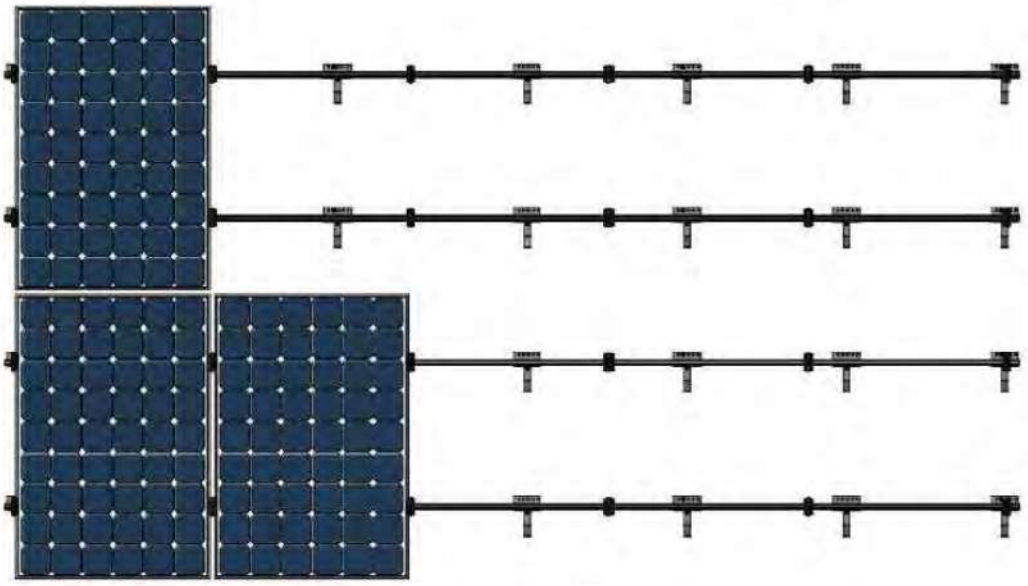
Clay Tile Roof

Step 1

Check all the materials are available on site with the BOM provided by PVSolver

Step 2

Read the design and shop drawing carefully to identify the hook's locations. The hook must be carefully to suit the tile roof dimensions.



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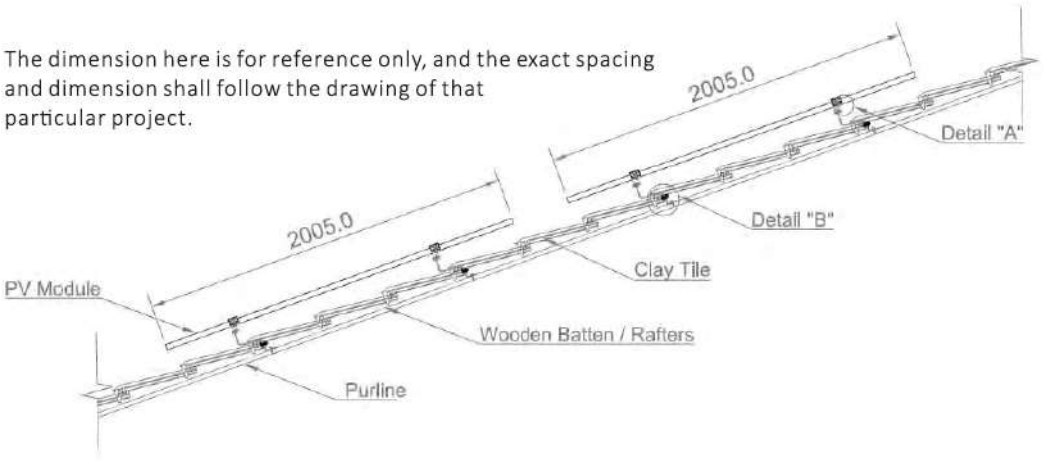
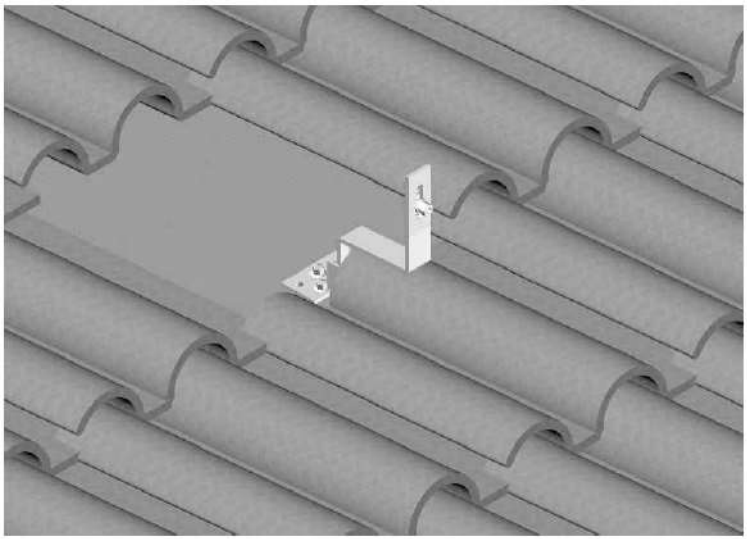


Clay Tile Roof

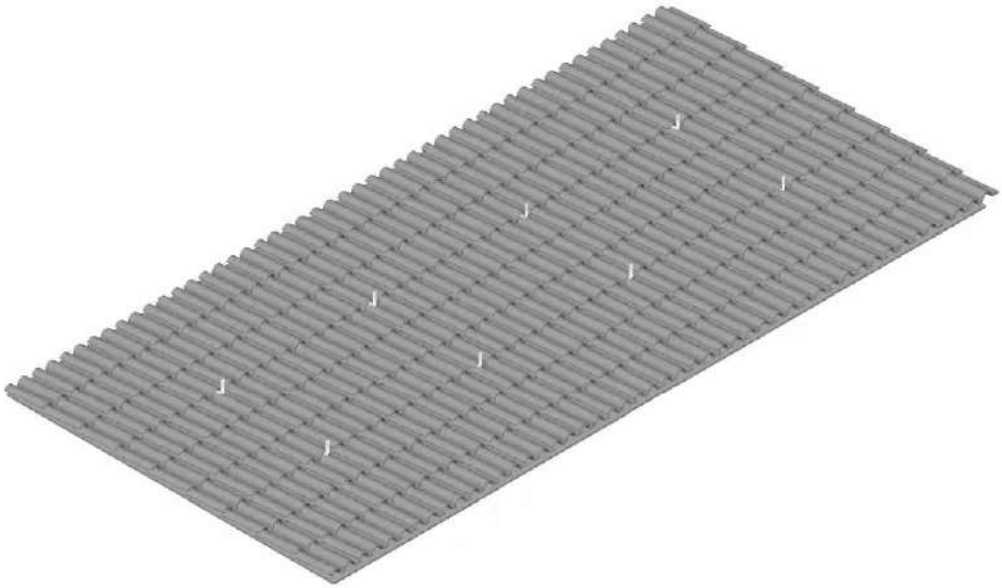
Step 3

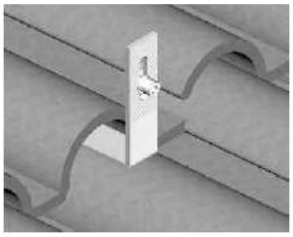
Take out a few roof tile and mount the hook base on the timber purlin underneath the tiles.

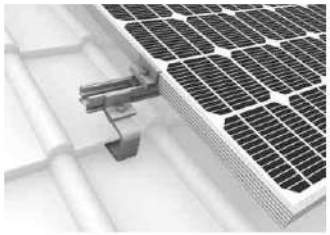


Step 4

Re-instate the roof tiles and the hooks are properly installed. Repeat the process and mount all the hooks at the specified location in the design drawings.



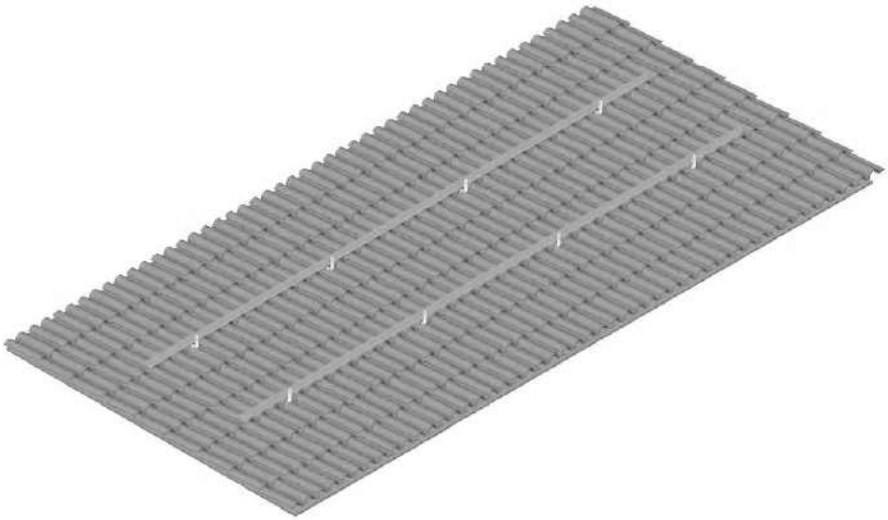


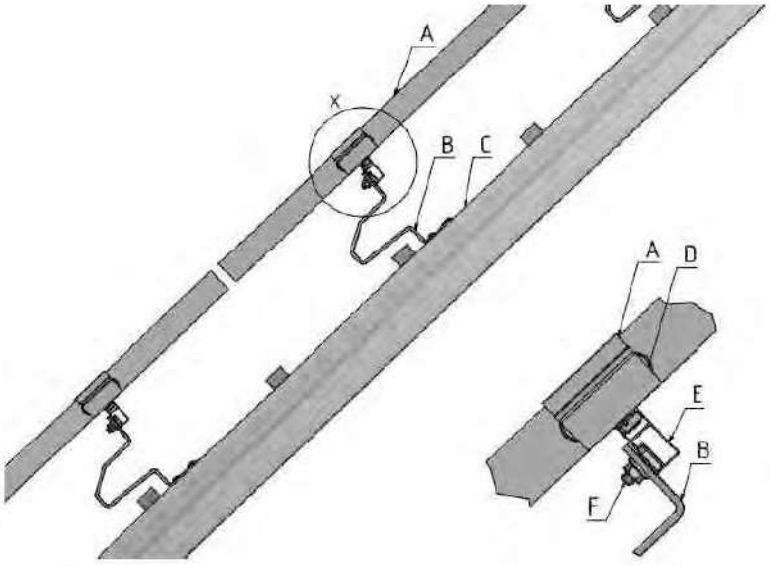


Clay Tile Roof

Step 5

Mount the rails above the roof hooks as below:



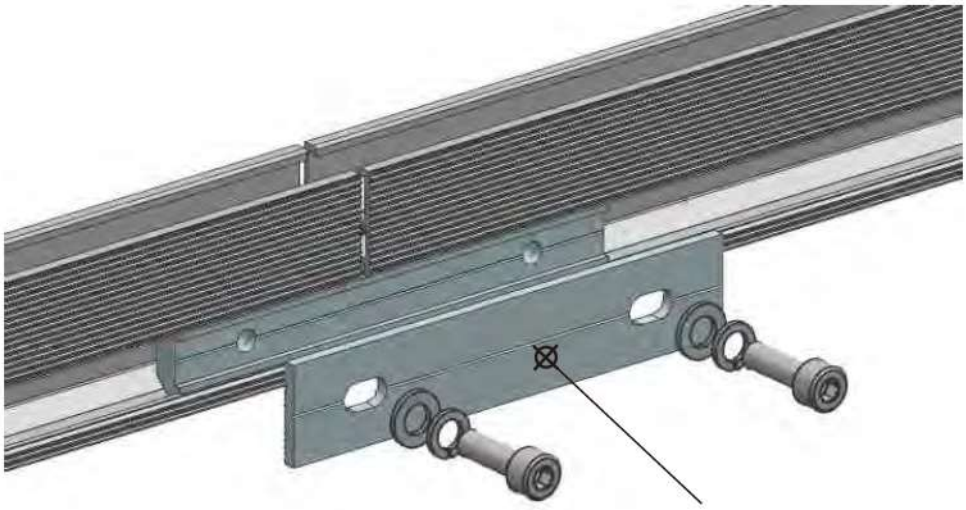


S/N	Descriptions
A	Solar Module
B	Roof Hook
C	Rafters
D	Module Clamp
E	Rail
F	Lock Nut

Clay Tile Roof

Step 6

Join the rails with different lengths to meet the array design (do remember to locate the joints at diagonal direction to increase the structural strength).

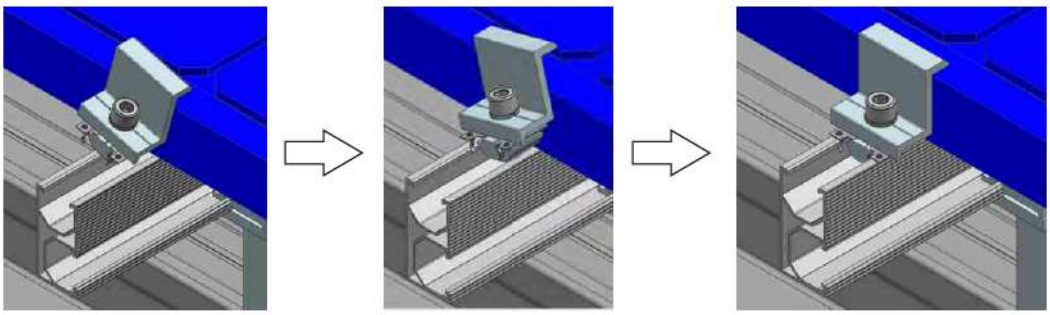


Rail joiner with screw sets
different rails shall use
different rail joiners

Location of Joints (Located at diagonal directions to
increase structural strength)

Step 7

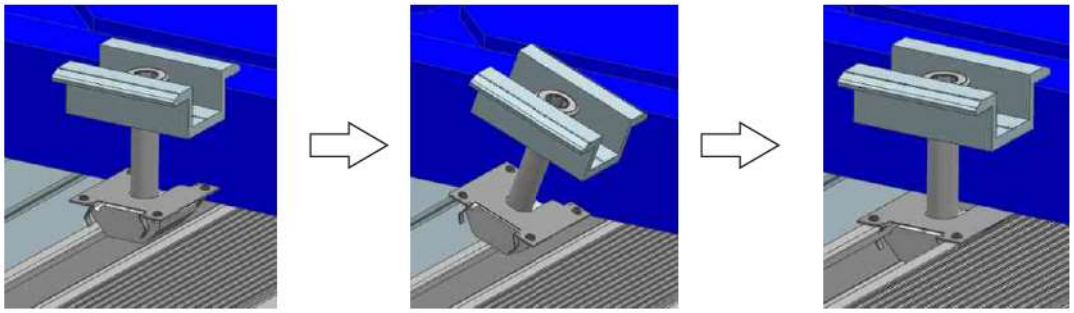
Installation of End Clamp Set: mount the solar modules on the rails via the End Clamp Set. The location of 1st End Clamp Set must follow the drawing design to avoid uneven force distributions which may lead tilt of solar arrays.



Clay Tile Roof

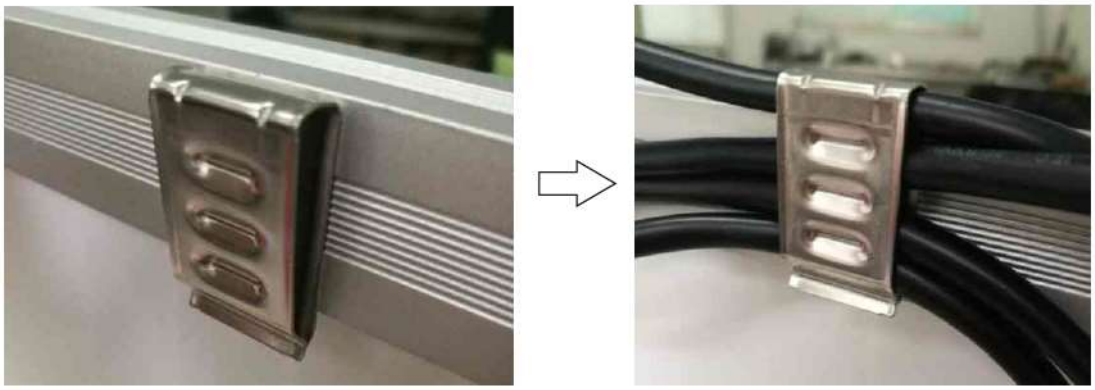
Step 8

Mount the solar modules on the rails via the Mid Clamp Set by using M8X50socket screw set (incl 1 no. spring washer and 1 no. Al nut). Meanwhile, also insert the grounding clip between the Mid Clamp and the Al Nut, tighten the hex screw to secure the solar module and push the Grounding Clip to penetrate the rail and the module frame for electrical continuity.

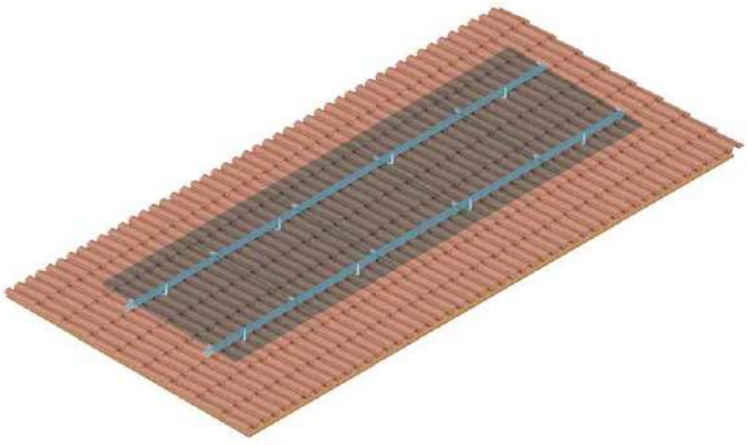


Step 9

Installation of the Cable Clips: Clamp the cable clip on the module frame and then secure the DC cables inside the cable clip (there are many types of cable clip and the exact type or model shall follow the design drawing of that particular project)



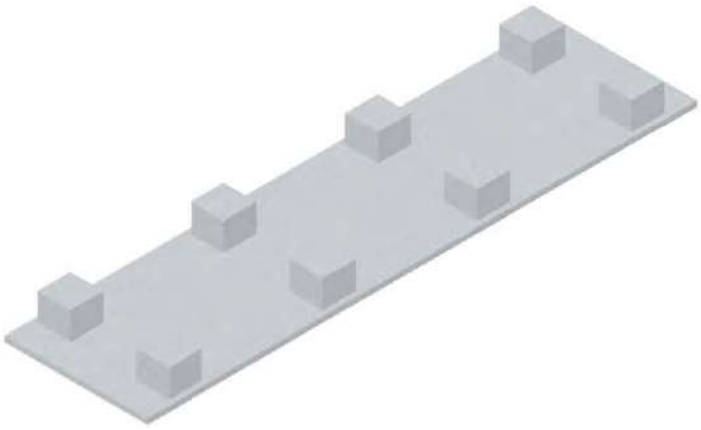
Overall View



Concrete Roof – Cast Concrete Stumps

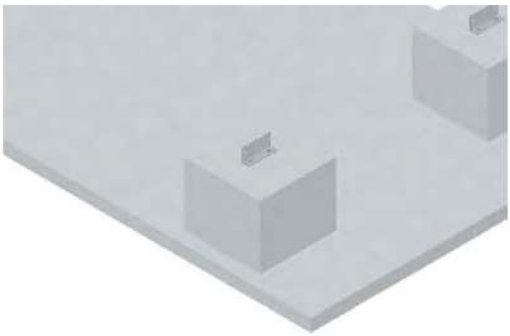
Step 1

Check the BOM and cast the concrete roof at designated locations with spacing and dimensions specified in design drawings.

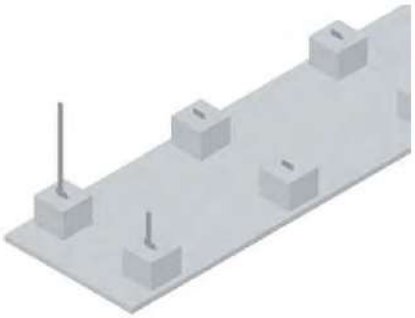


Step 2

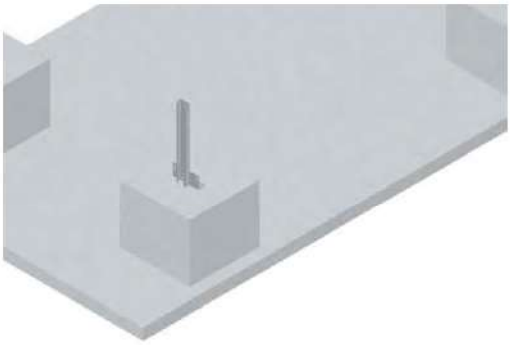
Mount the base plate, front and rear poles as per the designs.



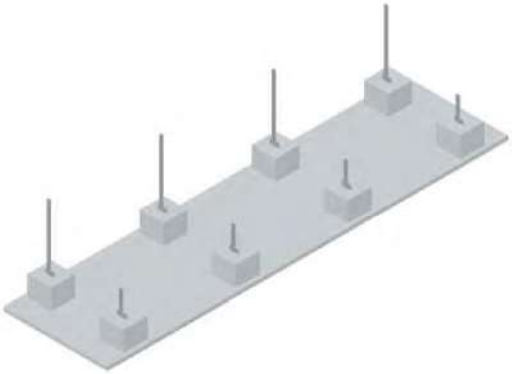
① Mount the Base Plate on the concrete stumps



② Mount the rear pole on the base plate



③ Mount the front pole on the base plate

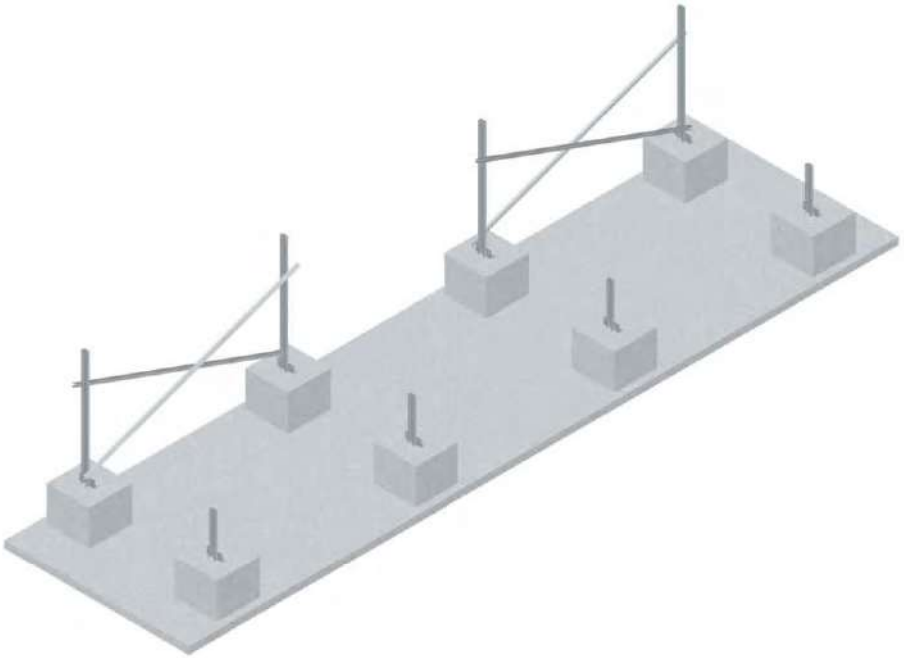


④ Repeat the process and mount all front and rear poles

Concrete Roof - Cast Concrete Stumps

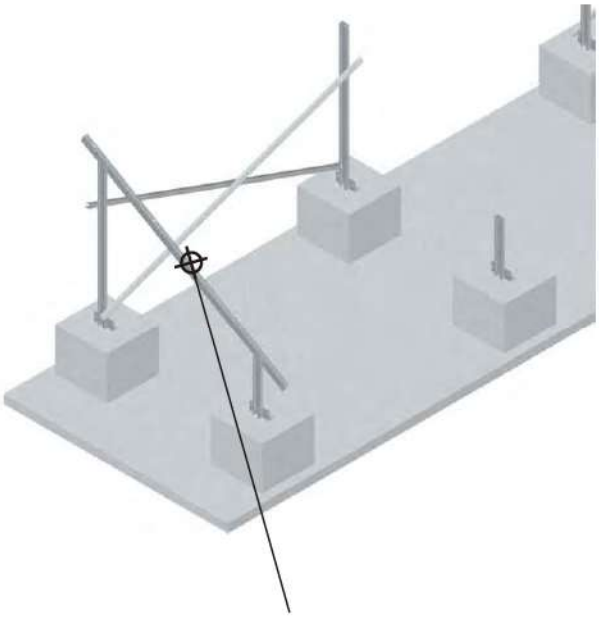
Step 3

Install the rear brace to increase the structural safety.

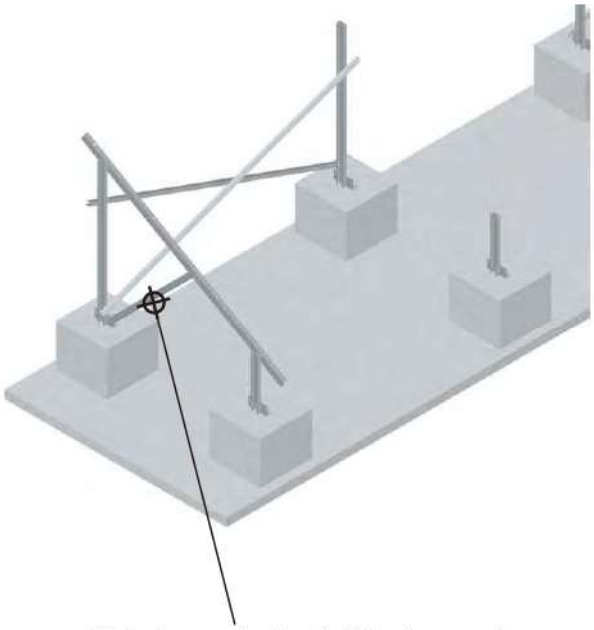


Step 4

Install the Primary Rail and Side Brace.



Primary Rail to be installed on the main poles

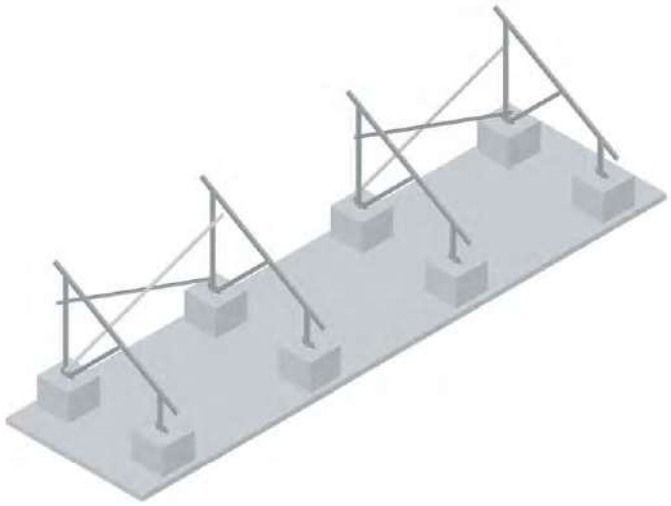


Side brace to install between base plate and primary rail to increase structural safety

Concrete Roof – Cast Concrete Stumps

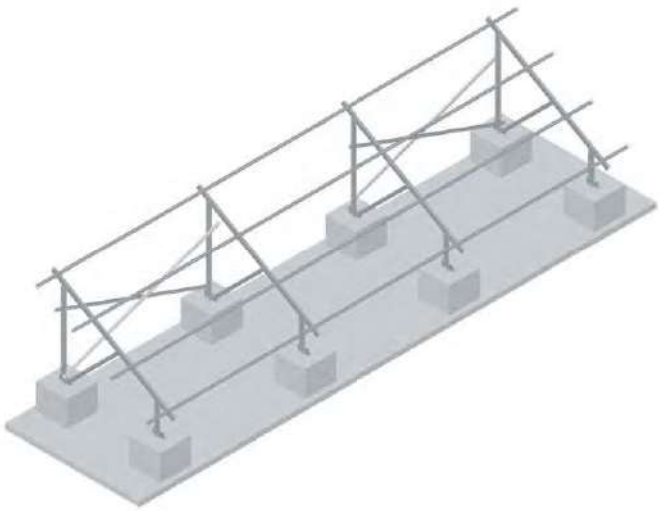
Step 5

Repeat the process and complete the installation of main structures.



Step 6

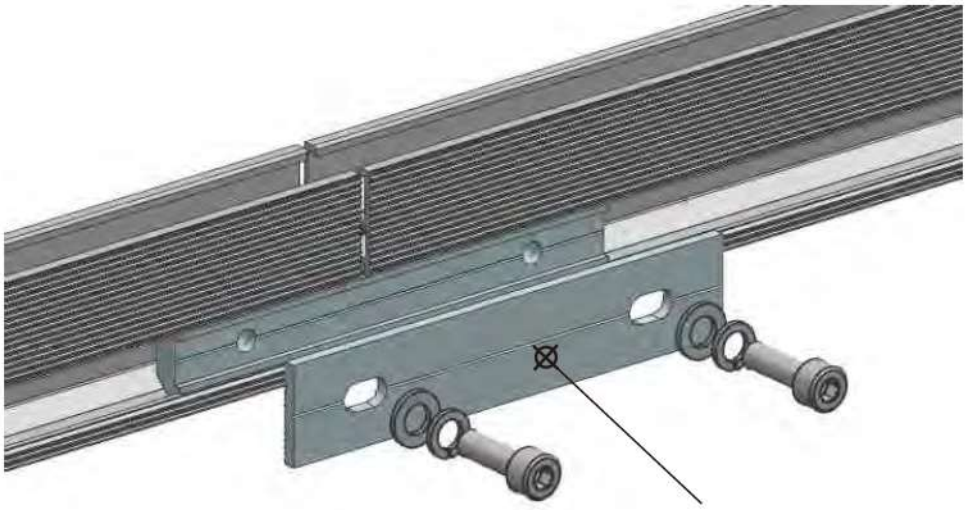
Install the rails above the primary rails.



Concrete Roof – Cast Concrete Stumps

Step 7

Join the rails with different lengths to meet the array design (do remember to locate the joints at diagonal direction to increase the structural strength).

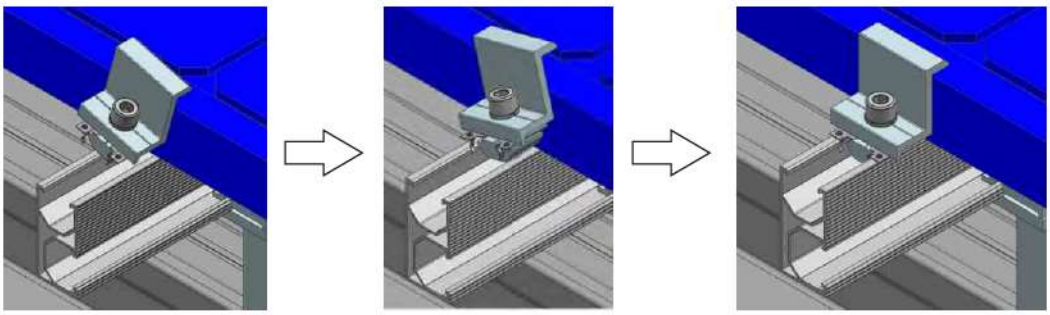


Rail joiner with screw sets
different rails shall use
different rail joiners

Location of Joints (Located at diagonal directions to
increase structural strength)

Step 8

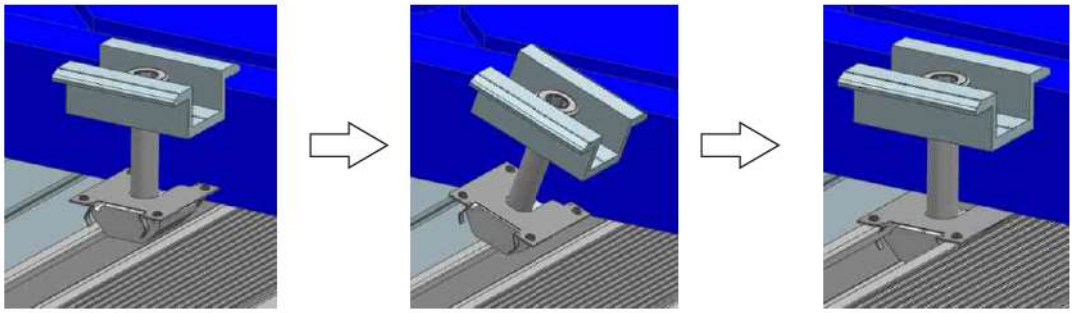
Installation of End Clamp Set: mount the solar modules on the rails via the End Clamp Set. The location of 1st End Clamp Set must follow the drawing design to avoid uneven force distributions which may lead tilt of solar arrays.



Concrete Roof – Cast Concrete Stumps

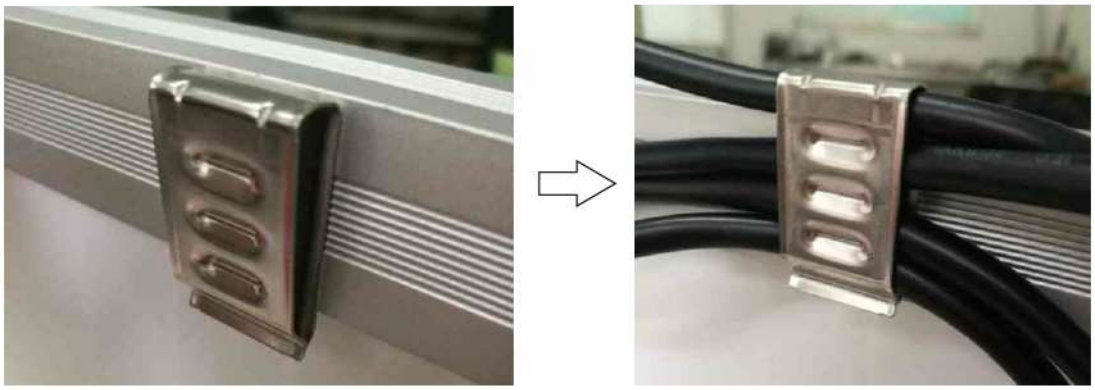
Step 9

Mount the solar modules on the rails via the Mid Clamp Set by using M8X50socket screw set (incl 1 no. spring washer and 1 no. Al nut). Meanwhile, also insert the grounding clip between the Mid Clamp and the Al Nut, tighten the hex screw to secure the solar module and push the Grounding Clip to penetrate the rail and the module frame for electrical continuity.

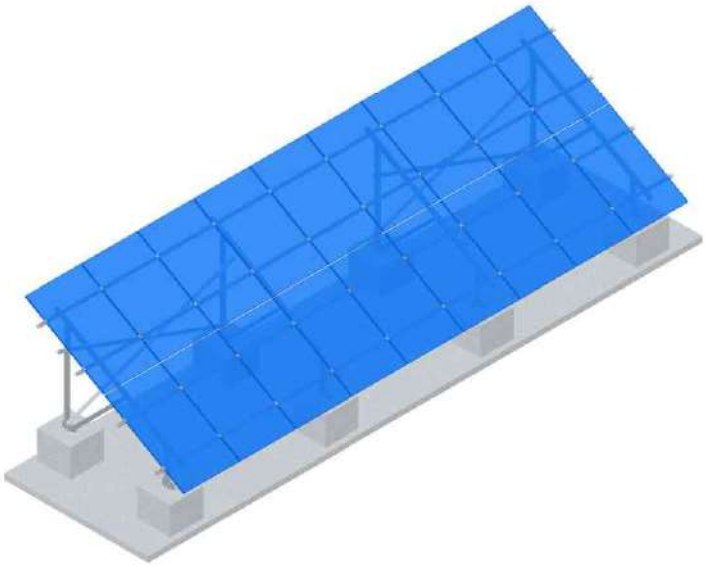


Step 10

Installation of the Cable Clips: Clamp the cable clip on the module frame and then secure the DC cables inside the cable clip (there are many types of cable clip and the exact type or model shall follow the design drawing of that particular project)



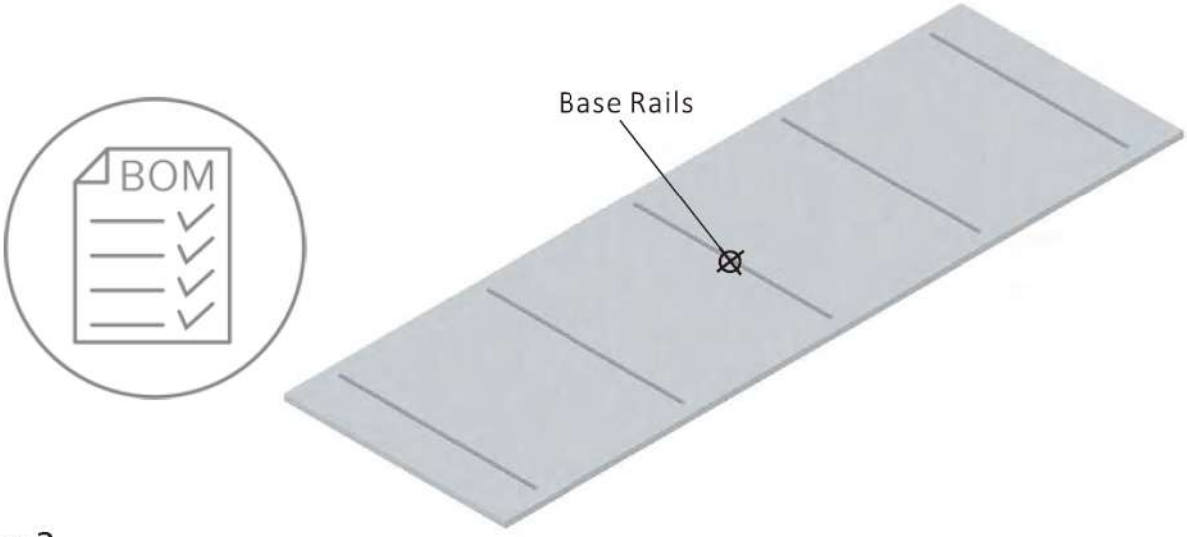
Overall View



Concrete Roof – Weigh Down Solution

Step 1

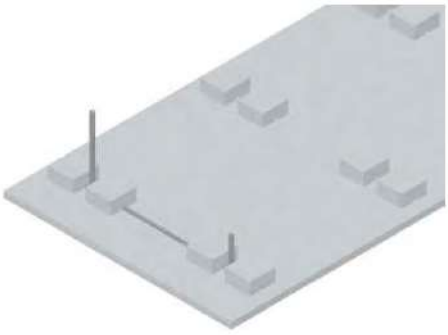
Check the BOM and lay the base rails at designated locations with spacing and dimensions specified in design drawings.



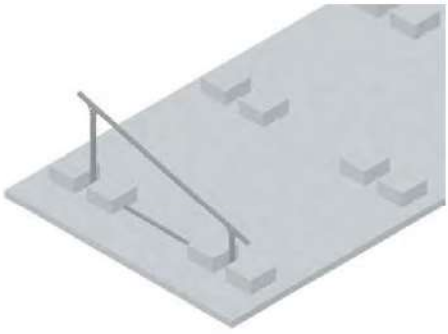
Step 2

Mount the base plate, front and rear poles as per the designs.

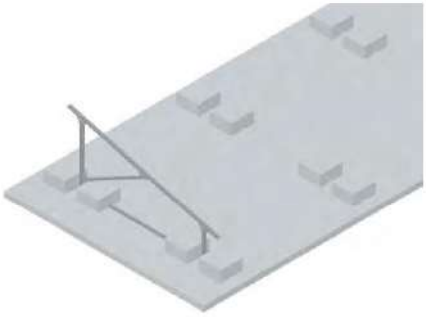
① Place the concrete stumps above the base rails



② Install the front and rear pole at the specified locations



③ Mount the primary rail on the front and rear pole

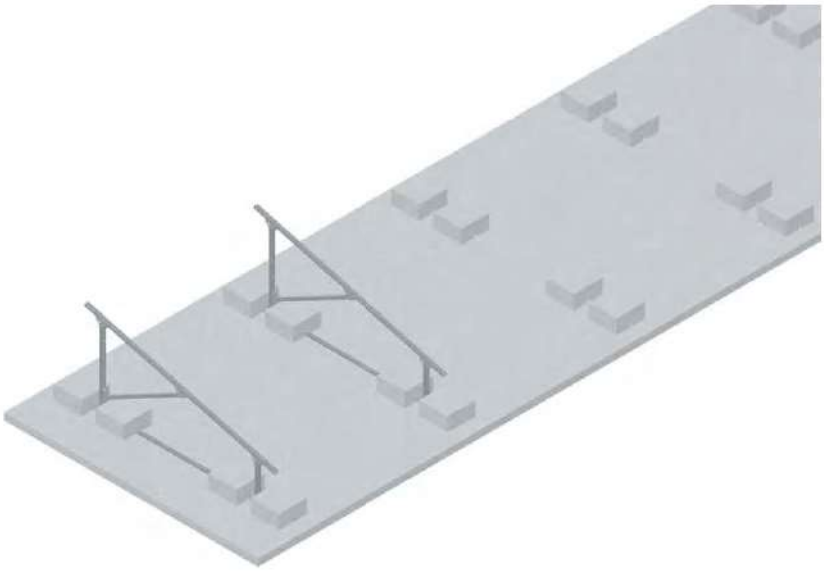


④ Install the side brace between base rail and primary rail

Concrete Roof - Weigh Down Solution

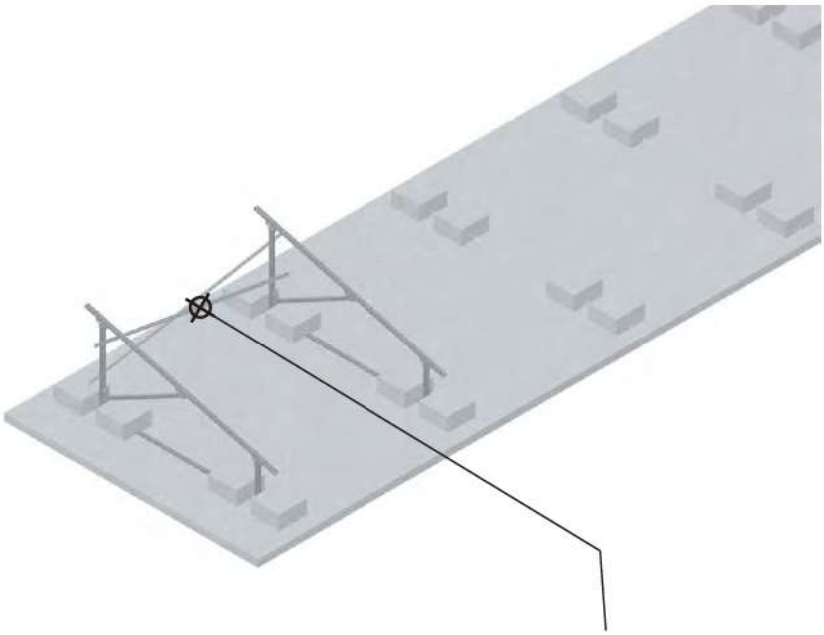
Step 3

Repeat the whole processes as follows:



Step 4

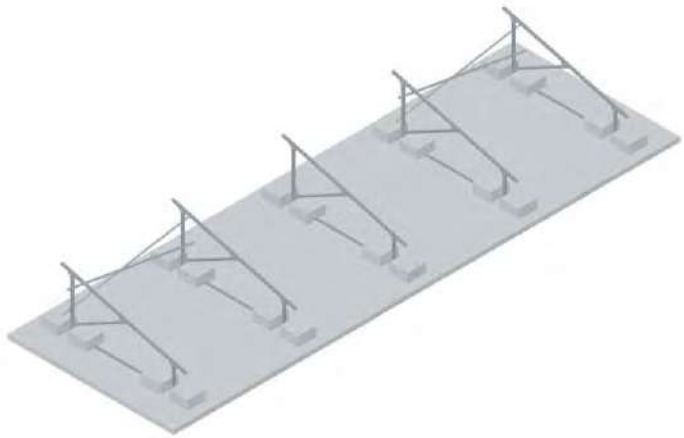
Mount the rear braces between each two main structure.



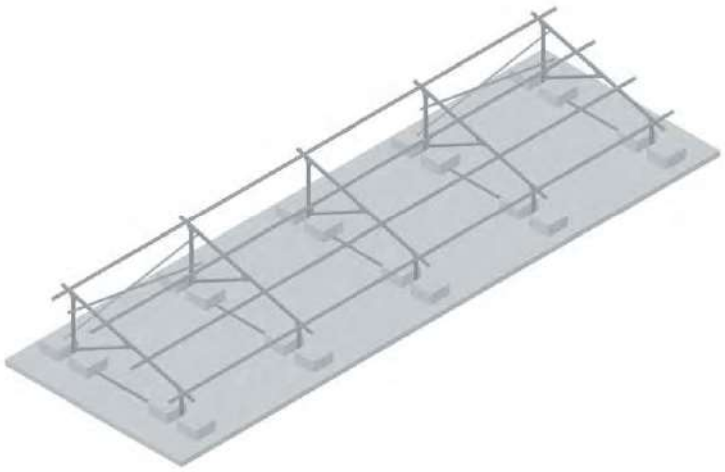
The rear braces to increase the structural strength.

Concrete Roof – Weigh Down Solution

Step 5
Repeat the process and complete the installation of all main structures.



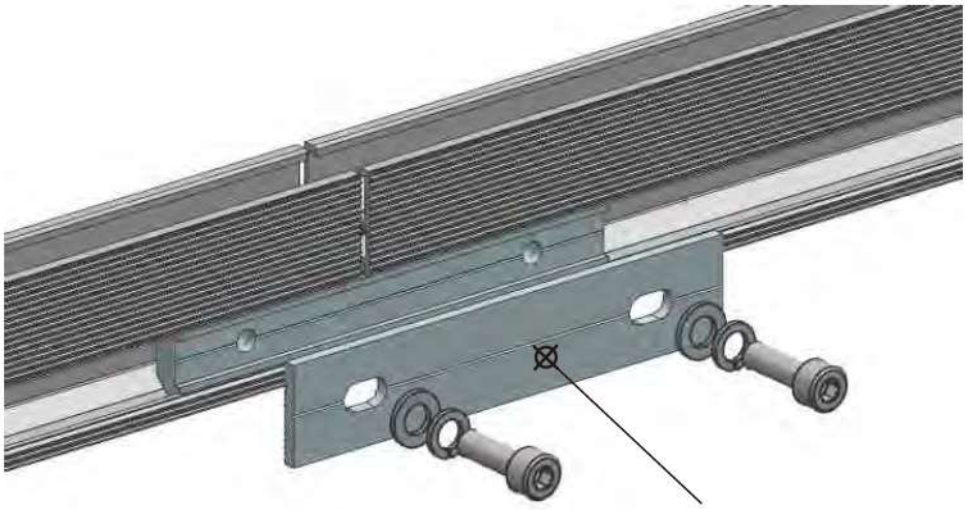
Step 6
Install the rails above the primary rails.



Concrete Roof – Weigh Down Solution

Step 7

Join the rails with different lengths to meet the array design (do remember to locate the joints at diagonal direction to increase the structural strength).



Rail joiner with screw sets
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Location of Joints (Located at diagonal directions to
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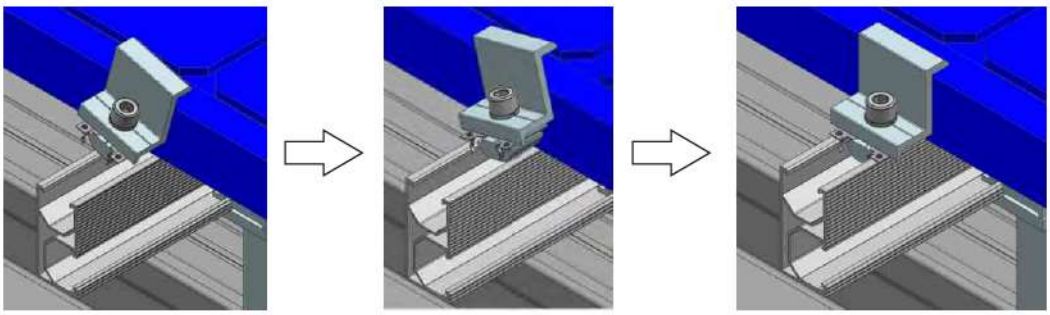

Concrete Roof – Weigh Down Solution

Step 9

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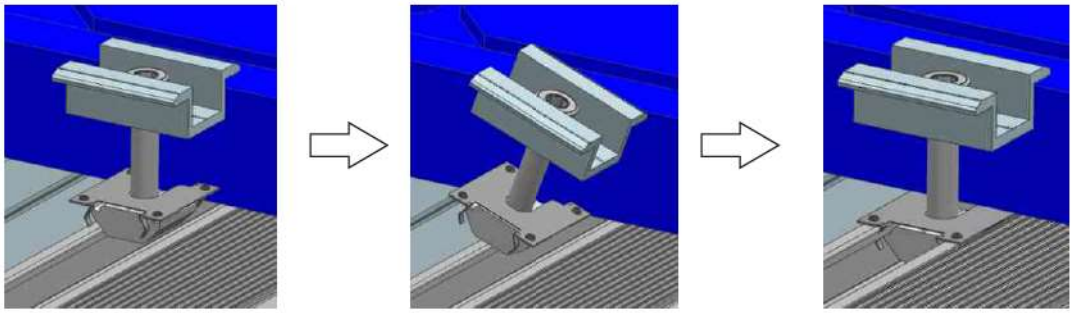

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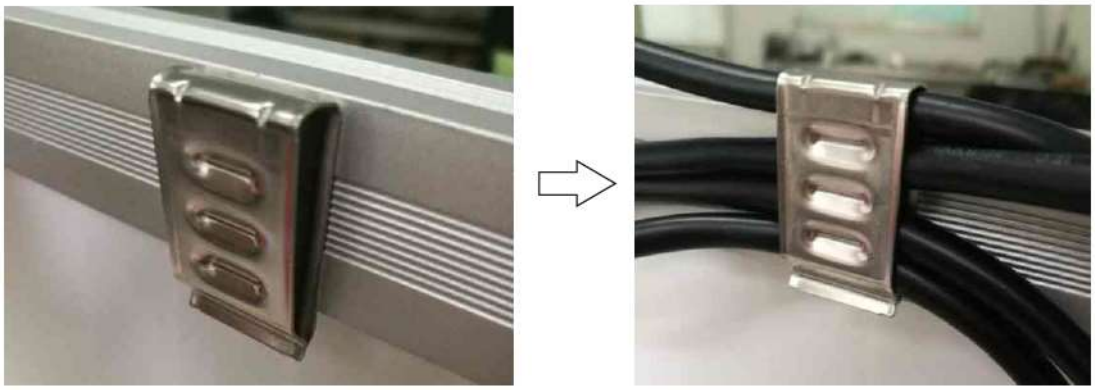
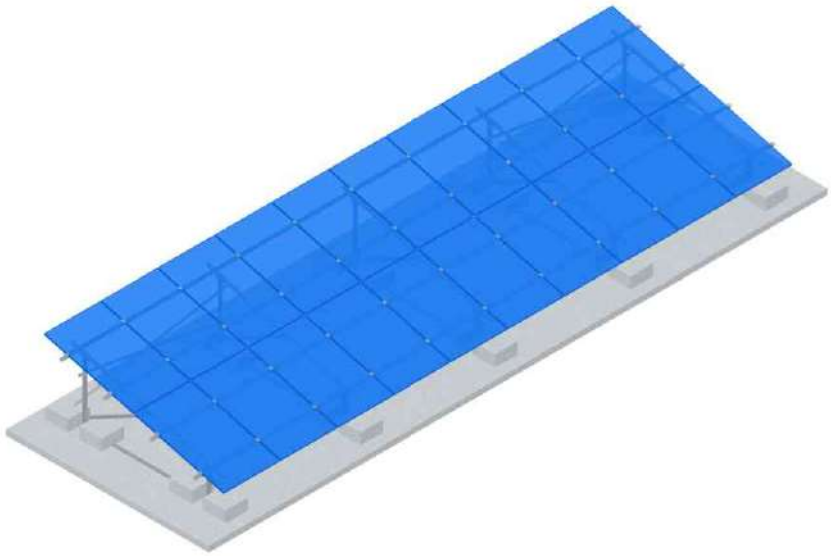


Overall View



After Installation

Do the following checkings after installation is complete:

- Check row by row if there are missing installation parts
- Check if all screws are tightened
- House keeping
- No climbing or trespassing
- No electrical connection until the mounting system is fully completed
- Only authorized personnel from the installer are allowed to dismantle, change or replace the parts by following this manual

Highlights

The torque for all our M8 Hexagon Socket Screws are 15N.M

The electrical tightening tool as below is able to indicate the Torque Value in installation, and the workers can check the toque by set the Torque Value to be 15N.M.

Maintenance and Service

Scope of Maintenance	Actions
Joints	Frequency: once a year Tighten if loose is observed
Rusty Parts	Frequency: once a year Anti-rusty treatment if rusty parts or components are observed.

Screw Loose Inspection

1. If Spring Washer become flat or not

2. After the screw has been tightened, a straight line can be marked on the screw and the fixing set, and the two lines will be overlapped if the screw has been tightened

3. Use professional electrical tightening tool and set the right torque value to tighten the screws.

Rusty Parts Inspection

The mounting systems are made of AL6005 and SS316, both of which are rust-free and have low chance to get rusty.

Inspection Period: no fixed period and it can be decided based on local environment. However, according to our experience, we recommend inspection period once a year under tropical weather conditions.

Warranty Terms

Jiangyin PVSolver Photovoltaic System Engineering Co., Ltd ("hereinafter refer as PVSolver") warrants to the original retail purchaser ("Owner") of PVSolver's rooftop solar mounting products, manufactured by PVSolver ("Products") that the structural components of the Products will be free from substantial defects in material and workmanship and that Product finish will be free from visible peeling, cracking or chalking under normal atmospheric conditions ("Finish Warranty") while the Products are installed at their original installation site provided that the Products were installed in accordance with PVSolver's written installation instructions.

Limited Warranty Period

This Limited Warranty covering the structural components of the Products is made for ten (10) years, from the earlier of 1) the date the installation of the Products is completed, or 2) thirty (30) days after the purchase of the Products (issue date of Purchase Order) by the original Owner.

Limited Warranty Coverage

PVSolver will, at its sole option, either repair or replace any Products or components of the Products that fail to meet the performance standards set forth in this limited warranty on an exchange basis without charge. If PVSolver is unable to repair or replace a defective Product or component within a reasonable time, PVSolver will, at its sole and exclusive option, either replace the defective Product or component with a functionally equivalent Product or component without charge, or refund the original price paid for the defective Product or component. These are your sole and exclusive remedies under this Limited Warranty.

Limited Warranty Exclusions

PVSover does not warrant that the Products will meet any specifications, needs, or requirements that are not expressly set forth in PVSolver's technical product documentation.

This Limited Warranty does not cover damage to the Products that occurs due to improper shipment, storage, or installation by Owner. This Limited Warranty shall be void if the Product is not installed in accordance with PVSolver's written installation instructions, if the Products are installed in an environment for which they were not designed, or if the Products have been modified, repaired, or reworked in any manner not previously authorized by PVSolver in writing.

This Limited Warranty covers only the Product and components provided by PVSolver. PVSolver makes no warrantiesor representations regarding any items or material provided by third parties.

Transfer of Limited Warranty

This limited warranty is transferable with respect to any mounting product to a new owner of the entire photovoltaic system, in which such mounting product is originally installed, provided that such mounting product remains intact in it's original place of installation. This warranty may not otherwise be assigned or transferred.

FURTHER EXCLUSIONS

ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. PVSOLVER SHALL NOT IN ANY CASE BE LIABLE FOR SPECIAL, INCIDENTAL, CONSEQUENTIAL, INDIRECT OR OTHER SIMILAR DAMAGES EVEN IF PVSOLVER OR ITS AGENT HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

In no case shall PVSolver's liability exceed the purchase price paid for the defective Products or components.

How to Make a Warranty Claim

If Owner has a claim for repair or replacement under this Limited Warranty, Owner must contact PVSolver as soon as possible and under no circumstances later than 30 days after the end of the applicable Limited Warranty Period to initiate the Limited Warranty claim process. Address all Warranty claims to: Jiangyin Pvsolver Photovoltaic System Engineering Co., Ltd. Warranty Claim No. 65, Wangtianwei Lane, Jishan Village, Zhouzhuang Town Jiangyin City, Jiangsu Province, China. Any claim under the above Limited Warranty must include proof of the date the Product installation was completed or the date of original Product delivery such as a copy of Owner's receipt or invoice.

Other Conditions

This Limited Warranty allocates risks of Product failure between Owner and PVSolver. The Limited Warranty set forth above is in lieu of all other express warranties, whether oral or written. The agents, employees, distributors and dealers of PVSolver are not authorized to modify this Limited Warranty nor to make additional warranties binding on PVSolver. Accordingly, additional statements such as dealer advertising or presentations, whether oral or written, do not constitute warranties by PVSolver and cannot be relied upon as a warranty of PVSolver. PVSolver's product pricing reflects this allocation of risk and the limitations of liability in this Limited Warranty.