

Key Points about Flexible PV Module Installation

Further Information

1. Flexible solar module can serve the roofs :

- *Insufficient load capacity
- *Unable to penetrate and anchor
- *Facade/curved surface
- *Lightweight corrugated steel roofing
- *Waterproof membrane roofing
- *Carport

2. *For each specific projects, it is suggested to contact Fortunes Solar for installation advise.*

3. Precautions on unpacking, secondary transport.

3.1 Modules should be handled and lifted by at least two people. **Do not touch the solar cell area** during handling to avoid cell-cracks.



3.2 **Do not stand, climb, walk or jump** on modules.



3.3 **Do not** carry the modules *by the wires or junction boxes* of the modules.



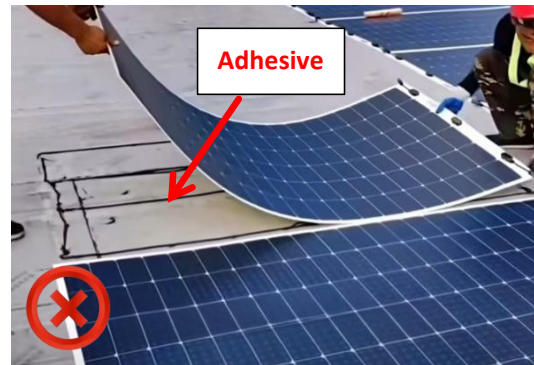
4. Installation Instructions:

4.1 Precautions

WARNING !

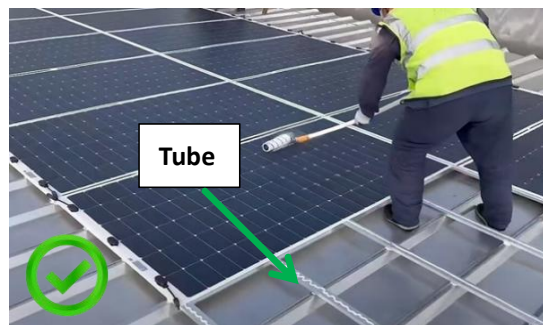
Improper Installation:

FDS Flexible solar panels are **prohibited to installed directly onto a flat roof surface using only adhesive**, as this prevents heat dissipation and free drainage of rainwater. This can lead to fire hazards and damage to the panels, including hot spots and moisture

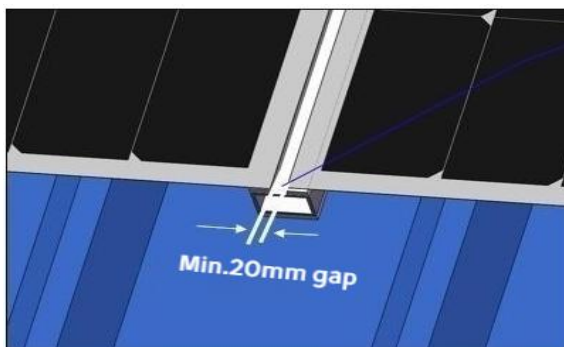


Proper Installation:

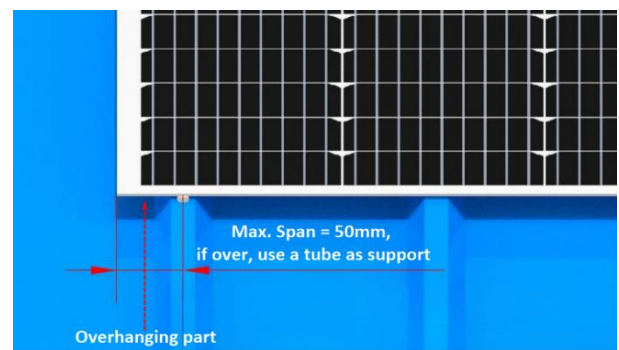
A **support** such as **aluminum tube or PVC tube** is **requested** between flexible solar panels and flat roof surface for installation to leave a minimum 20 mm gap between for ventilation and drainage.



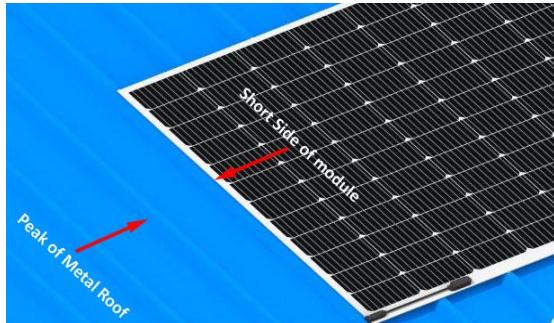
4.1.1 keep a min. 20mm gap between adjacent PV modules to allow thermal expansion.



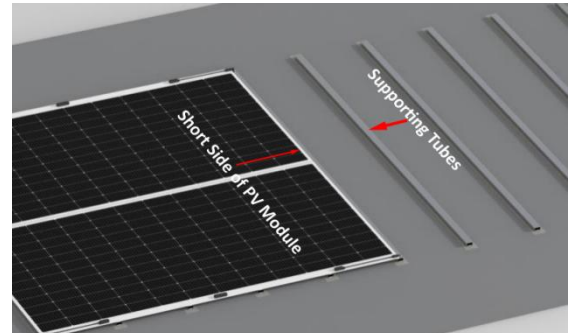
4.1.2 If PV module overhanging part is above 50mm, use aluminum tube for trapezoidal Metal Roof installation










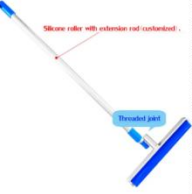



4.1.3 The short side of the PV module must be parallel to the direction of the peak of the metal roof. It is prohibited to be perpendicular to the roof sheet peak of metal roof.



4.1.4 The short side of the PV module must be parallel to the aluminum tube or PVC tube. It is prohibited for the long side to be parallel to the aluminium tube.



4.2 Construction Materials and Tools (the listed are only for reference, installer can use other preferable as per their own disposable)

Silicone sealant (glue)	Tonsan/Tianshan 1527,Huitian 906Z, Sika Sikasil SG-20s or Innotec	Tools for cleaning the roofs	Powe washer for flat roof	Power washer for all roof	Mop for roof	Mop for module
						
Glue Gun						
Material for Cleaning Roof	Trisodium Phosphate & liquid cleaner	Roller for pressing module after it has been placed on the adhesive	Long silicon/wool Roller		Short silicon/wool Roller	
						

4.3 Cleaning the roof surface

Remove debris from the roof base and use a designated or approved cleaning agent to clean the roof. **If the roof is very dirty**, use a low-pressure water spray or power washer **before using the cleaning agent**. Optionally, **use a mixture of 1/4 cup of trisodium phosphate, 1/2 cup of liquid cleaner and 5 gallons of water** for cleaning.

Cleaning agent

Roof type	Cleaning agent recommended by Fortunes Solar
TPO,PVC, Asphalt, EPDM, etc. Plastic Roof	Plastic cleaner China: RA-1033 Overseas: Use the cleaning agent recommended by the roofing material supplier
Color metal tile, glass roof, metal roof	90% Isopropanol + 10% water

Use the cleaners listed above or those recommended by the roofing material supplier.



Special glue curing table at different ambient temperatures			
Ambient Temperature(Ta)	-10≤Ta≤0	0<Ta<20	20≤Ta≤45
Full Solidification Time (Day)	21	14	7
Standard solidification conditions: temperature (23 +/-2) °C, humidity (50+/-5) % conditions can be completely solidified in 7 days			

Table 1. Special Adhesive Full Curing Time

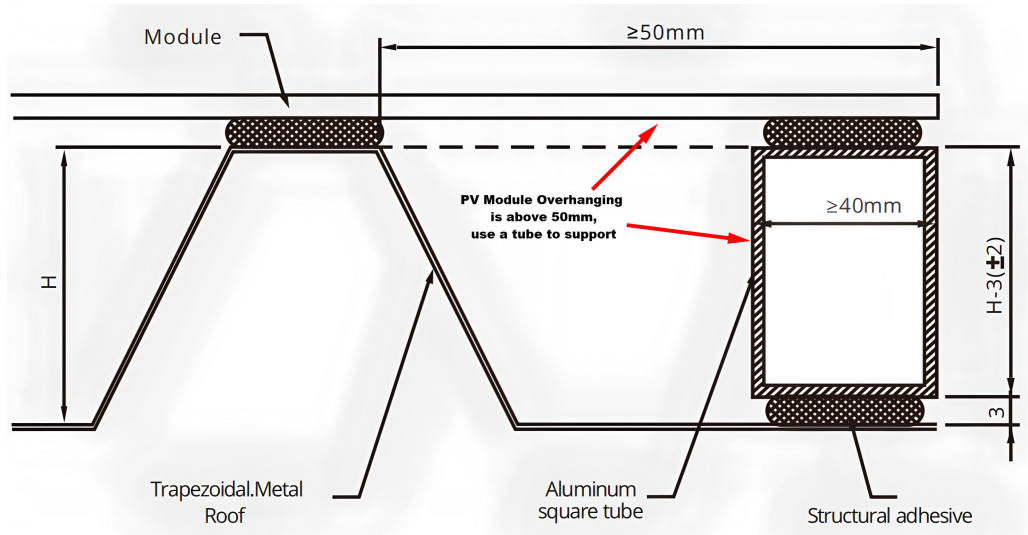
(This table is provided solely as a reference for the curing time of Tonsan 1527 adhesive. The specific curing time is subject to the information of the glue manufacturer)

4.4 Trapezoidal Metal Roof Construction Plan

Installation Steps

4.4.1 Supporting material

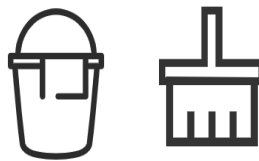
- Aluminum tube



Material: Aluminum 6000 Series-T5/T6.
Surface treatment: Anodic oxidation AA10 and above

4.4.2 Cleaning the roof surface

- Remove debris from the roof base and use a designated or approved cleaning agent (to clean the roof. If the roof is very dirty, use a low-pressure water spray or power washer before using the cleaner. Optionally, use a mixture of 1/4 cup of trisodium phosphate, 1/2 cup of liquid cleaner and 5 gallons of water for cleaning.



4.4.3 Positioning and releasing the line

- Locate the line and determine the installation position of the module.

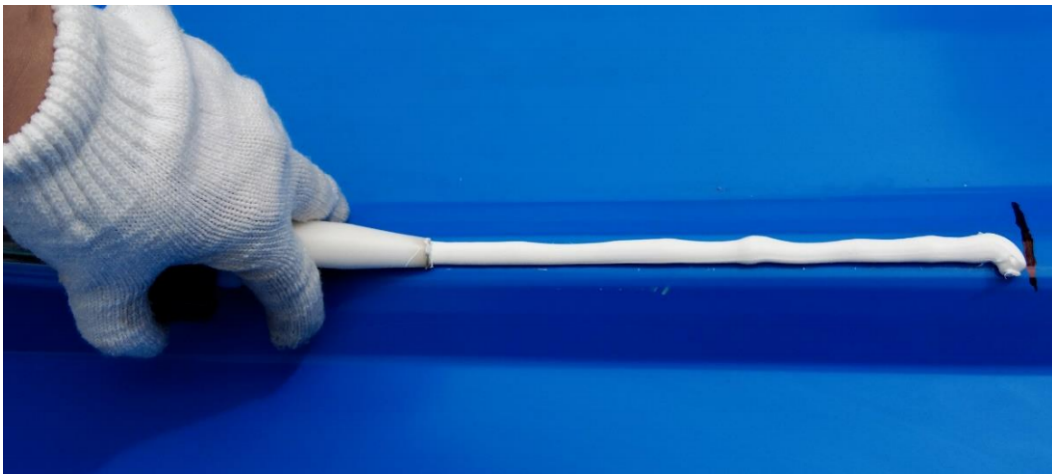


- Design consideration : Panels should not be placed where it will be subject to the roofs thermal expansion and contraction and other movement.

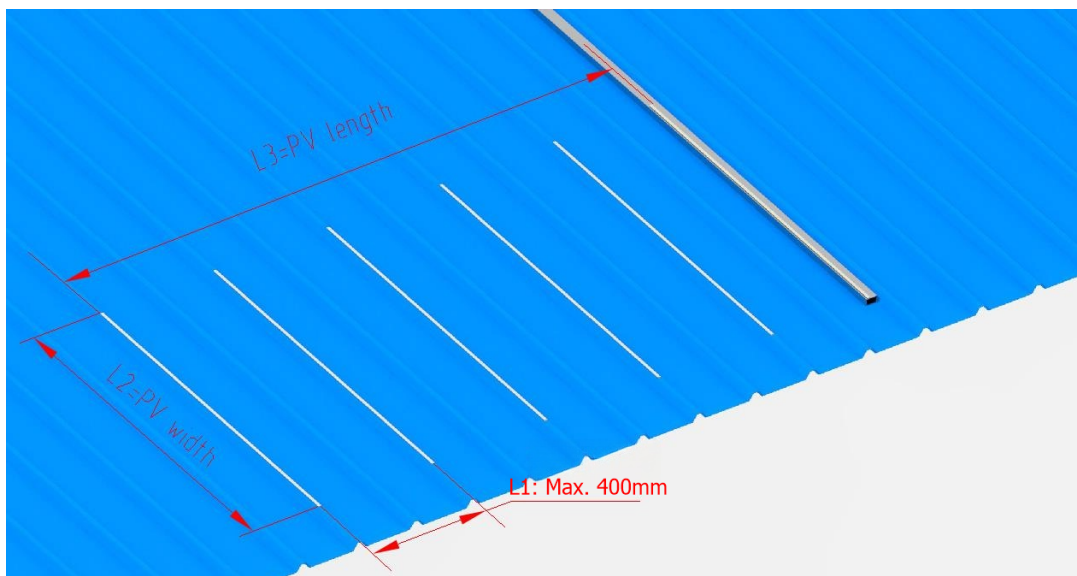


4.4.4 Gluing

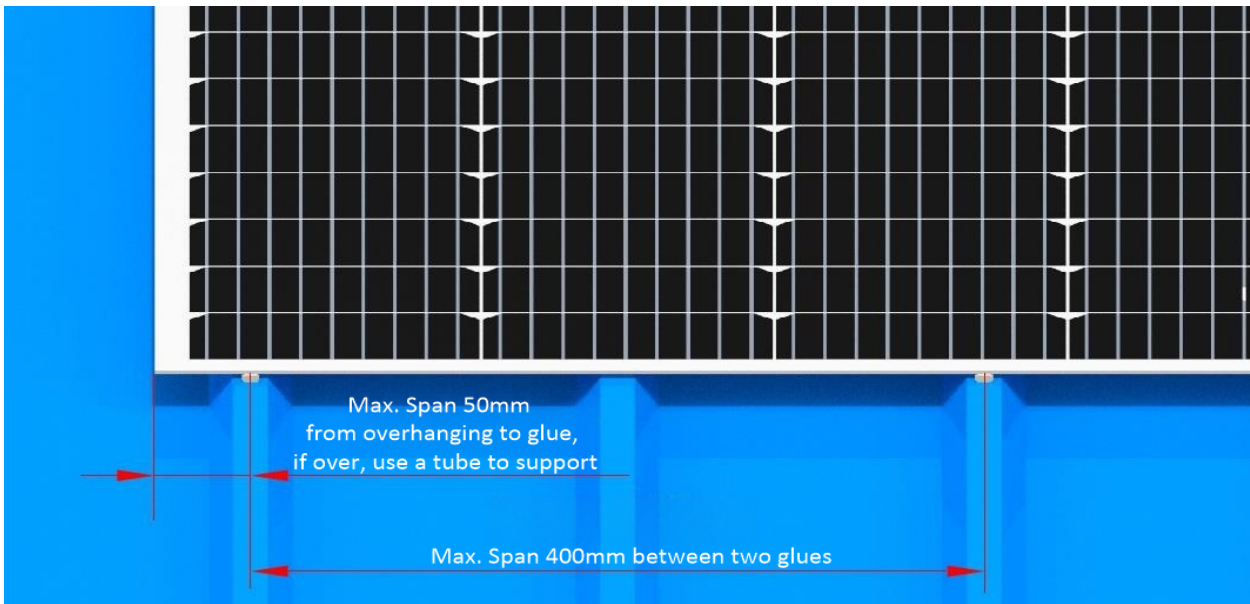
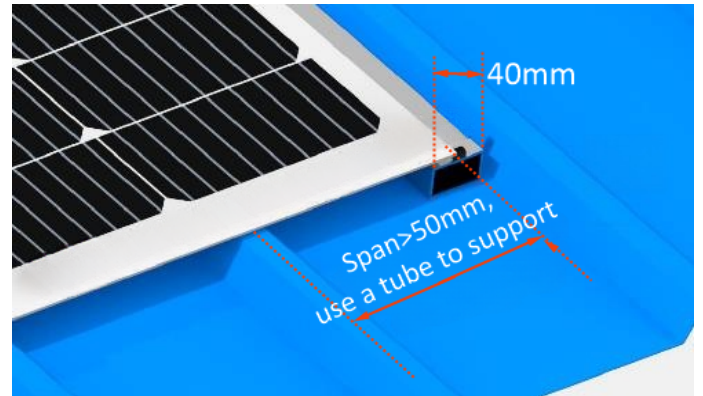
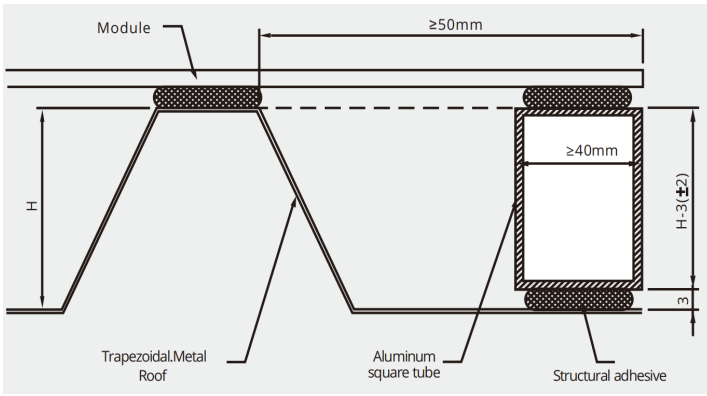
- The application of the adhesive on the roof sheet peak should be a continuous and even movement preferable from a caulking gun. Please refer to the adhesive manufacturer's installation manual.



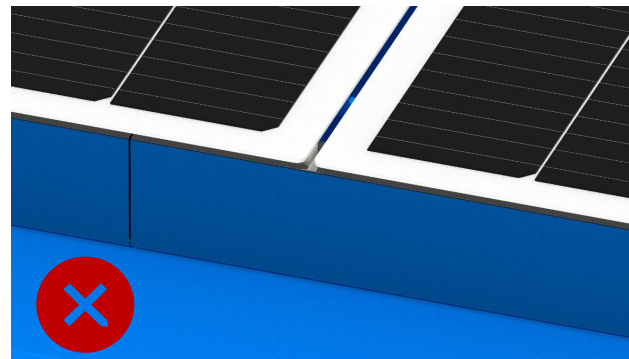
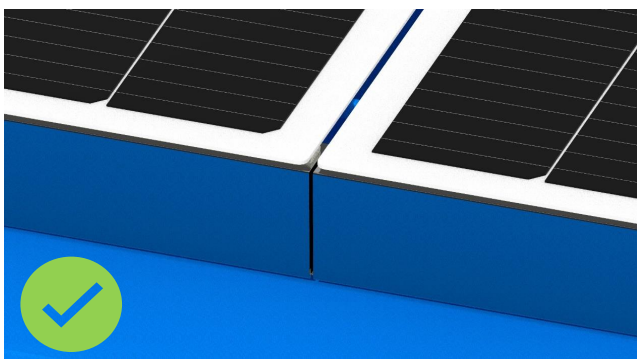
- The glue length L2 is the same at the width of PV panel, distance between glue L1 should be less than 400mm



- If PV module overhanging to glue is above 50mm, use aluminum tube to support

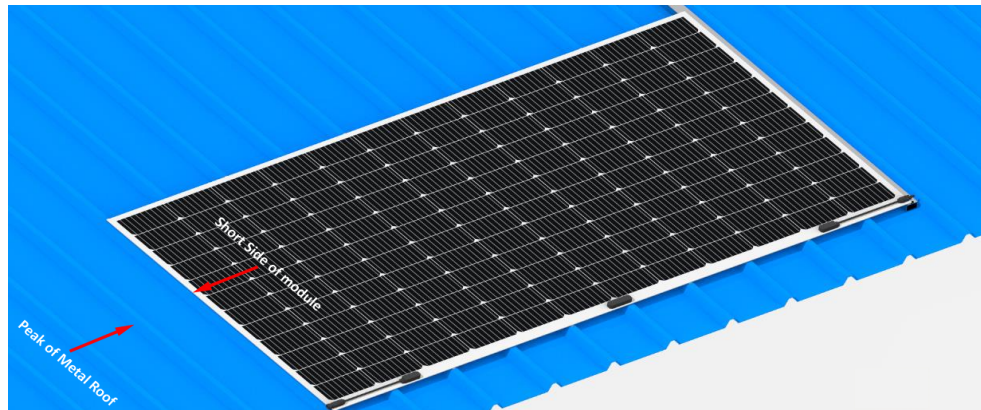


- If there are joints in the aluminum tube, they should be positioned between modules, Single module must not overlap the joints of the aluminum tube.

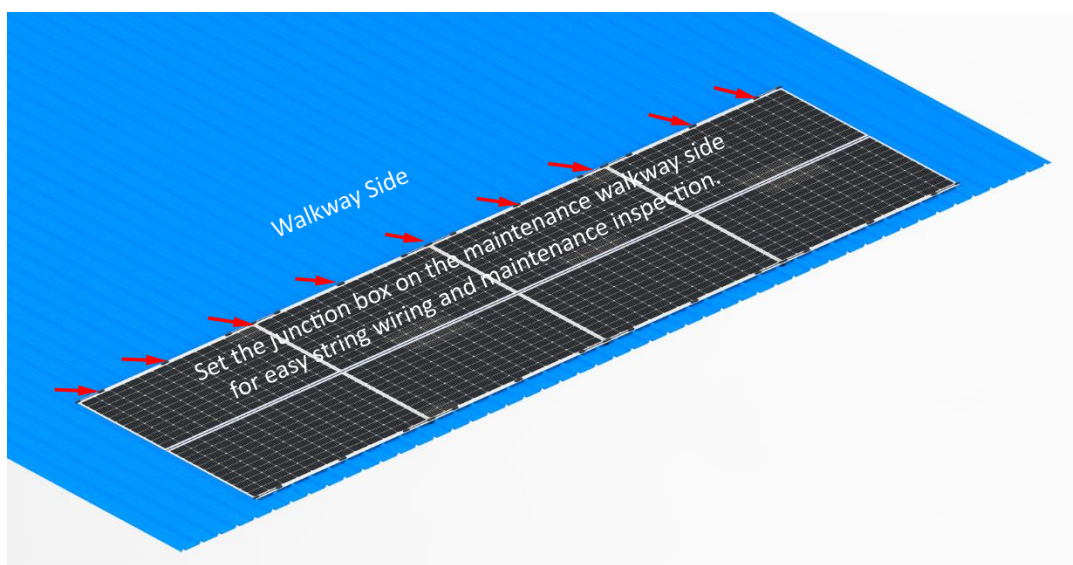


4.4.5 Laying modules

- Do not bend the module during installation. Two people should grasp the white edge of the module and place it onto the glue. Modules should be in a straight position during placement. Do not re-glove the modules.
- The short edges of the module must be parallel to the direction of the fall of the metal roof. It is prohibited to be perpendicular to the roof sheet peak of metal roof.



- Once modules are placed, avoid hand-pressing the cell-area to facilitate adhesion.
- The min. distance between the modules is 20mm, and the distance between each array is 400-800mm, which is used as a construction maintenance walkway. (This spacing is for reference only)
- Adjacent modules can share the same Aluminum tube.
- Place the junction box on the maintenance walkway side for easy string wiring and maintenance inspection.

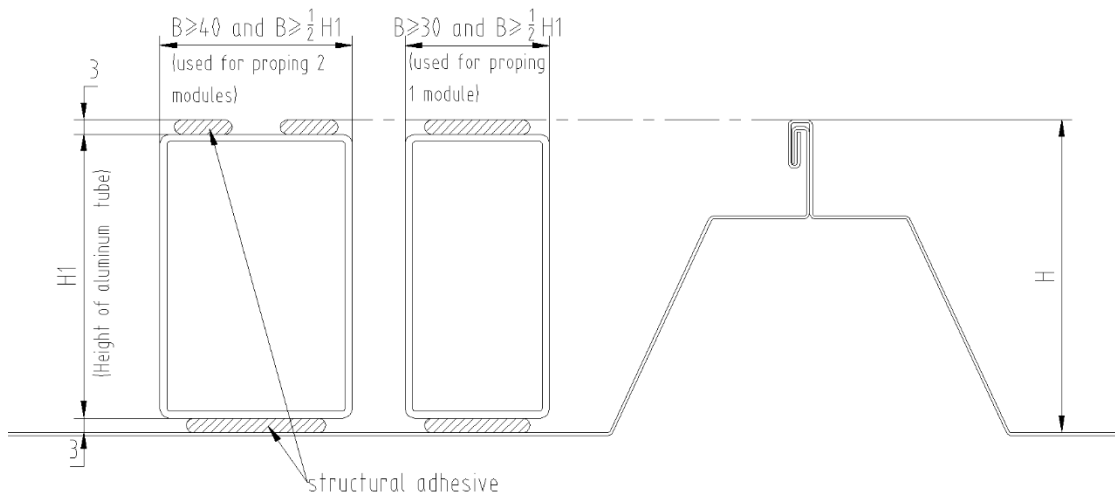


4.5 Standing Seam Metal Roof Construction Plan

Installation Steps

4.5.1 Supporting material

- Aluminum tube



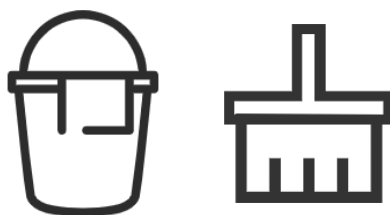
Material: Aluminum 6000 Series-T5/T6.
Surface treatment: Anodic oxidation AA10 and above,
Dimensions: $H1 = (H - 6\text{mm}) \pm 2\text{mm}$

For the tube at the joint of two modules, $B = 40\text{mm}$, and $B \geq \frac{1}{2} H1$;

For other tube, $B \geq 30\text{mm}$, $B \geq \frac{1}{2} H1$.

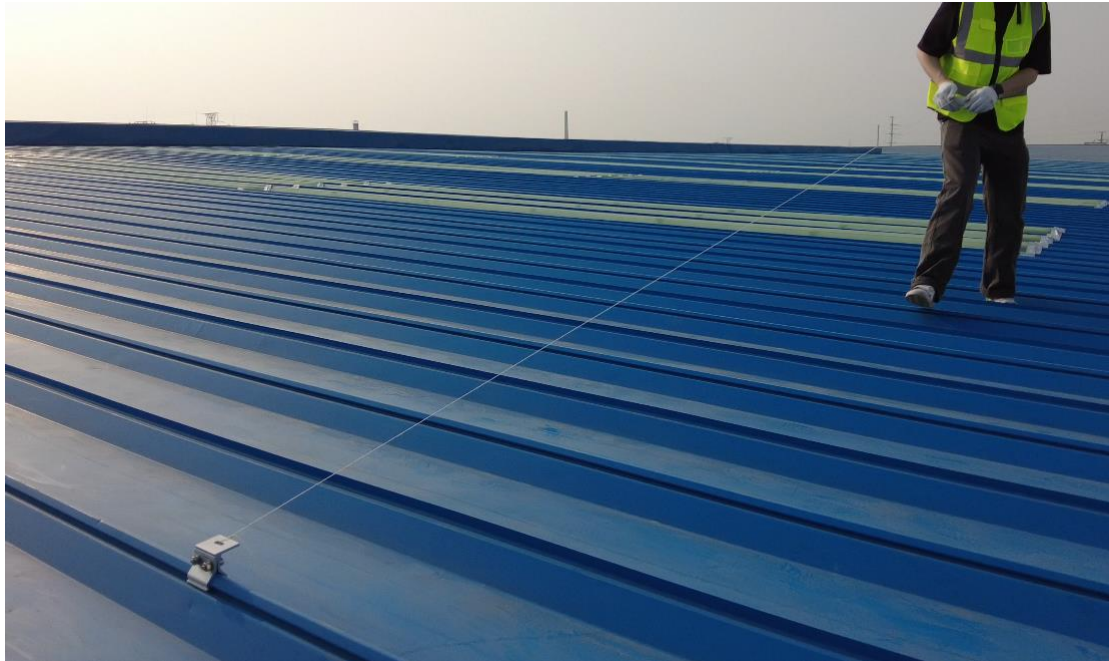
4.5.2 Cleaning the roof surface

- Remove debris from the roof base and use a designated or approved cleaning agent to clean the roof. If the roof is very dirty, use a low-pressure water spray or power washer before using the cleaner. Optionally, use a mixture of 1/4 cup of trisodium phosphate, 1/2 cup of liquid cleaner and 5 gallons of water for cleaning.



4.5.3 Positioning and releasing the line

- Locate the line and determine the installation position of the module.

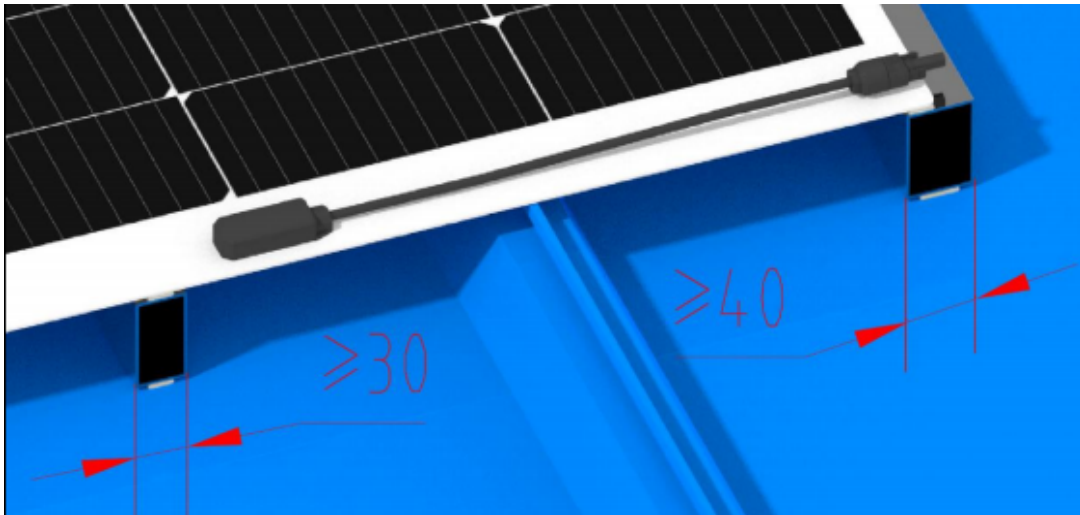


- For the FDS400-54M10 module, using at least five aluminum tubes to support, which are uniformly distributed in the length direction of the module.
- For the module FDS520-72M10, using at least six aluminum tubes to support, which are uniformly distributed in the length direction of the module.
- When the position of the tube is interfered with the roof sheet peak, the position of the tube can be adjusted appropriately;
- **If there are joints present from the ridge of the corrugated metal roof to the eaves, the seams must be positioned between modules rather than being covered by one single module.**

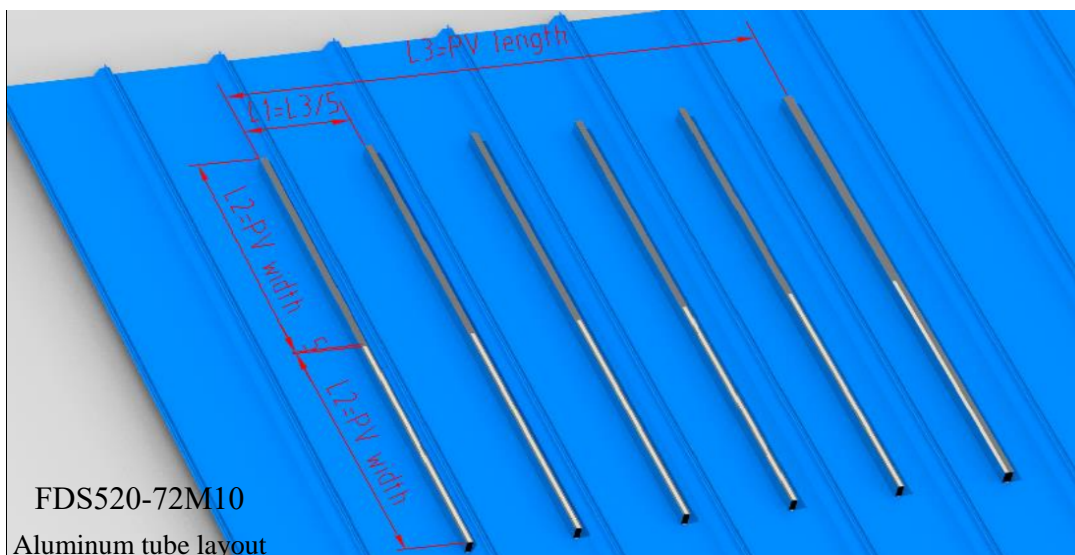
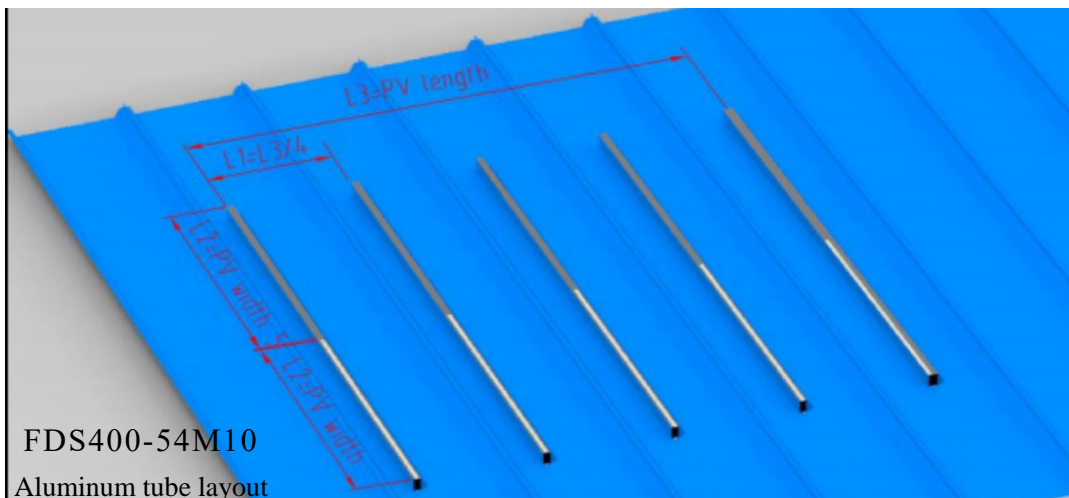


4.5.4 Gluing

- The application of the adhesive on the roof sheet valley should be a continuous and even movement preferable from a caulking gun. Please refer to the adhesive manufacturer's installation manual.
- Paste aluminum tube. Use the tube with width of 40mm at the joint of two modules, and use the tube with width ≥ 30 mm at other positions.



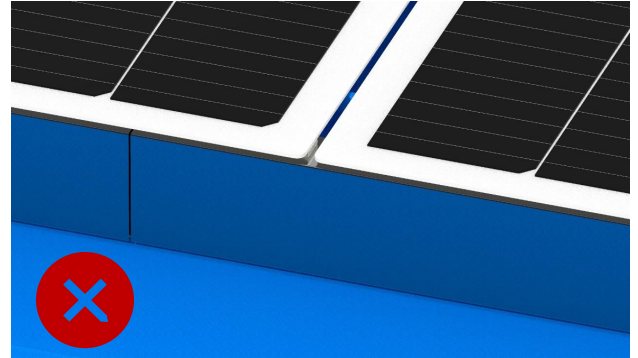
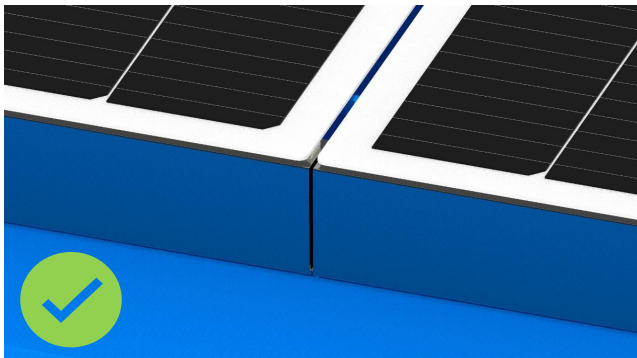
- The glue length L2 is the same at the width of PV panel, L3 is the length of PV panel.



- Glue evenly on the tube surface.



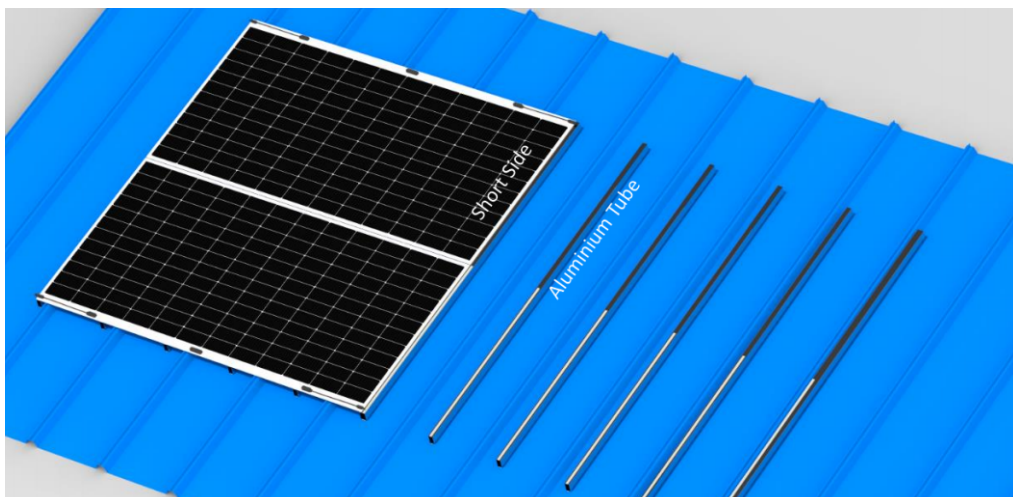
- If there are joints in the aluminum tube, they should be positioned between modules, Single module must not overlap the joints of the aluminum tube.



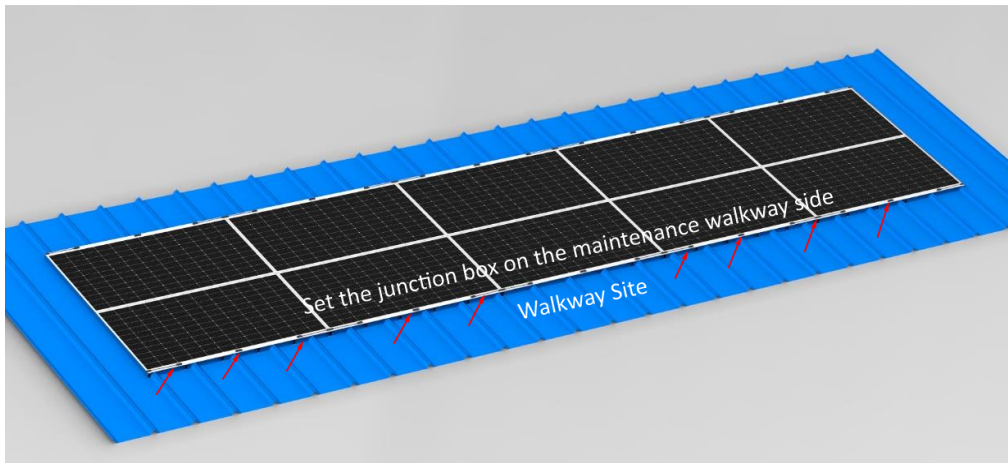
4.5.5 Laying modules

The following diagram shows FDS520-72M10. Following this procedure, FDS400-54M10 can also be constructed in the same way.

- Do not bend the module during installation. Two people should grasp the white edge of the module and place it onto the glue. Modules should be in a straight position during placement. Do not re-glue the modules.
- The short side of the module must be parallel to the aluminum tube. It is prohibited for the long side to be parallel to the aluminium tube.



- Once modules are placed, avoid hand-pressing the cell-area to facilitate adhesion.
- The minimum distance between the modules is 20mm, and the distance between each array is 400-800mm, which is used as a construction maintenance walkway. (This spacing is for reference only)
- Adjacent modules can share the same Aluminum tube
- Place the junction box on the maintenance walkway side for easy string wiring and maintenance inspection.



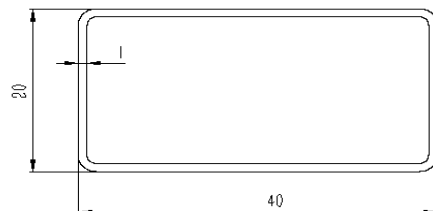
4.6 Flat Roof Aluminum Tube Construction Plan

Installation Steps

If the bitumen membrane surface has a protective film, the film must be removed before construction can proceed.

4.6.1 Supporting material

- Aluminum tube
The aluminum material should be 6000 Series-T5/T6. Minimum size recommended size will be as per the below



4.6.2 Cleaning the roof surface

Remove debris from the roof base and use a designated or approved cleaning agent (Annex B) to clean the roof. If the roof is very dirty, use a low-pressure water spray or power washer before using the cleaner. Optionally, use a mixture of 1/4 cup of trisodium phosphate, 1/2 cup of liquid cleaner and 5 gallons of water for cleaning.



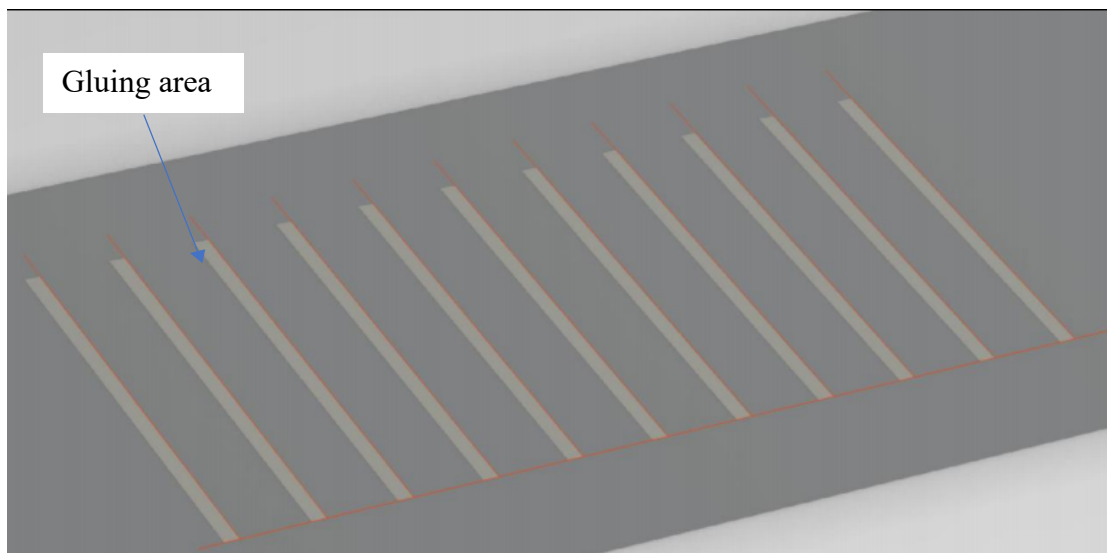
4.6.3 Positioning

- Positioning and securing lines to determine the spacing of aluminum tubes or PVC tubes in accordance with the design drawings (For design drawings, please contact Fortunes Solar).



- For the FDS400-54M10, at least five aluminum tubes or PVC tubes are used to support the module, and are evenly distributed in the length direction of the module.
- For the FDS520-72M10, at least six aluminum tubes or PVC tubes are used to support the module, and are evenly distributed in the length direction of the module.

4.6.4 Apply primer (ignore this step if no primer required for the roof material)



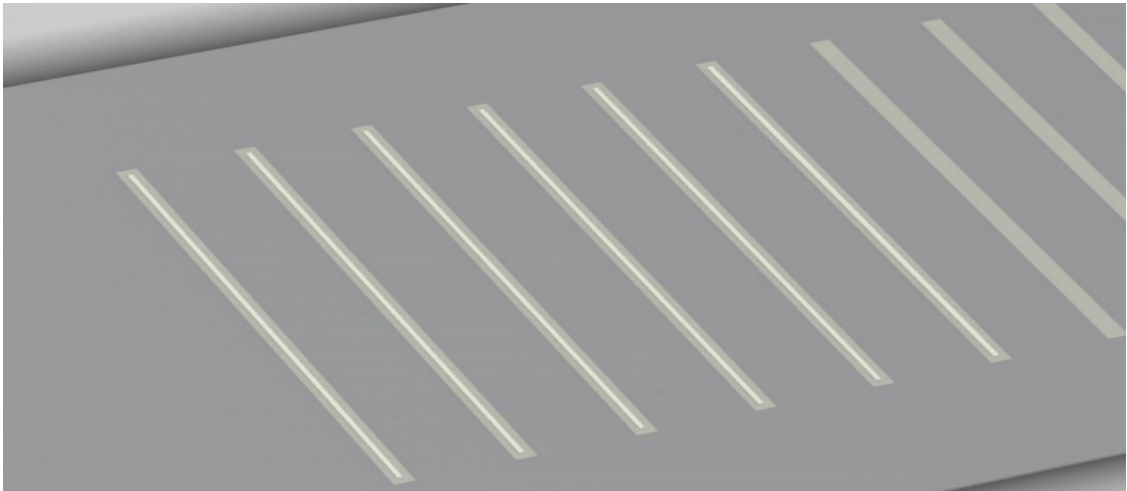
- Clean the gluing area again, wipe the area with the cleaning agent;
- For the gluing area, apply primer before gluing.

4.6.5 Apply activator for PVC tube (ignore this step for the aluminum tube)

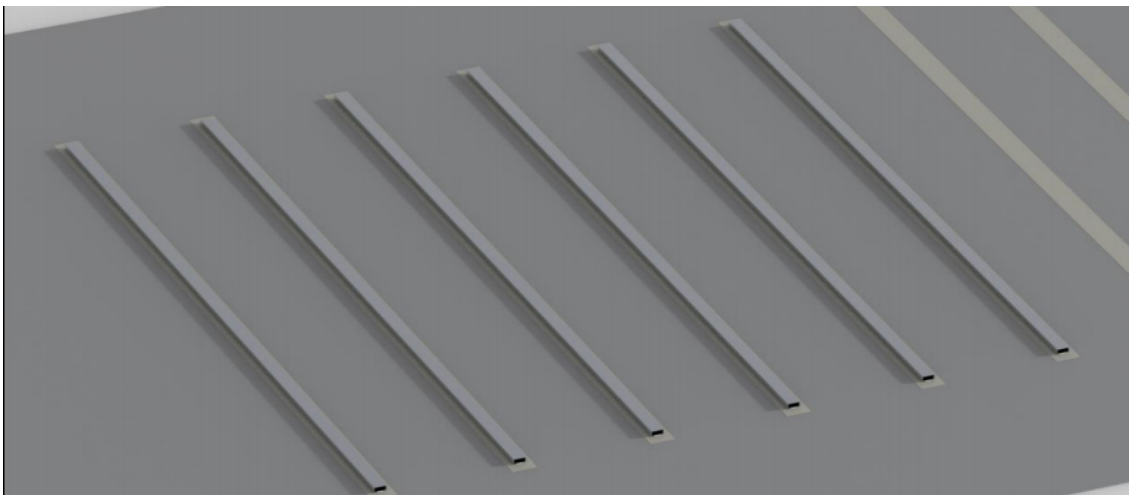
- Before commencing construction, please ensure you have read the activator manufacturer's manual to ensure that all the activator application requirements are followed.
- After 5 minutes of activator application when the activator has dried, continue with the installation of the glue. The glue needs to be completed within 2 hours of the application of the activator. If more than 2 hours have passed after the application of the activator, it will need to be reapplied (The specific available period of activator is subject to the information of the activator manufacturer).

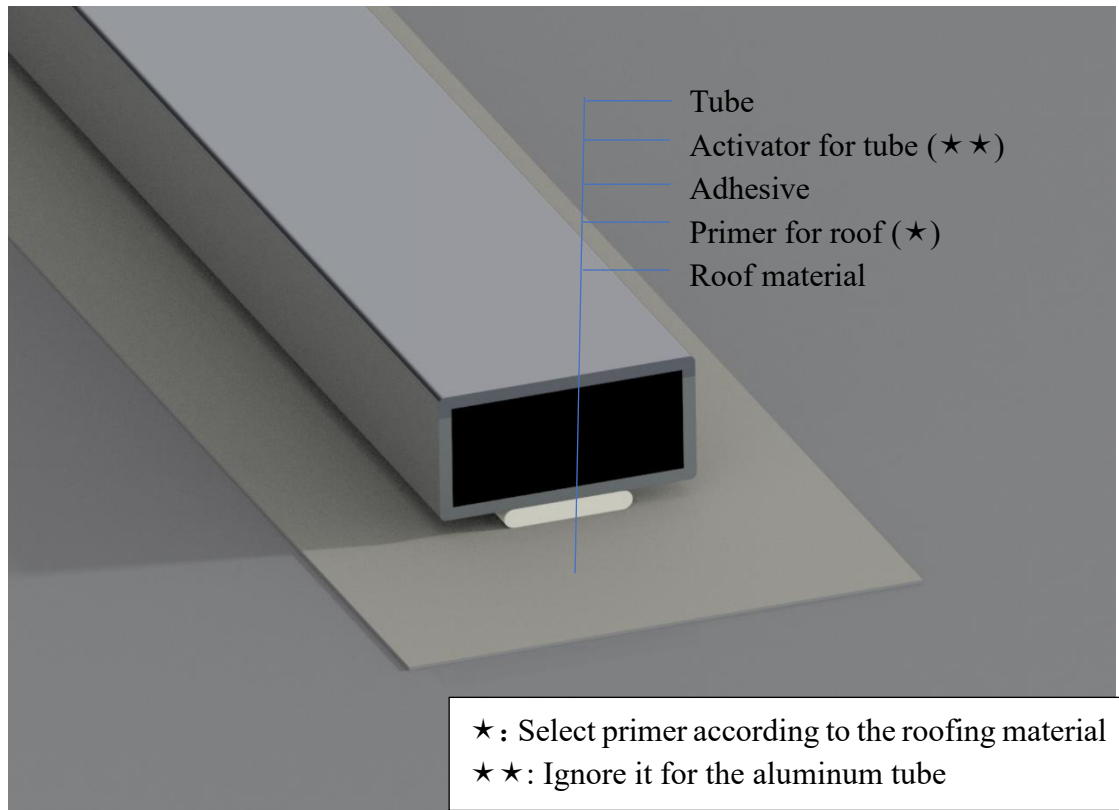
4.6.6 Paste tube

- Glue the silicone sealant continuously and uniformly in the glue area. It is strictly prohibited to apply adhesive in a dotted or segmented manner.



- Paste the tube along the gluing path and lightly compress. Ensure the bead height is not less than 3mm





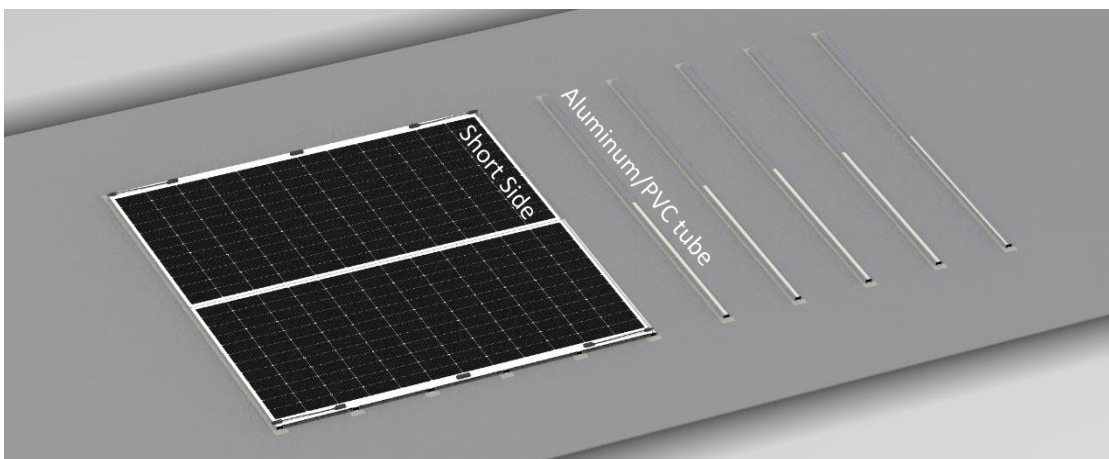
4.6.7 Laying modules

- Making Glue continuously and uniformly on the tube followed the Precautions and Tips for Gluing Modules. It is strictly prohibited to apply adhesive in a dotted or segmented manner.



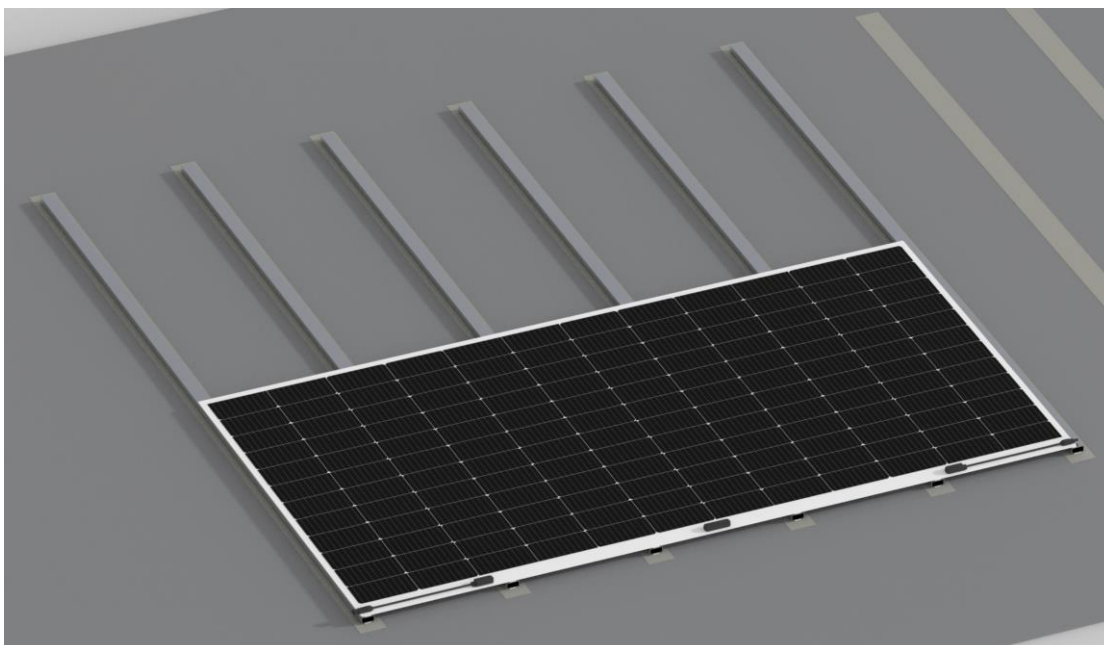
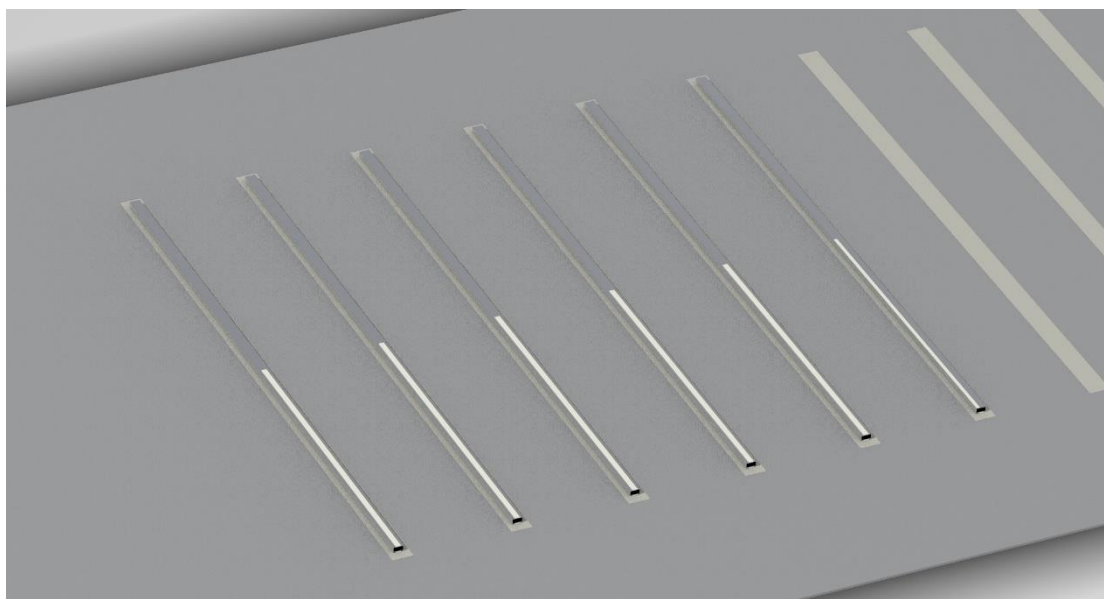
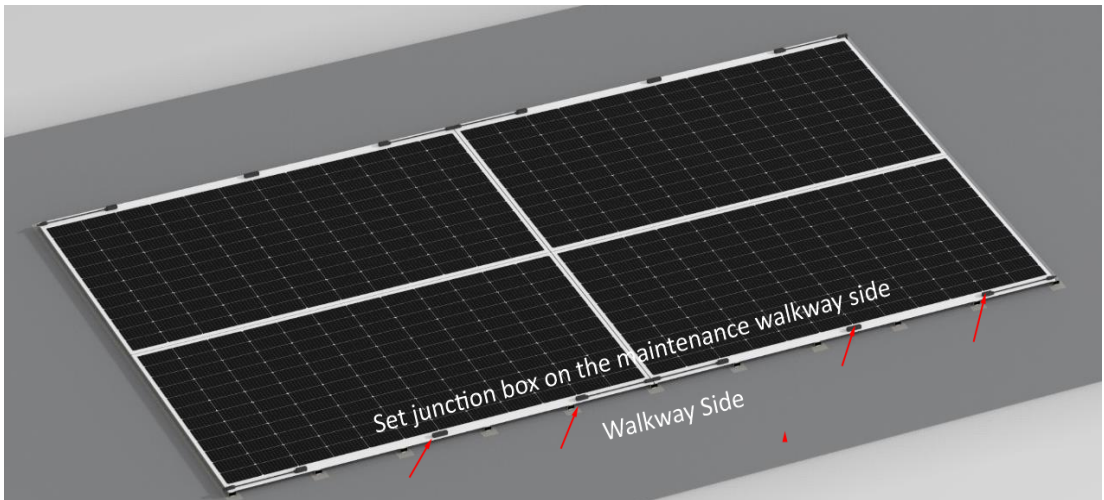


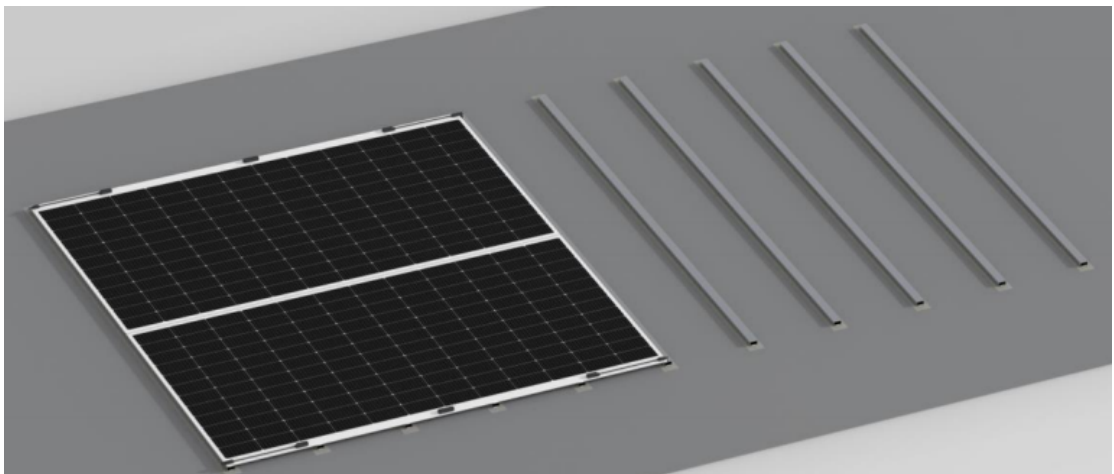
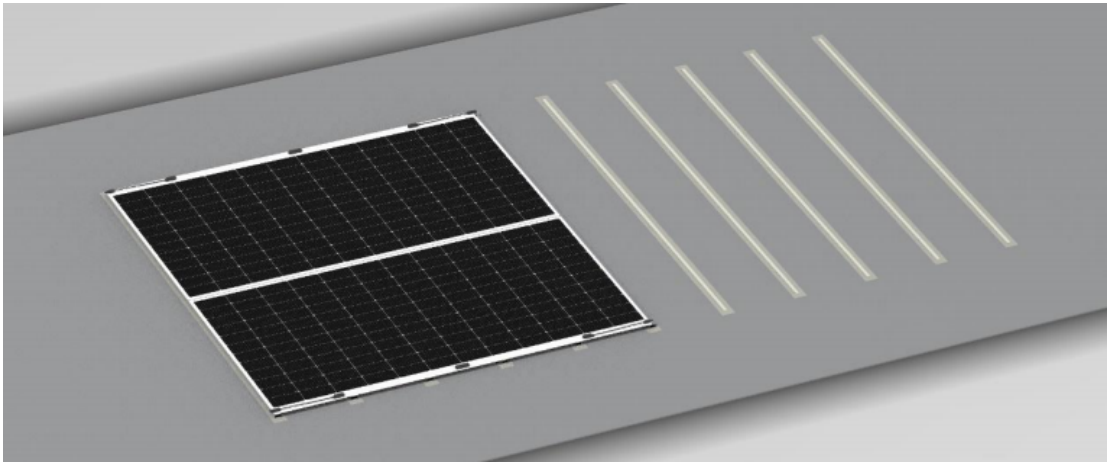
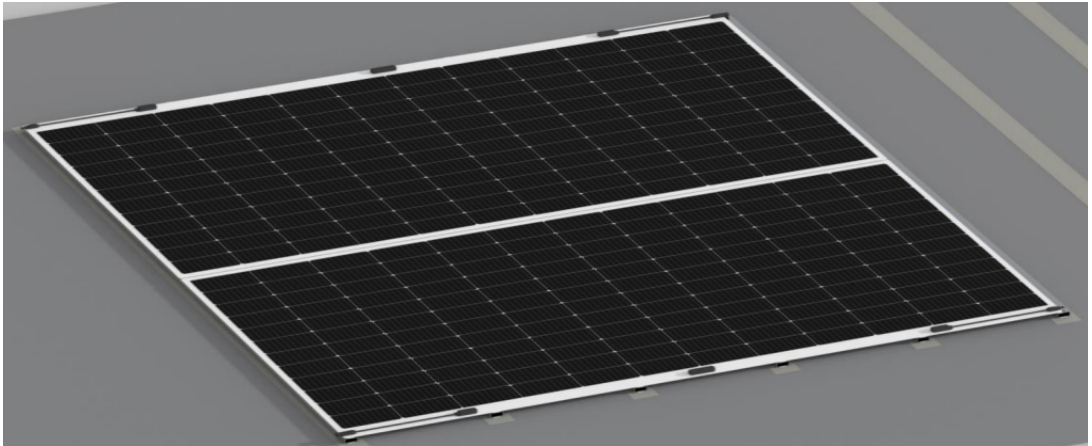
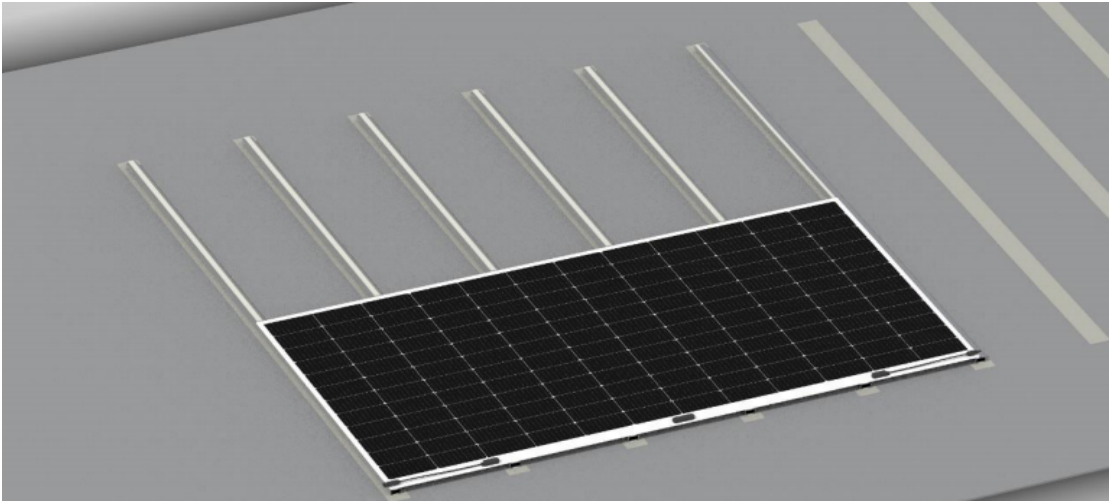
- Do not bend the module during installation. Two people should grasp the white edge of the module and place it onto the glue. Modules should be in a straight position during placement. Do not re-glue the modules.
- The short edges of the module must be parallel to the aluminum tube or PVC tube. It is prohibited to be perpendicular to the aluminum tube or PVC tube.

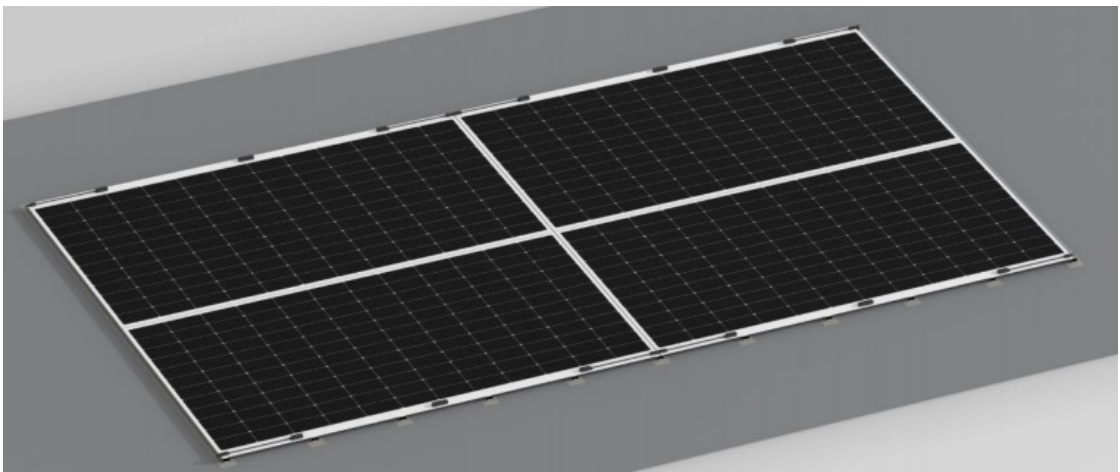
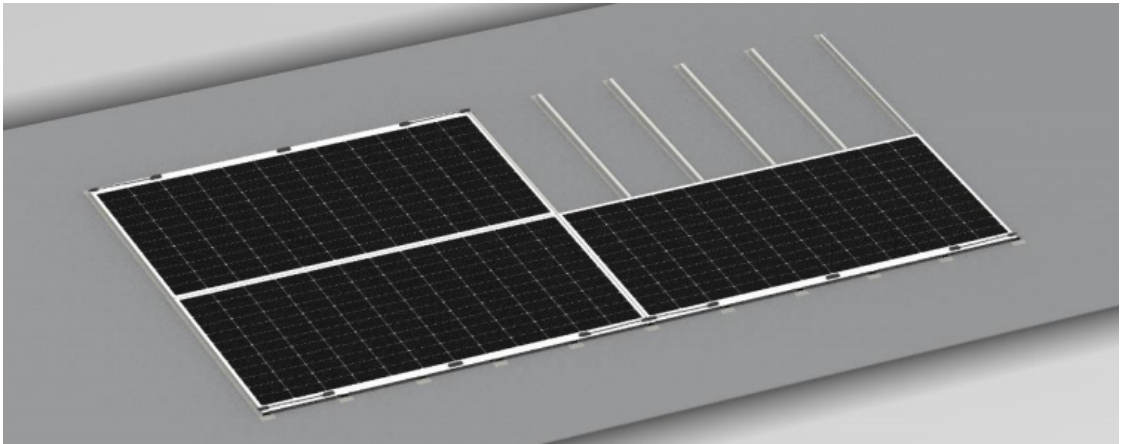
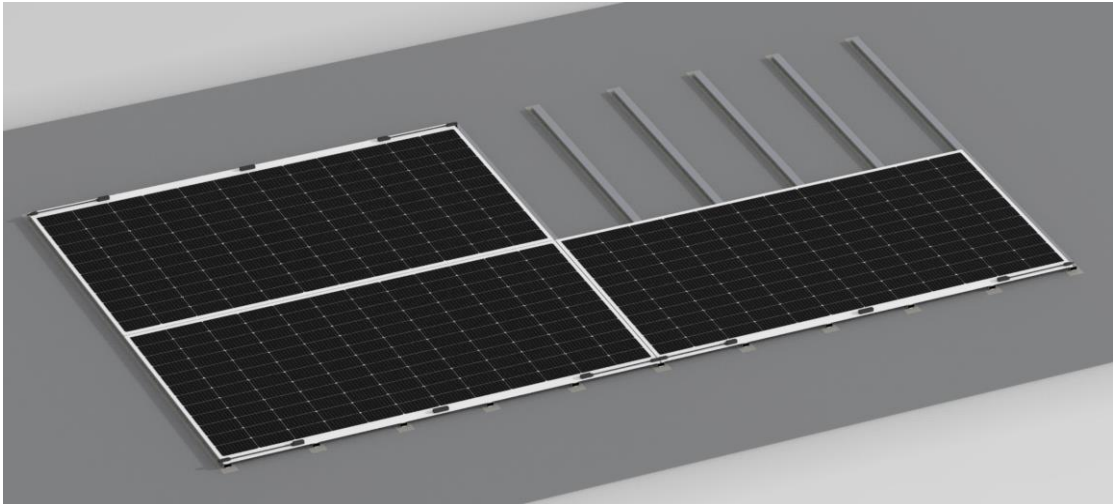
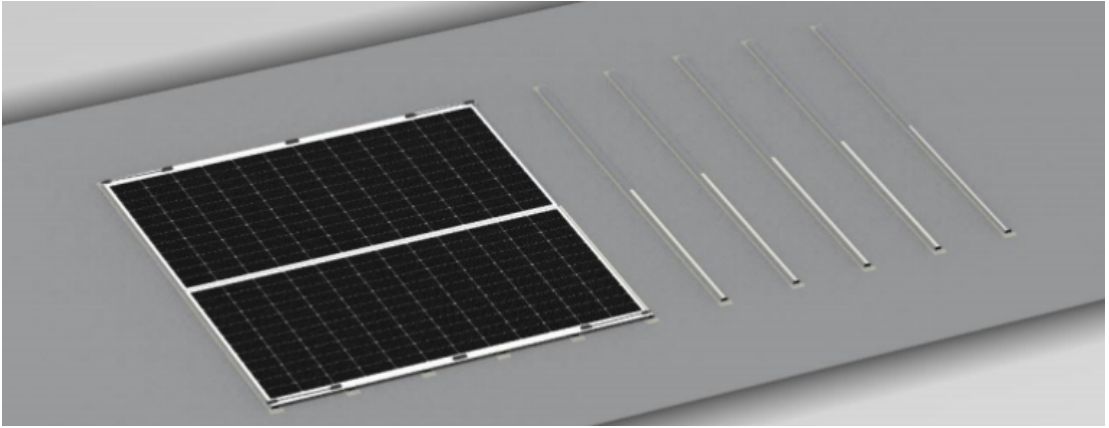


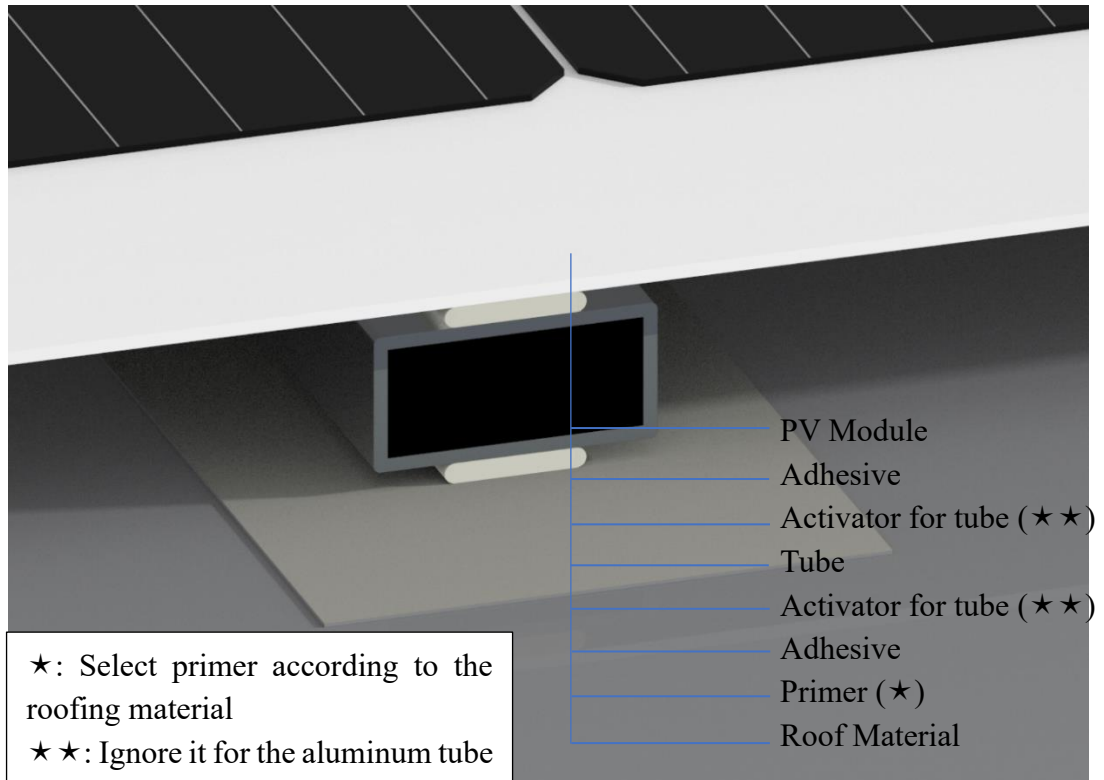
The following diagram shows FDS520-72M10. Following this procedure, FDS400-54M10 can also be constructed in the same way.

- Once modules are placed, avoid hand-pressing the cell-area to facilitate adhesion.
- The minimum distance between the modules is 20mm, and the distance between each array is min.400mm, which is used as a construction maintenance walkway. (This spacing is for reference only)
- Place the junction box on the maintenance walkway side for easy string wiring and maintenance inspection.



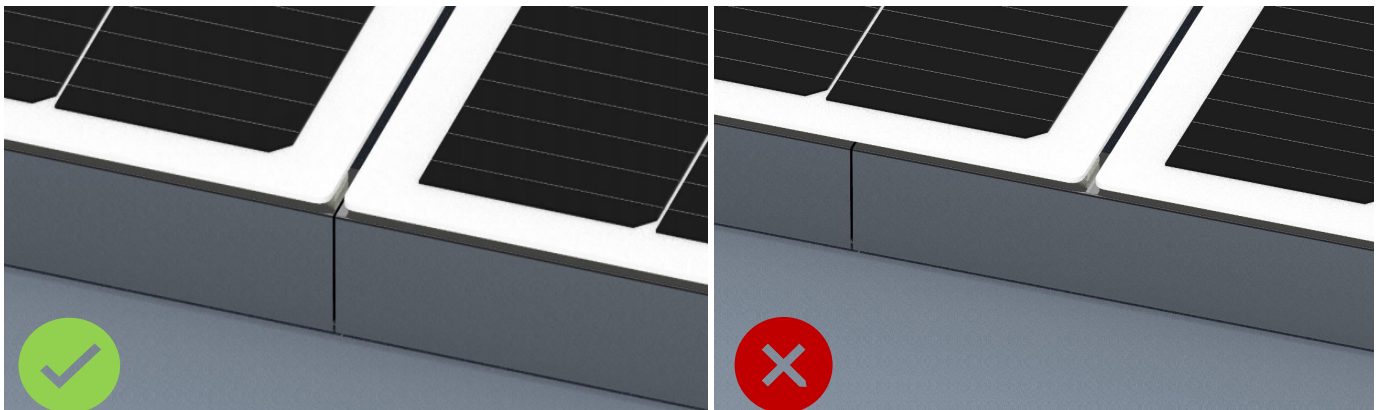






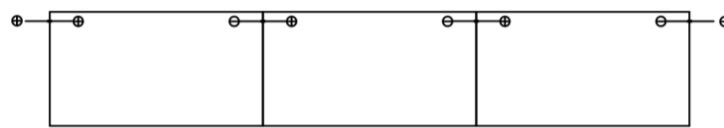
4.6.8 Joint of tubes

- If there are joints in the aluminum tube or PVC tube, they should be positioned between modules. Single module must not overlap the joints of the aluminum tube or PVC tube.

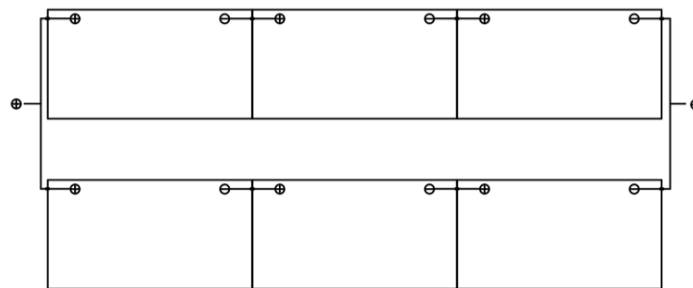


5.0 Wiring and testing

- The use of PV modules with different electrical characteristics in a PV system is prohibited.
- Excessive cables must be organized or fixed in the proper location, do not cover the cell area.
- For applications requiring high operating voltages, several PV modules may be connected in series to form a PV string, then the system voltage is equal to the sum of the voltages of each PV module
- For applications requiring high operating currents, several strings of PV modules can be connected in parallel to form a PV string, then the system current is equal to the sum of the currents of each PV module string.



Series connection



Parallel connection

- The maximum number of PV modules in series depends on the system design, the type of inverter used and the environmental conditions.
- Depending on the maximum series fuse rating of the PV module and local electrical installation codes, if the PV module does not have any fuses or blocking diodes, make sure to connect no more than two strings in parallel.
- There is no limit to the number of PV modules that can be connected in parallel (fuses per string should be considered), the number of PV modules is determined by system design parameters such as current or power output.
- Please refer to local regulations to determine the size, type and temperature of the system conductors.
- PV modules are equipped with connectors for system electrical connections, please refer to local regulations and data sheets that allow the use of connectors.
- To ensure a reliable electrical connection and to prevent possible moisture ingress, connectors must fit and lock together until a click is heard.

6.0 Maintenance

To ensure optimal performance of modules and maximize system power generation, the following maintenance measures are recommended:

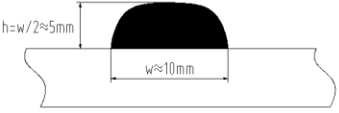







1. Module appearance inspection, focusing on the following points:
 - a) Whether the module is damaged.
 - b) Whether there is a sharp object touching the surface of the module.
 - c) Whether the modules are obstructed by obstacles and objects, avoiding new trees, new poles etc. to shielding the modules.
 - d) Check for corrosion near the busbar. This kind of corrosion is caused by the damage of the module surface during transportation, which causes moisture to penetrate into the interior of the module.
2. Clean the modules. The accumulation of dust or dirt on the surface of the modules will reduce the power output. It should be cleaned regularly to keep the surface clean. Generally, it should be cleaned at least once a month, appropriately increase the frequency in the harsh natural environment. Pay attention when cleaning PV modules:
 - a) Rinse with water first, then dry the water with a soft cloth. Do not use corrosive solvents to clean or wipe the PV modules with hard objects.
 - b) The PV module should be cleaned at an irradiance of less than 200 W/m^2 . It should be cleaned in the absence of sunlight or in the morning and evening.
 - c) It is strictly forbidden to clean PV modules under meteorological conditions where the wind is greater than grade 4, heavy rain or heavy snow.

Note: Do not walk, stand or sit on the module when cleaning.

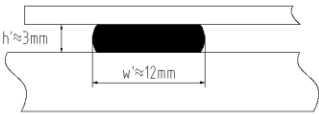




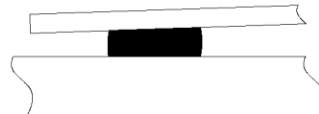


3. Connector and cable inspection. It is recommended to conduct a preventive inspection every six months:
 - a) Check for signs of aging of PV modules, including possible rodent damage, weathering, and whether all connectors are tightly connected or corroded.

7. Structural adhesive form

Please see below for proper bead application

	
 Correct dimension	 Too flat
	
 Too high, too small	 Poor wetting

The correct form of structural adhesive after pasting modules

	
 Correct dimension	 Too flat
	
 Too high	 Inclined

(The specification is subject to the information of the glue manufacturer)

Module stacking and handling operations are as follows:

