Haier flat panel solar collector
Installation manual

Model： PGT2.0-2

Prepared by： Qingdao economic and technology development zone Haier water heater company

Prepared date： 2009.02.18

CONTENTS

Instruction manual for collector installation

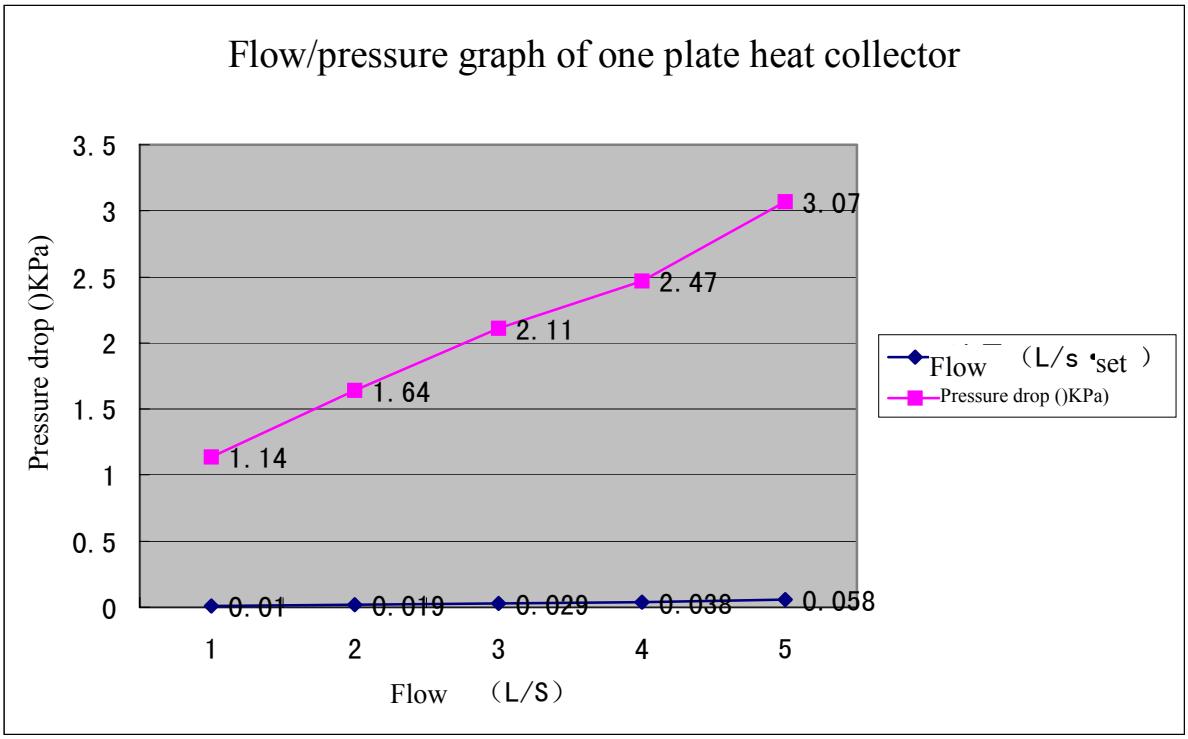
I. Introduction of the plate collector

1. Technical parameters of the plate collector

Model	Light receiving area (m^2)	Exterior size (mm)	Net weight (kg)	Gross weight (kg)
PGT2.0-2	1.9	2000*1020*84	40	43

Maximum loadability of the plate collector: without being damaged by the test pressure of 1.2MPa and the working pressure is 0.15～0.2MPa.

2. Pressure drop graph of one collector



The four major factors that impact the pressure drop of the collector are as following:

- The quantity of the liquid flowing through the collector：When the diameter and the coarseness of the draining pipe and collecting pipe for the collector is fixed, the pressure drop increases along with the quantity increase of the liquid flowing through the collector.
- The diameter of the draining pipe and collecting pipe for the collector：When the coarseness of the inner wall of the pipe and the liquid quantity is fixed, the pressure drop increases along with the decrease of the diameter.
- The coarseness of the inner wall of the draining pipe and collecting pipe for the collector: When the liquid quantity and pipe diameter is fixed, the pressure drop increases along with the increase of the coarseness of the pipe ’ s inner wall.
- The liquid viscosity: when other conditions are the same, the pressure drop increases along with the viscosity increase of the liquid flowing in through the collector.

3. The angle for mounting the collector

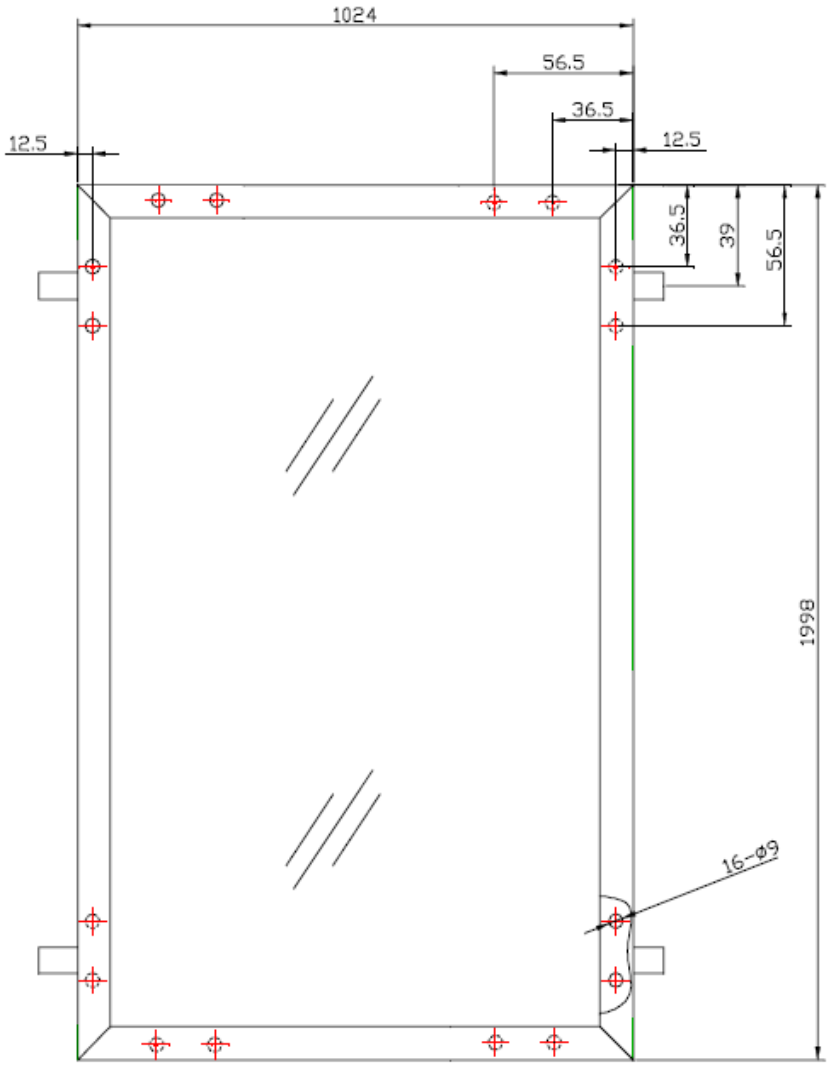
How to select the tilt angle α for mounting the collector:

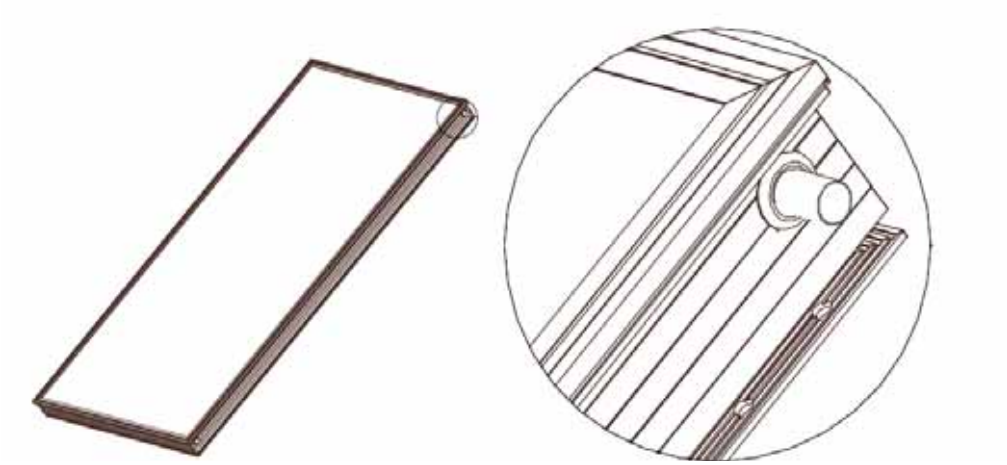
- When the solar system is applicable in four seasons: α=β
- When the solar system is used mainly in summer: α=β-10°
- When the solar system is used mainly in winter: α=β+10°

Note: α——Title angle for mounting the collector；

β——Geographical latitude of the area for mounting the collector;

4. For the detailed sizes for mounting the plate collector, see the figure below（in: mm）:





The 16 holes (φ9) above are prepared for fixing the collector.

II. The introduction of the relevant heat conducting media of the plate heat collecting system

It is the twice (secondary) circulation system that must be selected for the area where icing is possible. The antifreeze shall be used in the heat conducting medium and propylene glycol is recommended to be used as the antifreeze (It is forbidden to use the once (primary) circulation system in the area where icing is possible);

The secondary circulation system is recommended for the area where icing is impossible in any season and the antifreeze could be used as the heat conducting medium. Pure water is recommended to conduct thermal energy. The primary circulation system is not recommended;

The primary circulation system is not recommended to be used by the plate collector in any case; if it is inevitable to use the primary circulation system, the problem with the scaling in of the copper pipe must be solved;

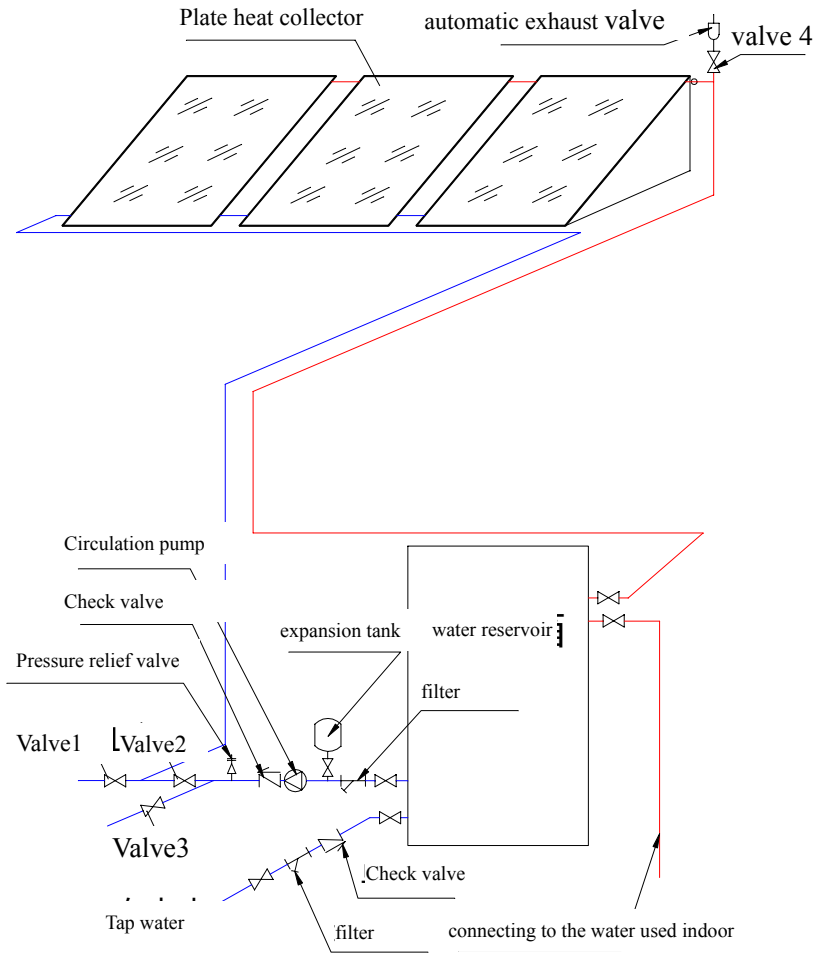
The table below contains the valves of the freeze points of the propylene glycol antifreezes which concentrations are different. The concentration of the propylene glycol antifreeze to be filled in depends on the lowest temperature of the application area. (It is for your reference only) .

Concentration (volume percent)	5	10	15	20	25	30	35	40	45	50	55	59
Freezing point ℃	-1.7	-3.3	-5.3	-7.2	-9.7	-12.8	-16.4	-20.9	-26.1	-32	-39.7	-50

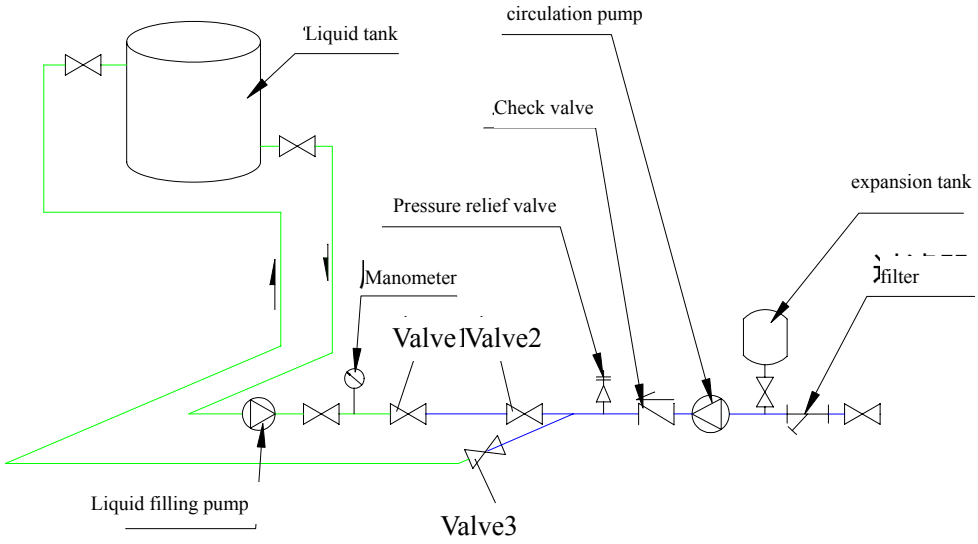
The processes for filling liquid:

1. Inspect the pipes which have been connected to make sure that the check valve, gate valve, filter and circulation pump are connected correctly, and that the pipes and connectors have been tightened while the pipes have been fixed firmly (for the pipe connection, see the figure below);

2. Pressurization test（Pressurizing with water）:



(Principle schematic drawing of the heat collecting system)



(Schematic drawing for the liquid filling components)

Open the automatic exhaust valve first and close the valve at the inlet of the expansion tank. Connect the outlet of the liquid filling pump to valve 1 and ensure that the water flows in the same directions for mounting check valve. Connect the suction nozzle of the pump and water-return pipe to the liquid filling tank. Close valve 2 and open the valve below the highest automatic exhaust valve on the array of the collector. Allow the liquid filling pump to fill water into the system. Observe the water flowing back and close the water return valve 3 (marking it) when you find that the returned water is clean and flows evenly, and there are no more bubbles. Pressurize it at the pressure which is 1.5 times the pressure for opening the relief valve. Observe the connection points carefully to find out if there is any leakage or oozing. It passes the test when there is no leakage or oozing, and the pressure drop is less than 0.02MPa in 10 minutes.

Attention:

a. The test pressure is 1.5 times of the pressure for opening the relief valve;

b. Notice the relative positions of the relief valve and manometer.

3. Pipe cleaning:

Pipes shall be cleaned before and after testing the pressure of the system by flushing them and cleaning the filter. Then drain the liquid from the pipe so as to fill antifreeze; if the liquid is not drained up from the system, you can blow the liquid out with a blower; blow it until it is dried up.

4. Antifreeze filling:

The process for filling antifreeze is same as the above. The different work is that the valve connecting to the expansion tank must be opened before filling the antifreeze; it should also be noticed that the pressure for filling the liquid must be consistent to pre-filling pressure of the expansion tank, 0.15MPa to 0.2MPa in general;

5. Close valve 4 below the automatic exhaust valve when antifreeze is fully filled to prevent the medium vaporizing when the system operates;

Requirements on maintenance and notices:

1. If it will stay idle for long time, cover the plate collector with a nontransparent object and disconnect it from the power supply to prevent overheating of the collector.

2. Check the system regularly to find out if it operates properly; check the manometer to look at if the pressure valve on it is normal; if the pressure value is under standard, check if there is any leakage on the pipes; if not, antifreeze shall be refilled into the system.

3. If the system needs the antifreeze to be replaced, it shall be emptied first. The liquids in the pipes shall be drained up so as to fill antifreeze into it. If liquid cannot be drained up from the system, dry it by blowing the system with a blower; don't stop blowing until the system is completely dry（Attention, the replacement should be assisted by the local after-service providers）.

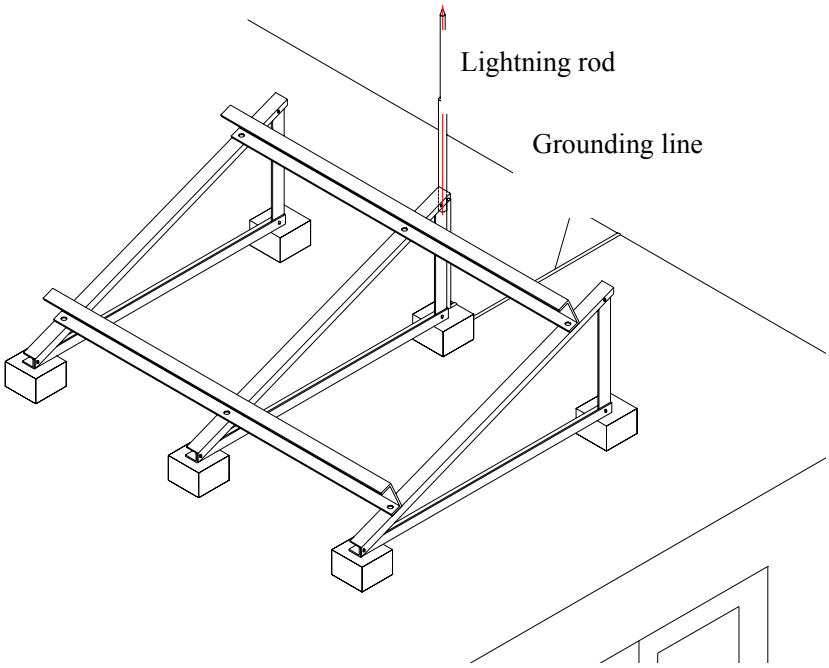
4. Check the low temperature resistibility of the antifreeze regularly（For the detailed interval, consult the local antifreeze supplier）.

5. Pull the lever of the relief valve monthly to flush the valve seat and valve clack; keep dirt and scaling off its sealing surface since they would cause leakage or Open/Close failing. Check if the valve can be opened or closed normally.

III. Introduction of the lightning arrestor

Since collectors are mounted on roofs, they are vulnerable to lightning strikes. Therefore, they shall be mounted in the area which is well protected against lightning. If there isn't any lightning arrestor, to protect the plate collector, a lightning rod or grounding line is required. The following is a simple drawing for mounting the lightning rod on a flat or sloped roof:

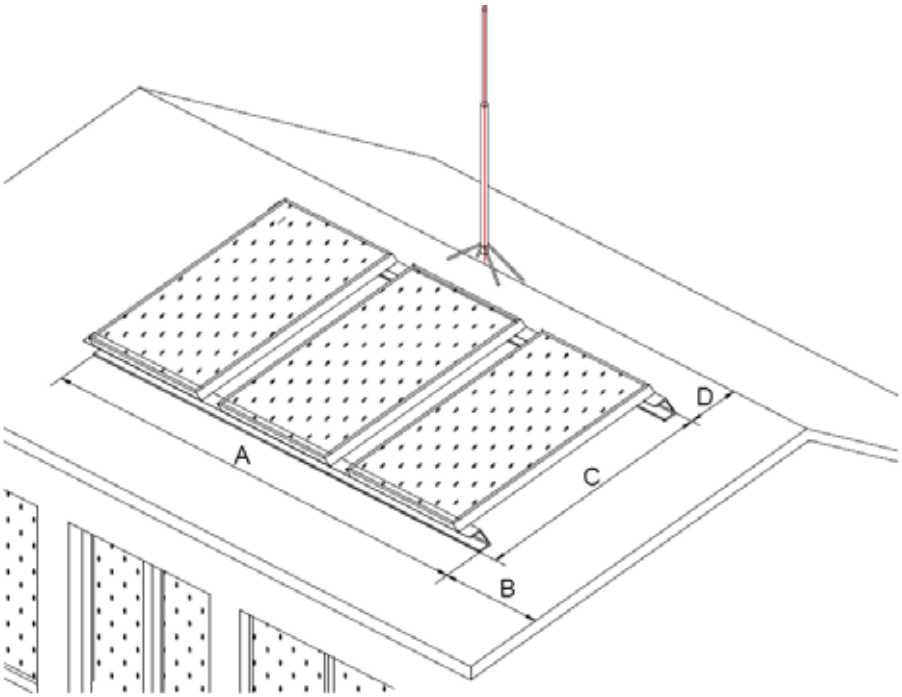
- The drawing for mounting the lightning rod on a flat roof:



The lightning rod can be welded onto a frame, or an independent lightning rod can be manufactured and it can be fixed with a wire rope.

- The drawing for mounting the lightning rod on sloped roof:

Making an independent lightning rod is recommended; it can be fixed with a wire rope and the equipotential bonding shall be applied between it, the frame and the lightning belt.



Notes:

1. If the building has a lightning arrestor, it shall be made sure by the local professional if the collector is well protected by the lightning arrestor.
2. If the collector can be protected, the frame mounted on-site shall be connected to the existing lightning belt with equipotential bonding. For the connection material, connection and anti-corrosion method, the local specifications about the lightning system designing shall be followed.
3. If the collector cannot be protected, making a lightning rod is required; it shall be the relevant professionals that decide how to select the materials, decides its height and how to fix it; the lightning rod and its frame mounted on-site shall be connected to the existing lightning belt with equipotential bonding. For the connection material, connection and anti-corrosion method, the local specifications about the lightning system designing shall be followed.

IV. How to mount and fix the plate collector

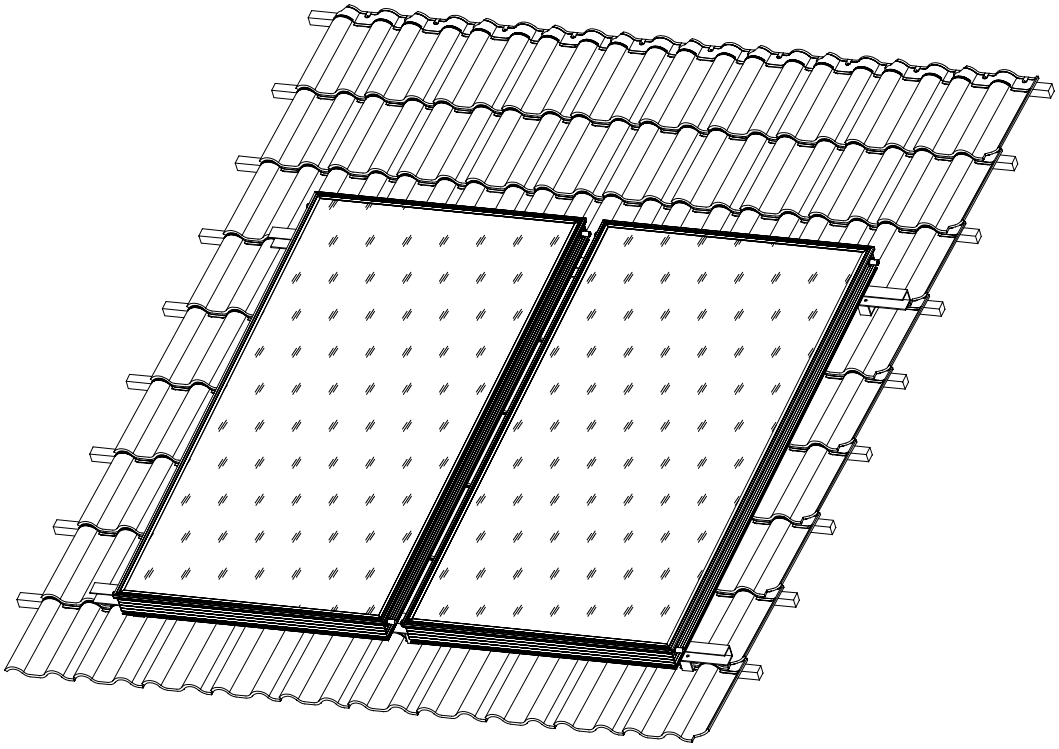
Different ways to mount and fix the plate collector:

- How to mount it on a sloped roof;
- How to mount it on a flat roof;
- How to mount it on a wall;

(I) There are two ways to mount the collector on a sloped roof, depending on the roof style:

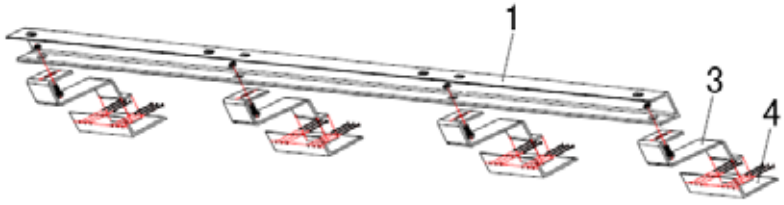
- How to mount it on a tile roof:
- How to mount it on a color steel roof:

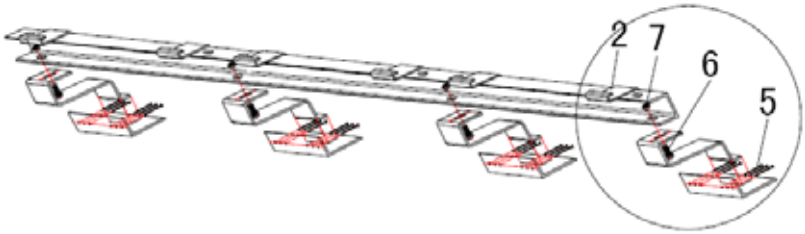
1. How to mount it on a tile roof:

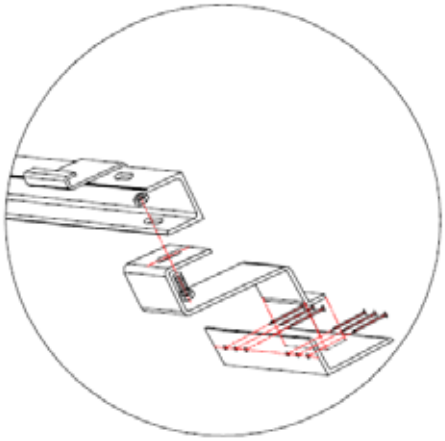


（1） How to assemble the fittings of the plate collector

① How to connect and fix it with batten


1
3
4


2
7
6
5



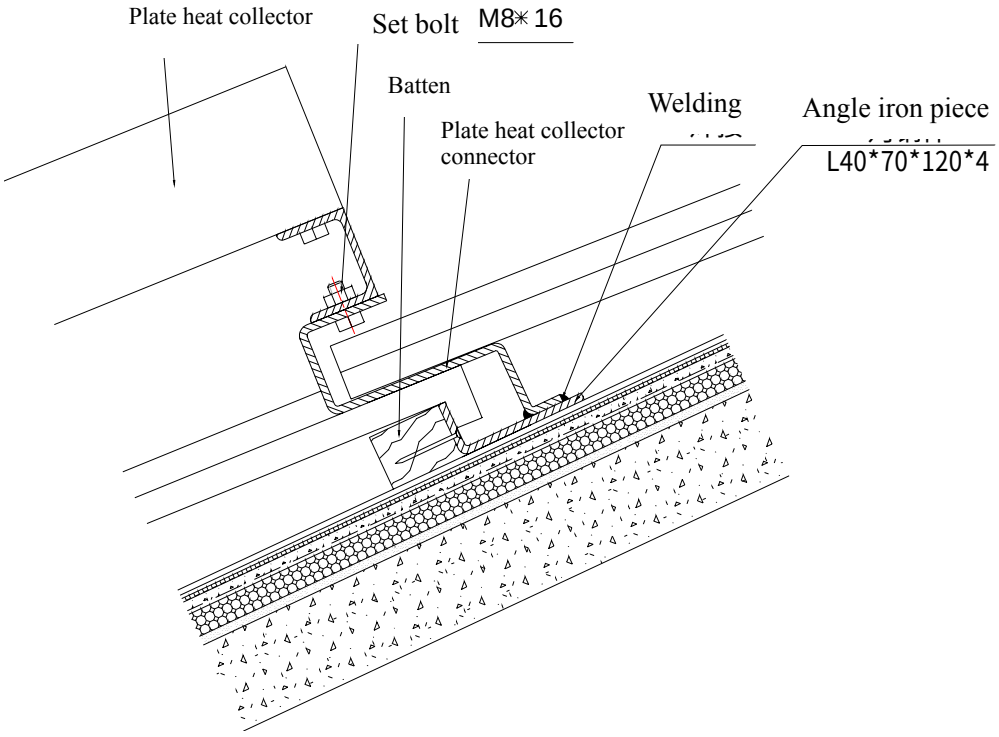


Plate heat collector
Set bolt M8*16
Batten
Plate heat collector connector
Welding
Angle iron piece
L40*70*120*4

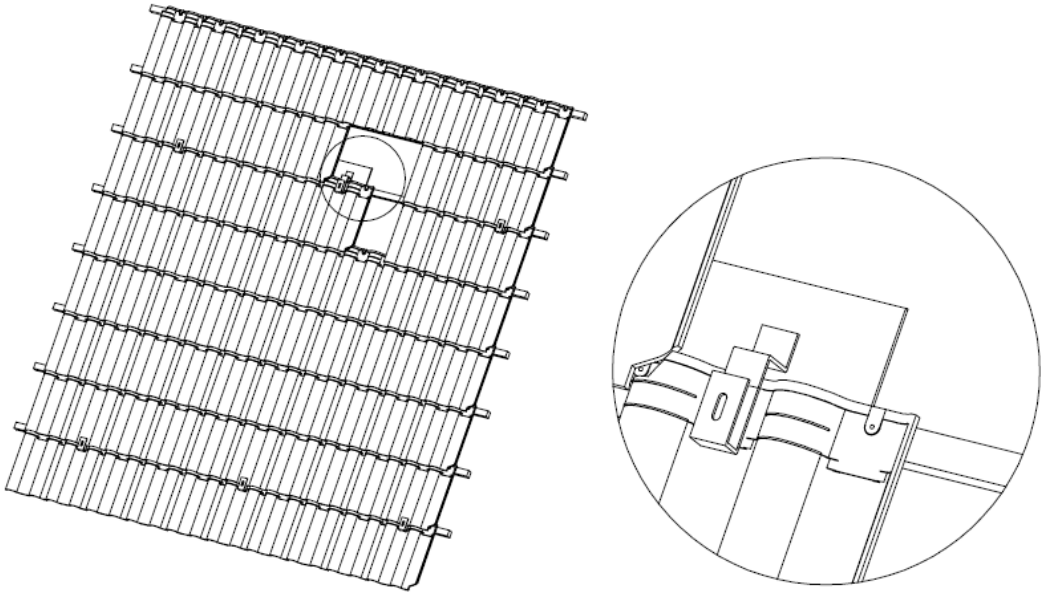
1:Channel steel 2:Collector fixing hook 3:Collector connector （There is a wrong mark in the drawing） 4:Wood screw 5:Angle iron piece 6:Bolt 7:Nut

Step 1: Remove the tile from the place where the plate collector shall be mounted and fixed.

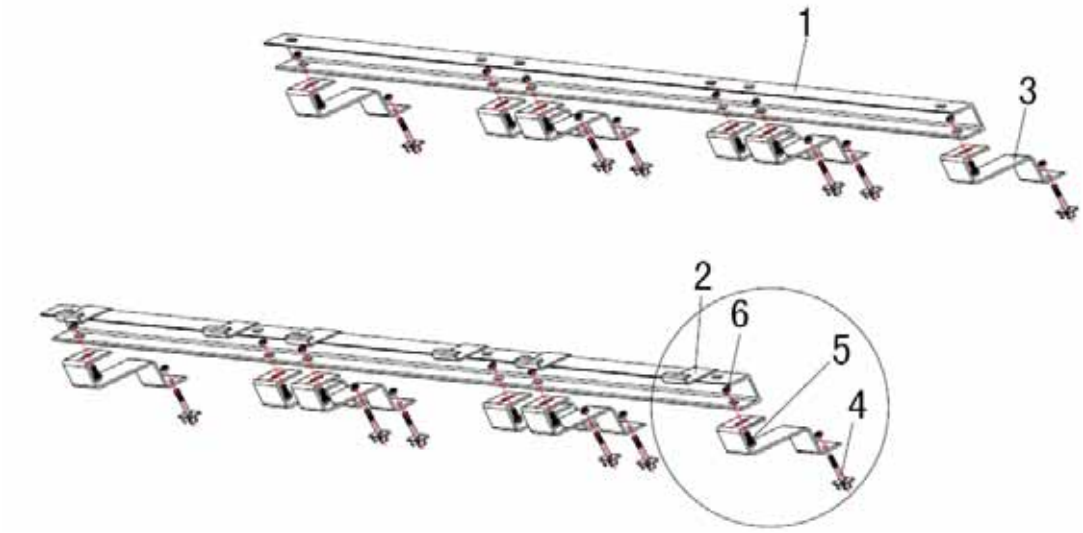
Step 2: Prepare angle iron pieces 5 (L40*70*120*4); fix them onto the roof beam with wood screw 4 after drilling its side wall;

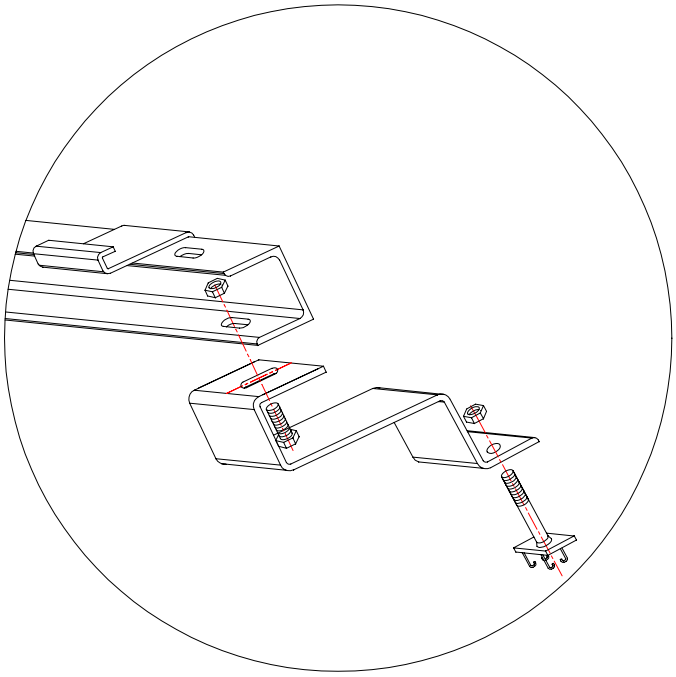
Step 3: Weld the bent collector connector 3 onto the angle iron piece 5 (they can be weld prior to mounting them);

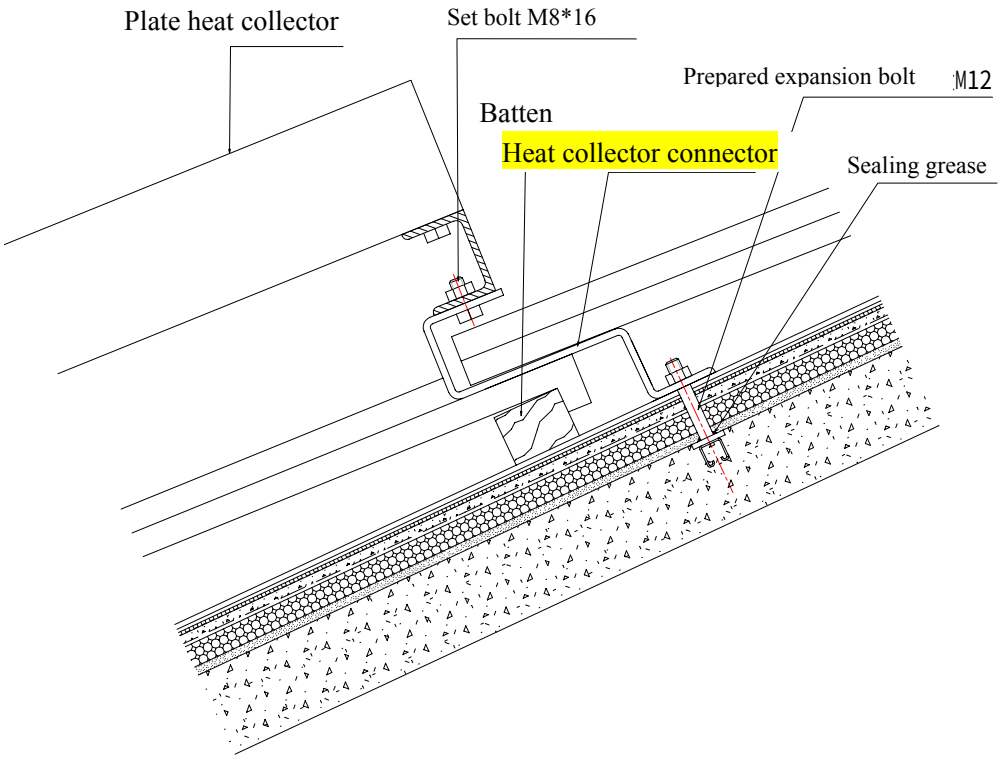
Step 4: Connect the drilled channel steel 1with collector connector 3 with bolt 6.



② How to connect and fix the prepared bolt





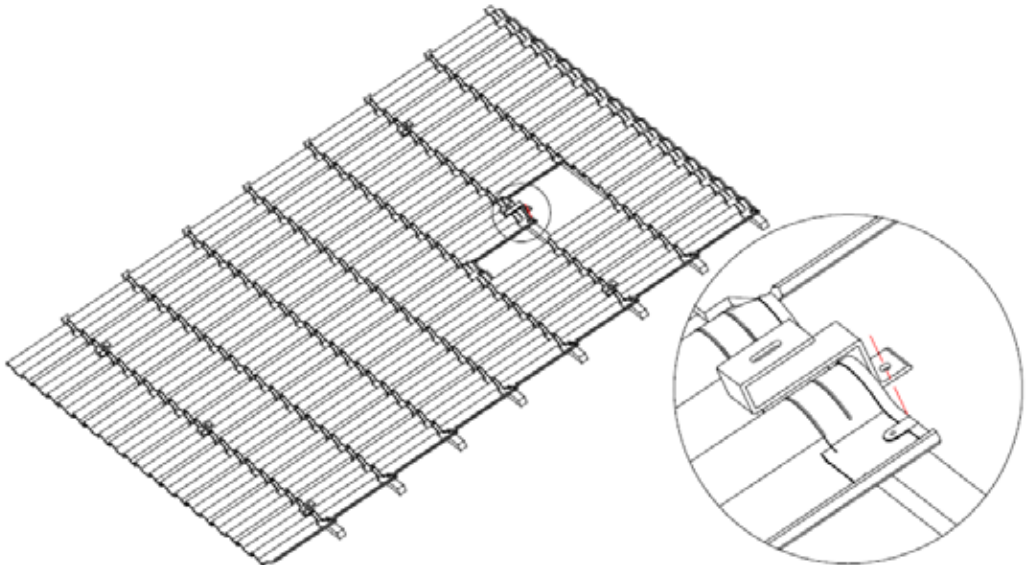


1:Channel steel 2:Collector fixing hook 3:Collector connector （There is a wrong mark in the drawing）
4:Prepared bolt 5:Bolt 6:Nut

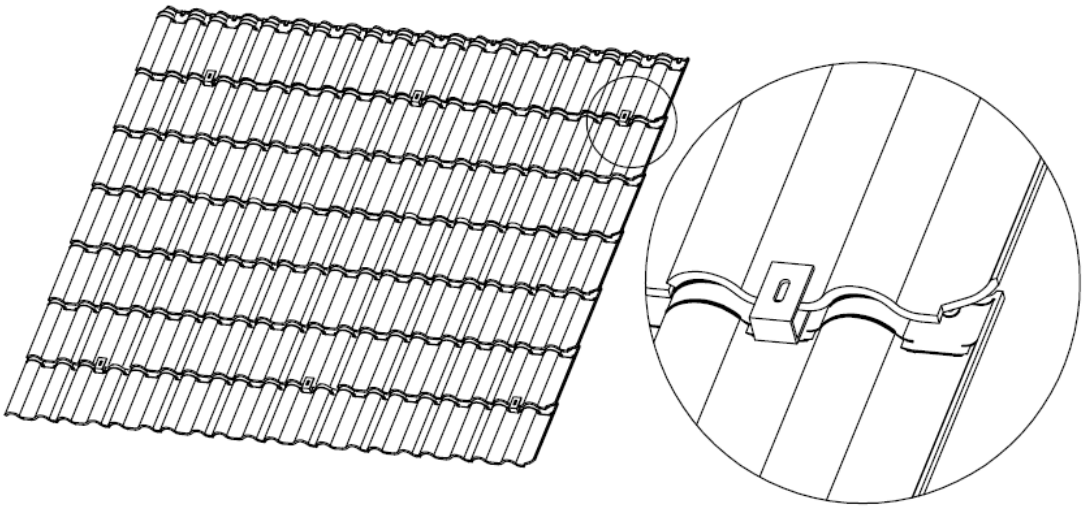
Step 1: Build M12 bolt 4 onto roof with concrete;

If bolt 4 is not built in on the roof in advance, the collector can be fixed with an expansion bolt during mounting, but waterproofing measures shall be taken.

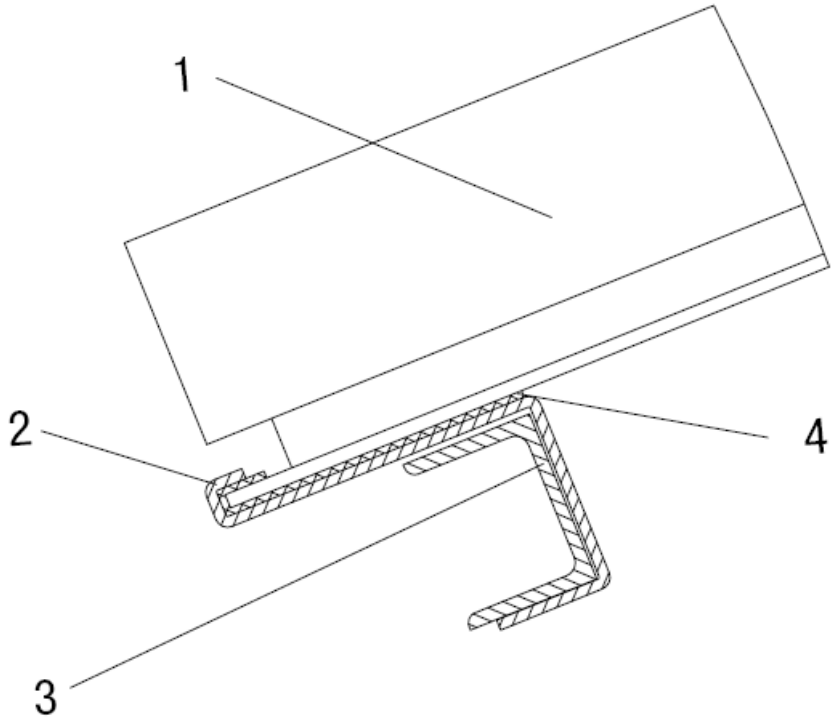
Step 2: Prepare the collector connector 3, drill holes on its bottom and fix it with bolt 4.
Step 3: Fix the drilled channel steel 1 and collector connector 3 with bolt 5.



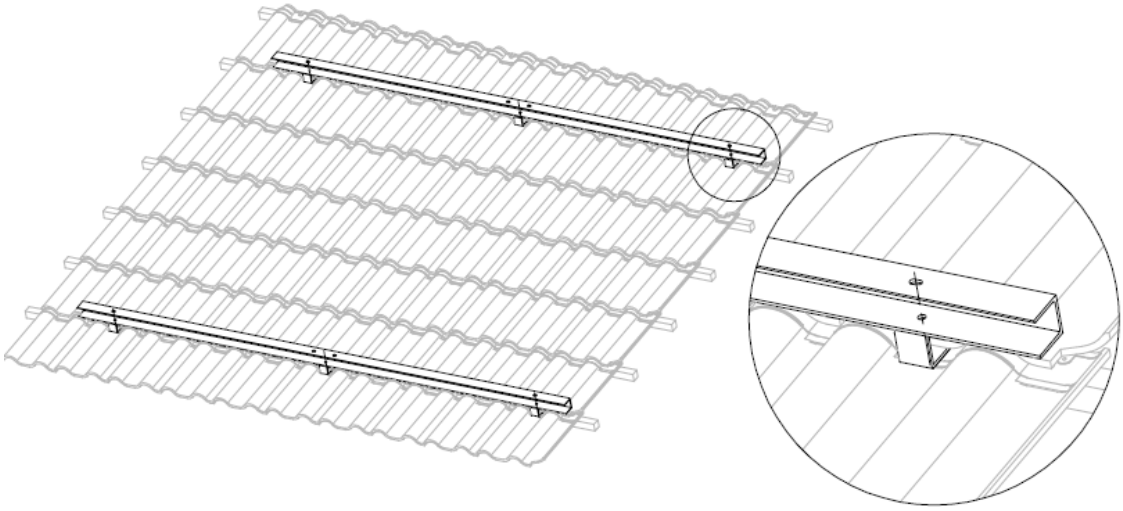
（2）Put tile back to its original place when the collector connector is assembled.

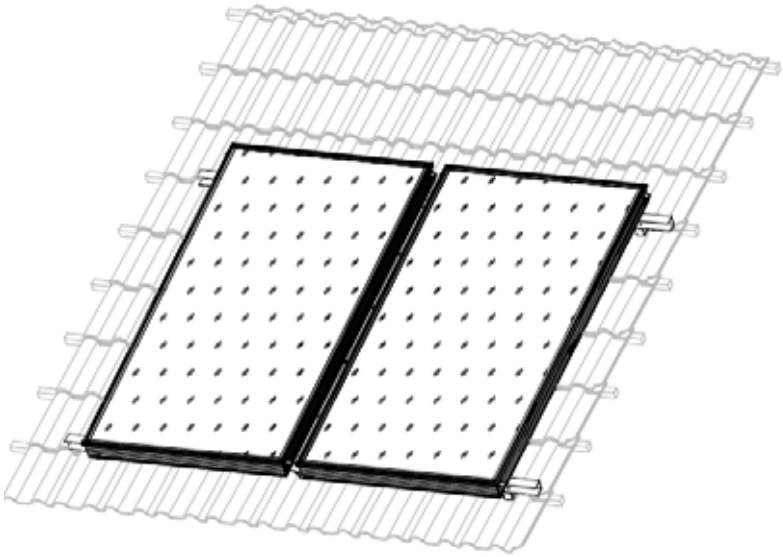


（3）Fix the channel steel with collector connector with bolt 5, mount the collector fixing hook 2 onto the lower channel steel, cushion them with rubber pad 4, mount plate collector 1 onto it, hook the lower edge of the plate collector 1, fix the upper edge with the fixing hole on the outer frame, and connect plate collector and the fixed channel steel with bolts.

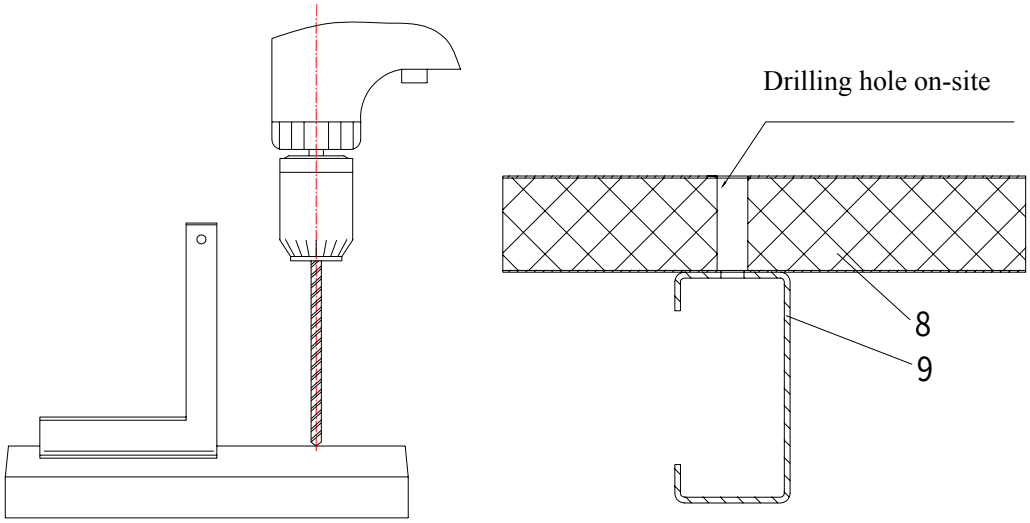


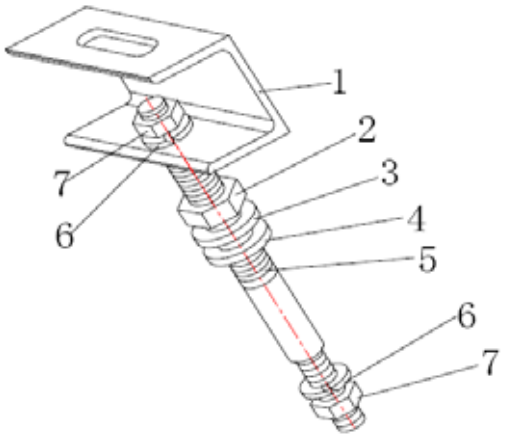
1:Plate collector 2:Collector fixing hook 3:Channel steel 4:Rubber pad

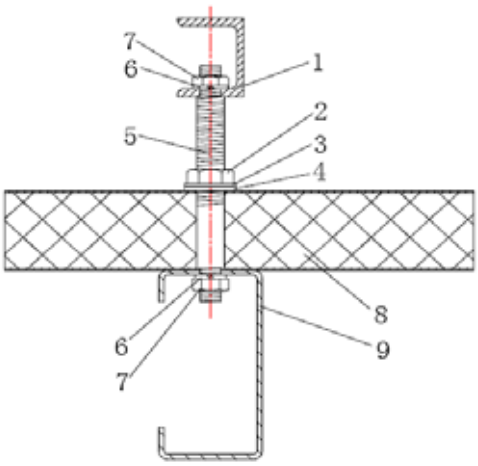




2. How to mount it onto color steel roof:




1
2
3
4
5
6
7
6
7

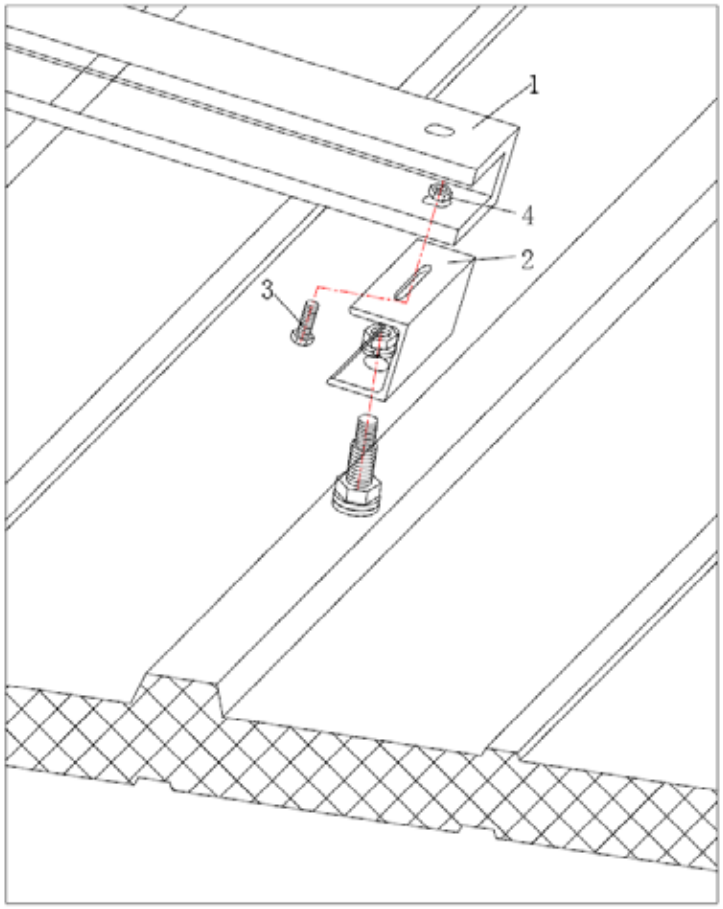

7
6
1
2
3
4
5
8
9
6
7

1:Channel steel connector 2:Nut 3：Gasket 4:Rubber gasket 5:Collector fixing Bolt
6:Spring shim 7:Nut 8:Color steel plate 9:C steel

Step 1:Drill holes on the color steel and C steel;

Step 2:Insert the collector fixing bolt into the holes drilled; assemble nut 7 and spring shim 6 in order and tighten them; assemble nut2, gasket 3 and rubber gasket 4 in sequence with the collector fixing bolt 5; as it is just for sealing, don't make them too tight;

Step 3:Fix the channel steel connector to the collector fixing bolt 5.



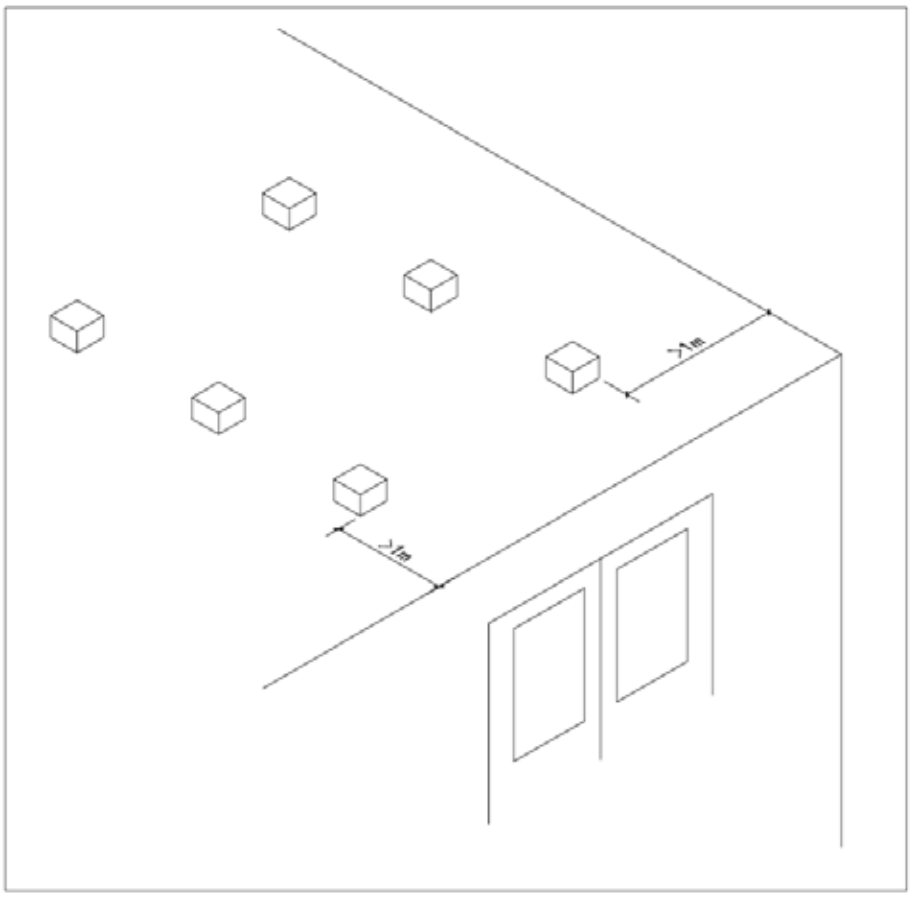
1:Channel steel 2:Collector fastener 3:Bolt 4:Nut

Step 4: Prepare the hole-drilled channel steel, fix the collector fastener 2 with channel steel 1 with bolt 3 and nut 4; screw them up.

Step 5: Fix the plate collector with the fixed channel steel with bolt through the fixing hole on the outer frame of the plate collector.

II. How to mount the collector on flat roof

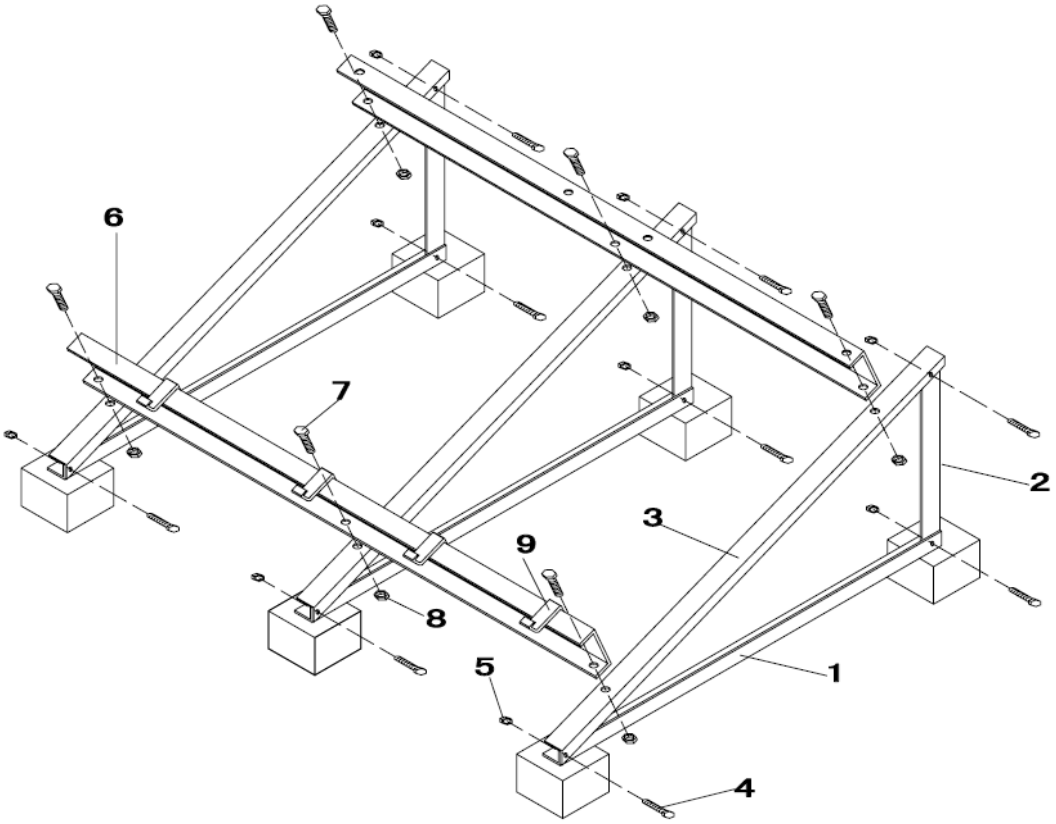
1. How to prefabricate the foundation of the collector



Select a proper foundation for the collector according to the actual roof condition, which may be a field casting concrete frusta or concrete brick. No matter which way is taken, the top of the foundation for the collector shall be leveled.

2. How to mount the support for the collector

（1）Mounting steps



1: Bottom rod of the support 2: Vertical rod of the support 3: Tilted rod of the support 4 and 7: Bolt 5 and 8: Nut 6: Channel steel 9:Collector fixing hook

Step 1: Fix angle iron 1 onto the concrete foundation with expansion bolt;

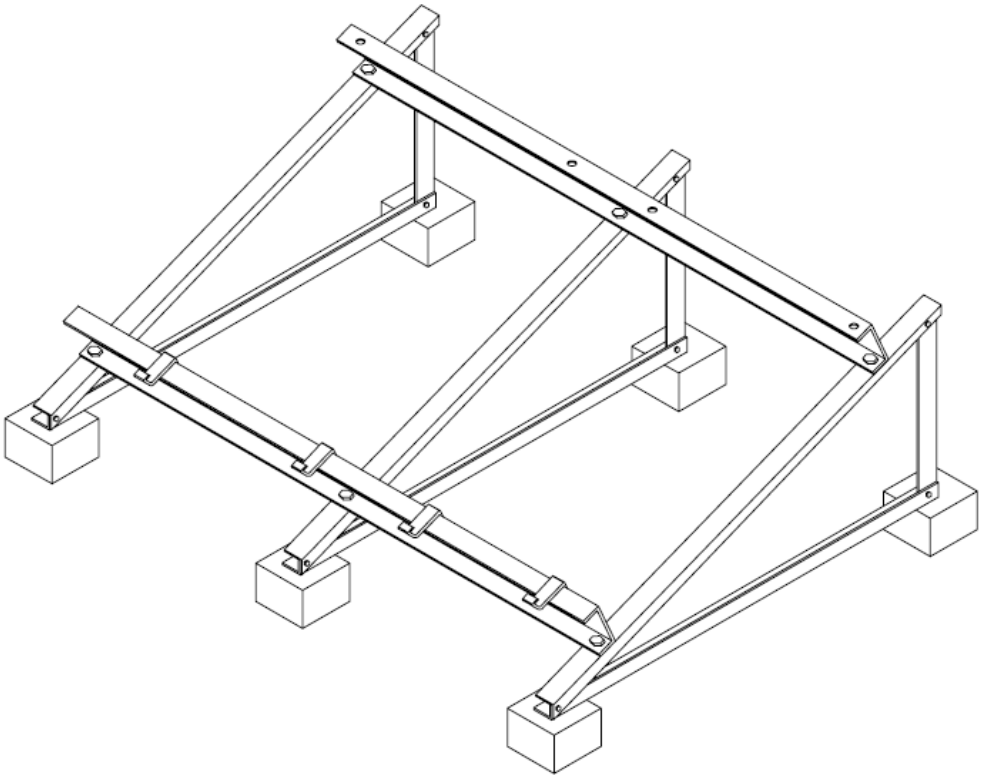
Step 2: Make angle iron 2 and 3 a triangle frame with bolt 4 and nut 5;

Step 3: Fix the channel steel 6 not the triangle frame assembled in step 2 with bolt 7 and nut 8;

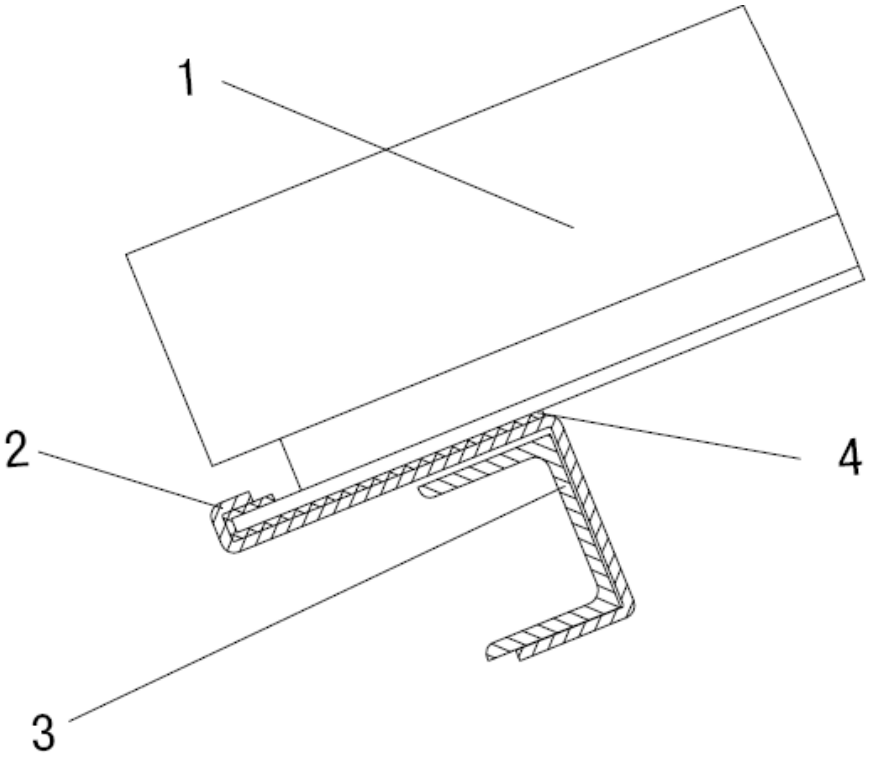
Step 4: Anti-corrosion treatment: When the support is finished, treat it with hot galvanizing or paint it to prevent corrosion. First remove rust, oil or dirt off the angle iron and channel steel, apply the antirust paint on it twice and apply finish paint twice.

Step 5: Mount the collector fixing hook 9 onto the lower channel steel and cushion them with a rubber pad.

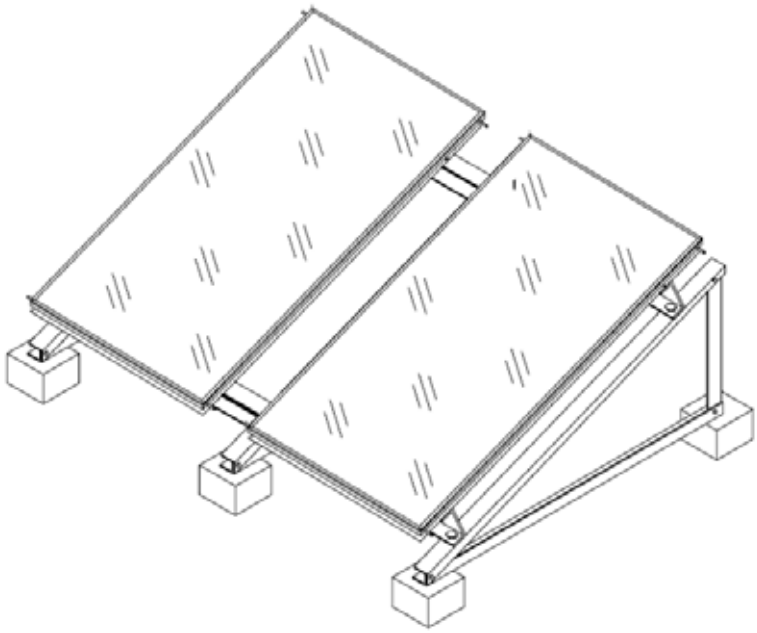
（2）Assembling the finished support



3. How to mount the plate collector

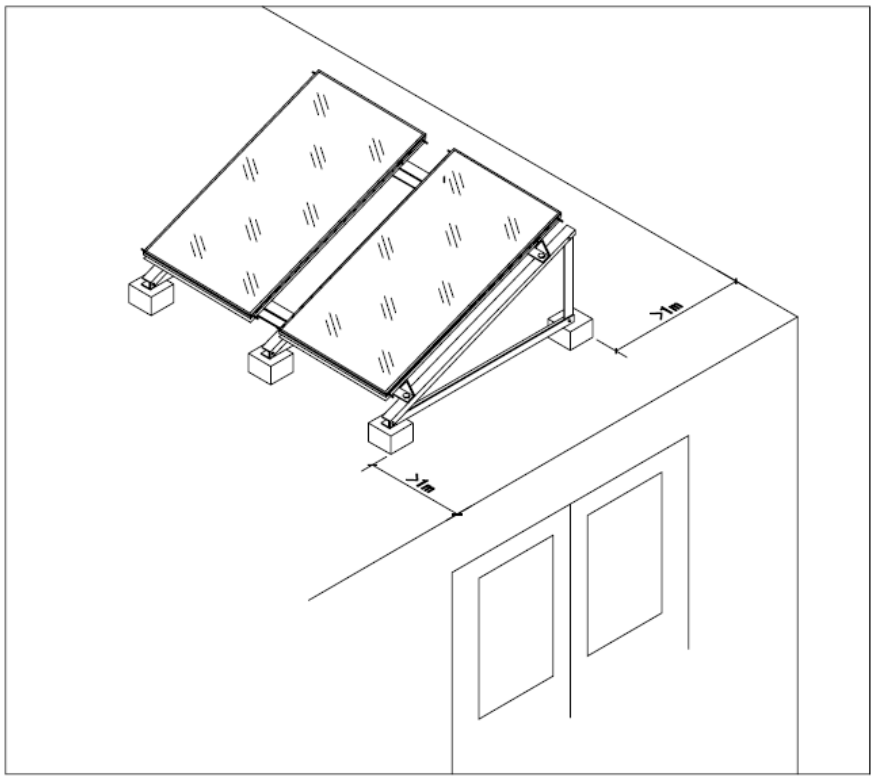


1: Plate collector 2:Collector fixing hook 3:Channel steel 4:Rubber pad



Step 1: Fix the collector onto the assembled support, clutch the lower edge of the collector with the collector fixing hook; the upper edge of the collector shall be fixed through the fixing hole on its outer frame. Connect the plate collector to the fixed channel steel with a bolt.
Step 2: Tighten all bolts.

4. Sample drawing for the mounted collector



III. How to mount the collector on an external wall

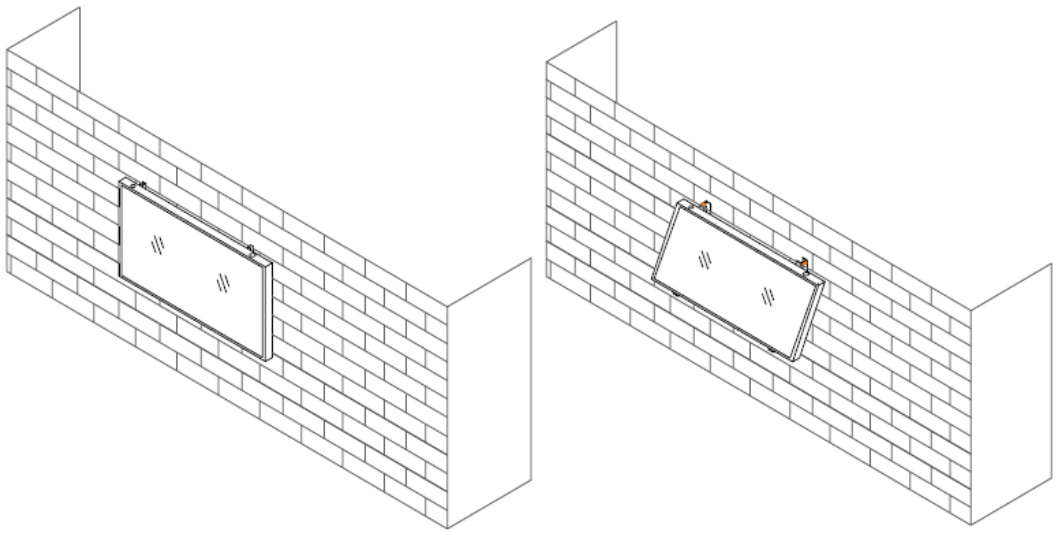
The requirement to the wall body for mounting the collector on external wall:

- The loadability of the external wall shall be 2 times the total mass of the collector loaded fully with water and there shouldn't be any deformation, crack or chip on the wall body. Its loadability shall be confirmed through tests. In addition to its loadability to the solar collector, the necessary technical measures shall be taken to treat the locations where the collector will be mounted, so as to prevent the disadvantages to the wall body, such as deforming or cracks, etc.
- The light-weight filled wall shall not be used as a structure to support the solar collector.
- The support of the collector mounted on the external wall shall be fixed onto the built-in connector in the wall firmly. A concrete structural column could be added at the place o the built-in connector if necessary, and it shall meet the requirement of anticorrosion.

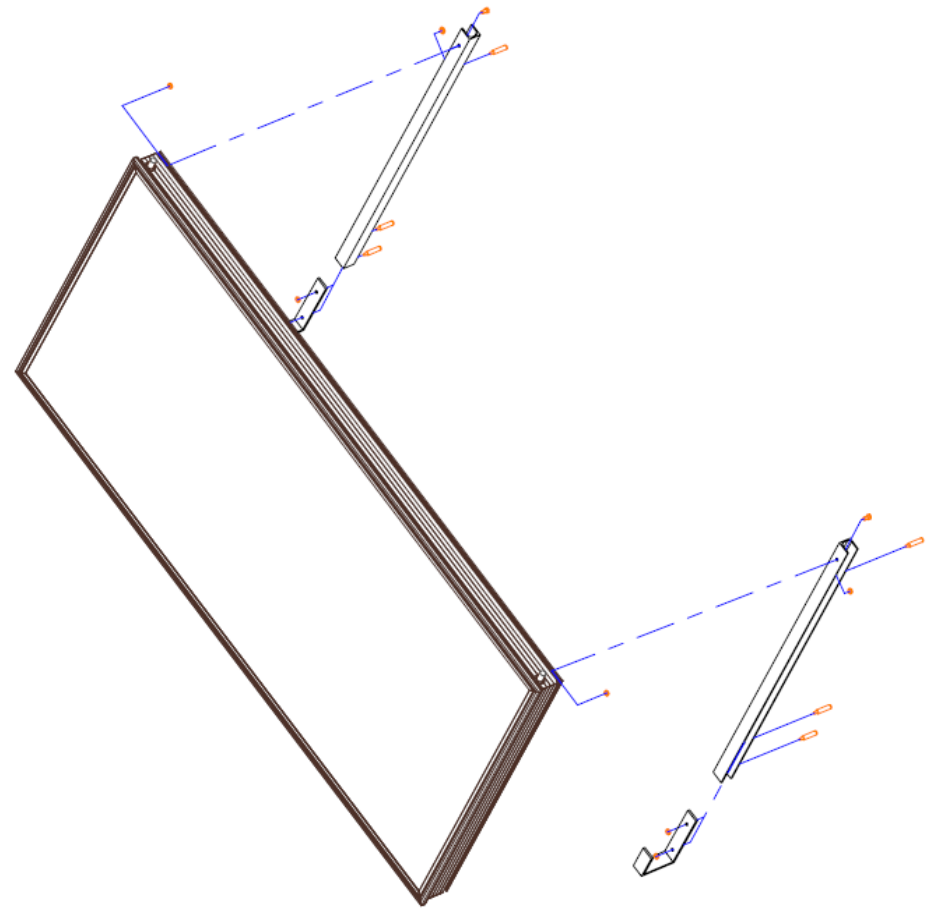
There are two ways for mounting the plate collector onto the external wall, depending on the angle between the plate collector and the external wall.

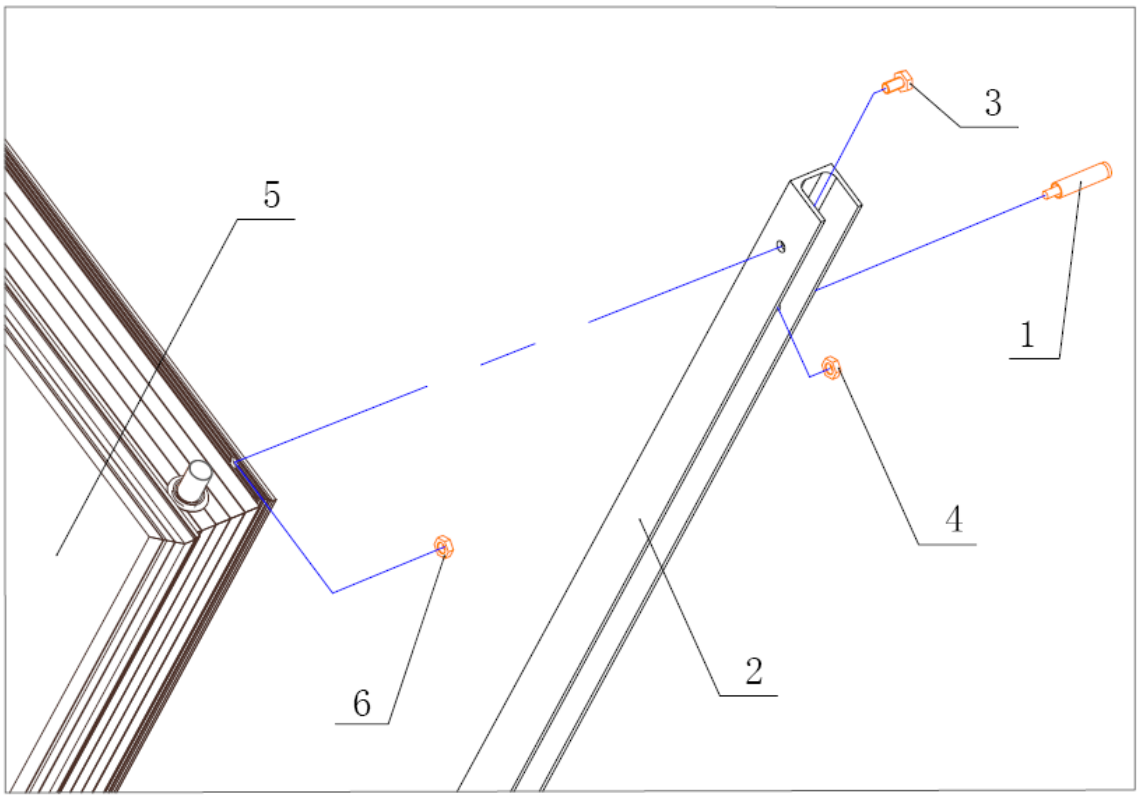
● Mount the plate collector onto the wall vertically;

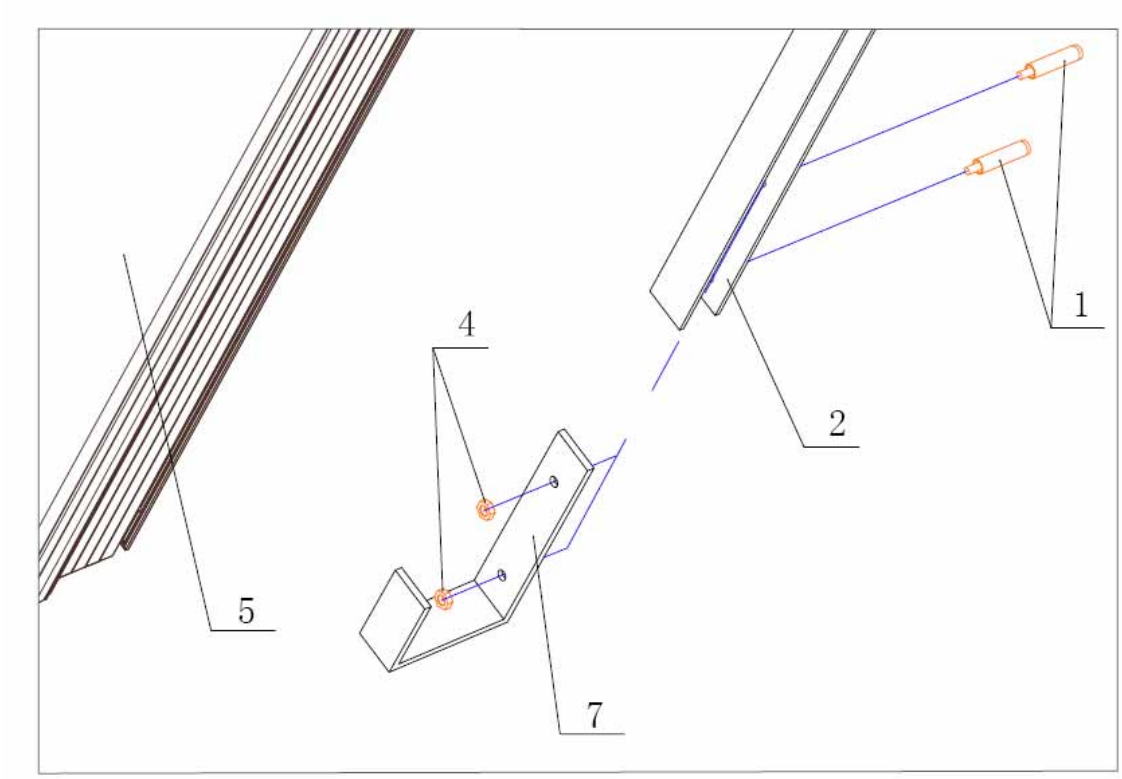
● Mount the plate collector onto the wall not vertically;



1. When the plate collector is mounted to the external wall vertically:




3
5
1
4
2
6

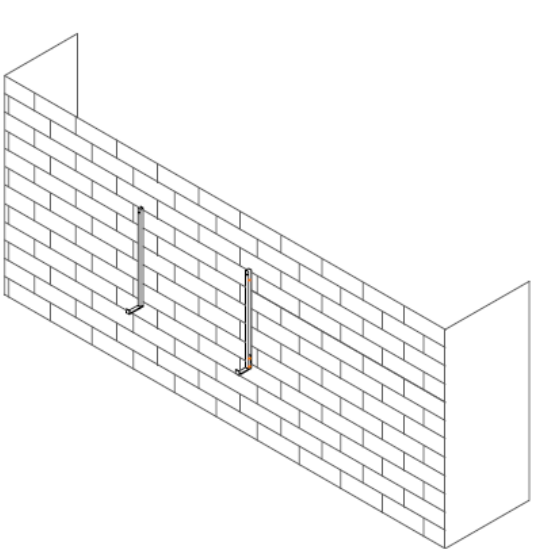


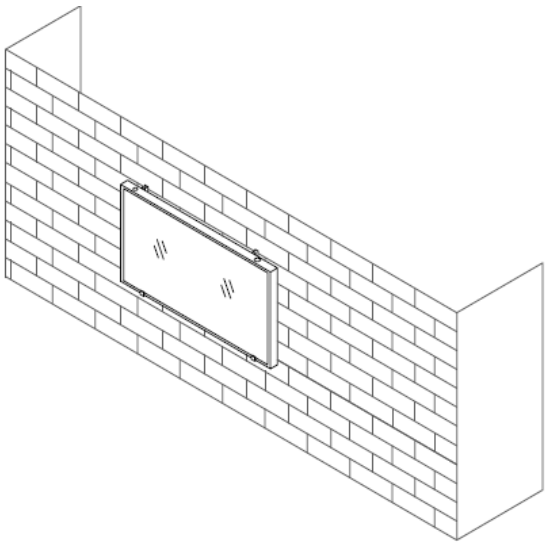
1: Expansion bolt 2: Channel steel 3: Bolt 4、6: Nut 5: Plate collector 7: Collector fixing hook

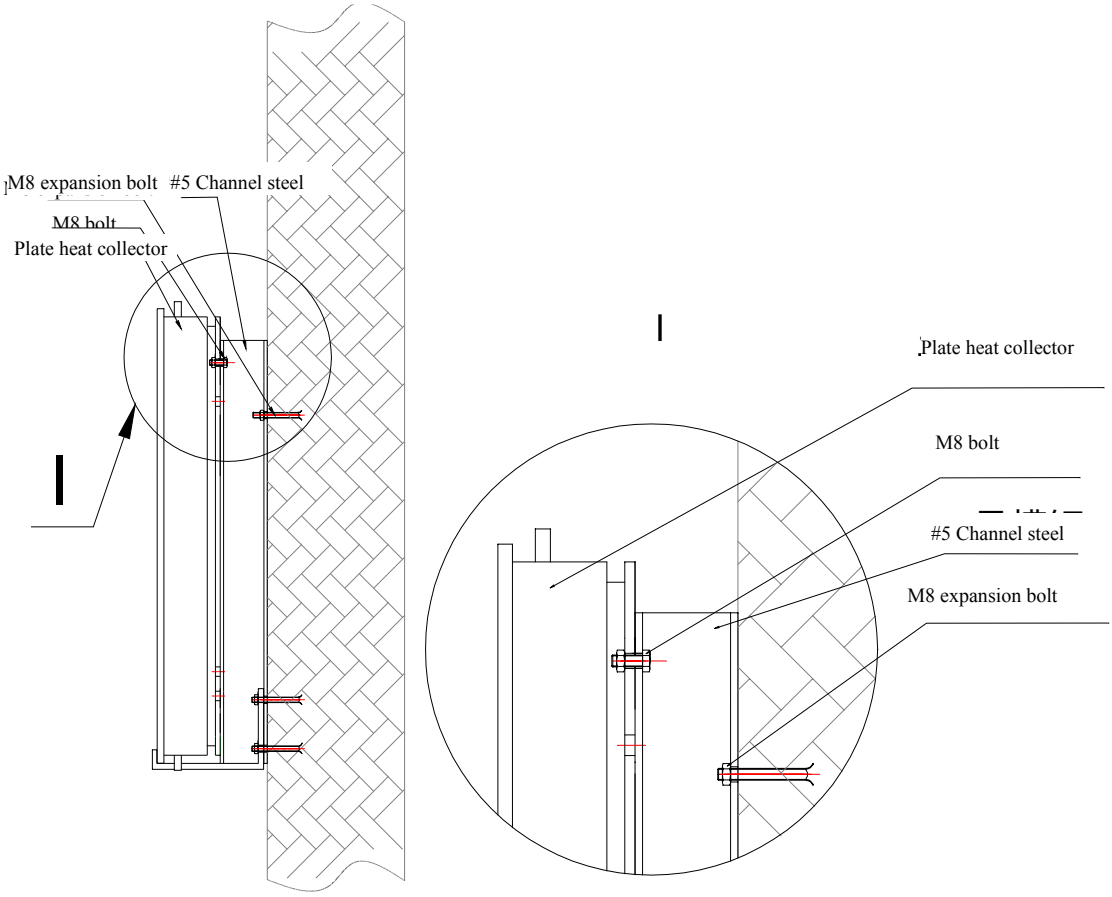
Step 1: Drill 3 holes on the external wall and insert the expansion bolt 1 into the holes;

Step 2: After drilling holes on the channel steel 2, fix the channel steel 2 and collector fixing hook 7 onto the external wall with expansion bolt 1 and nut 4.

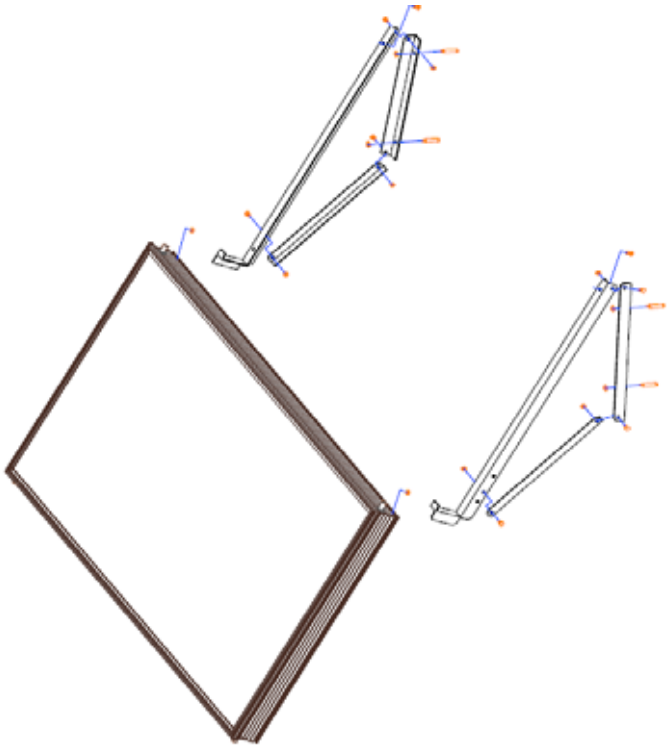
Step 3: Put the plate collector onto the collector fixing hook 7 and stabilize; Fix the plate collector 5 onto the channel steel 2 with bolt 3 and nut 6 through the fixing holes on the outer frame of the plate collector.

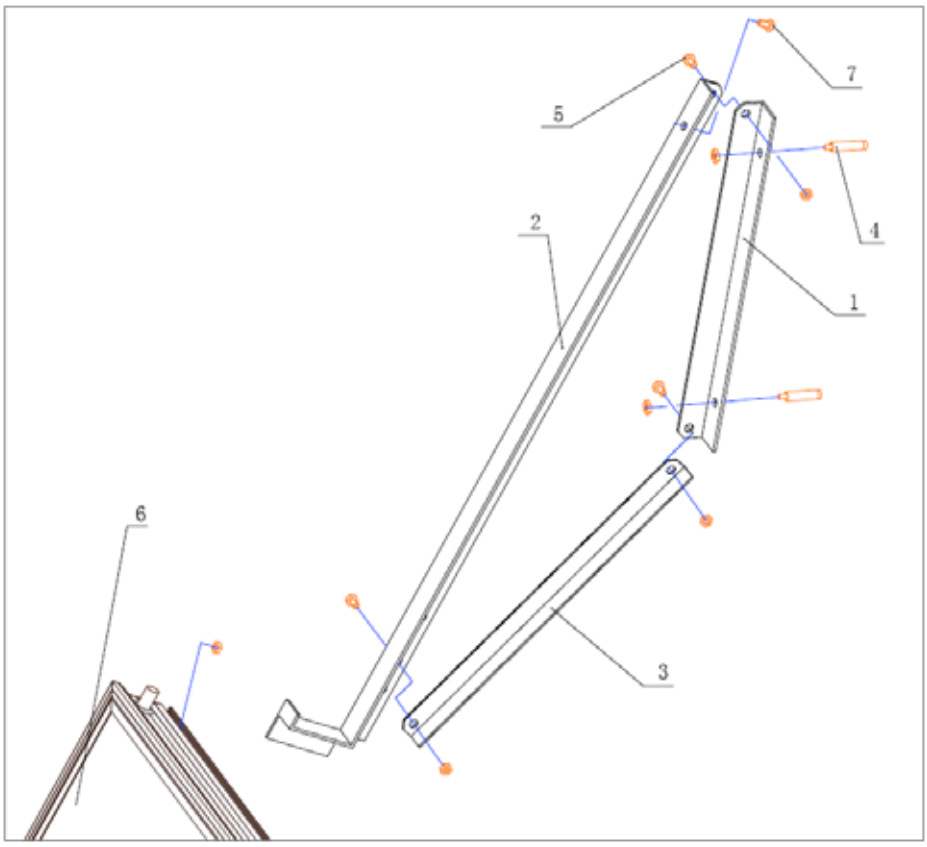




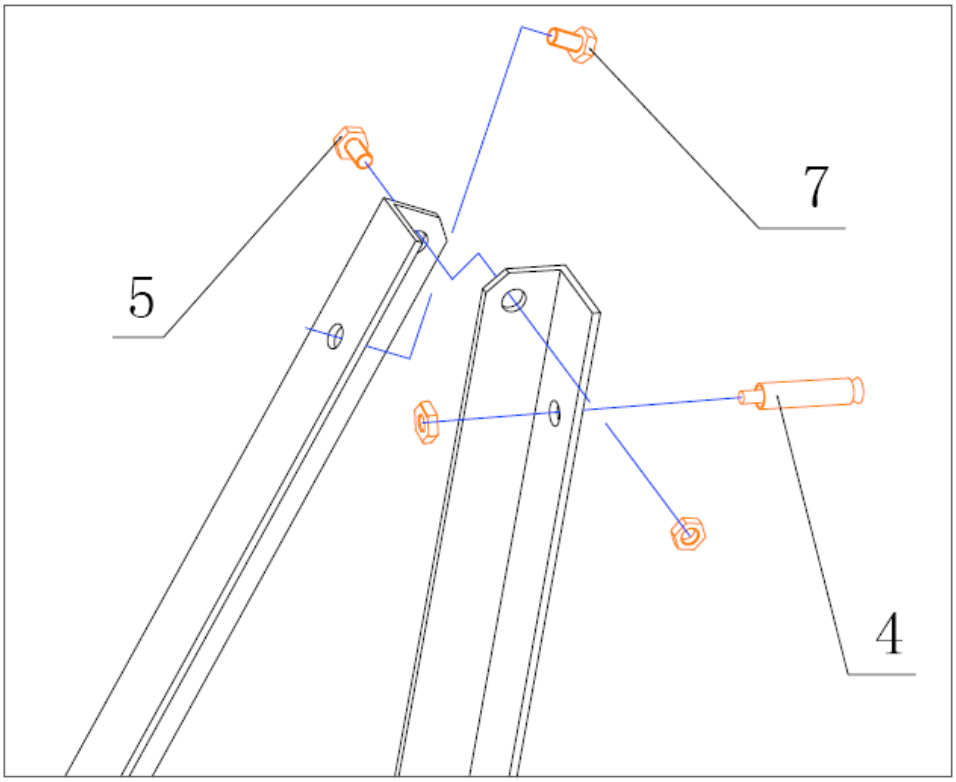


2. When the plate collector is mounted to the external wall not vertically

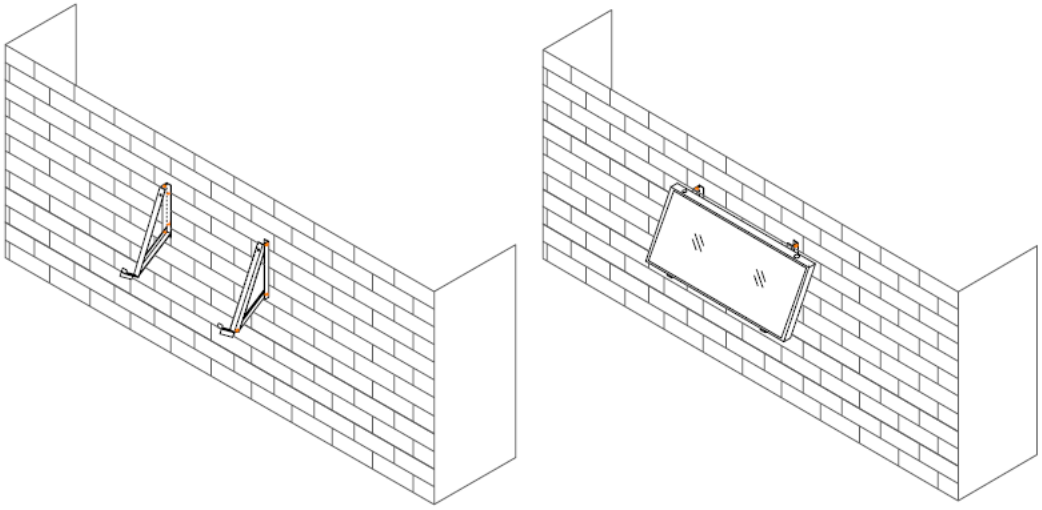


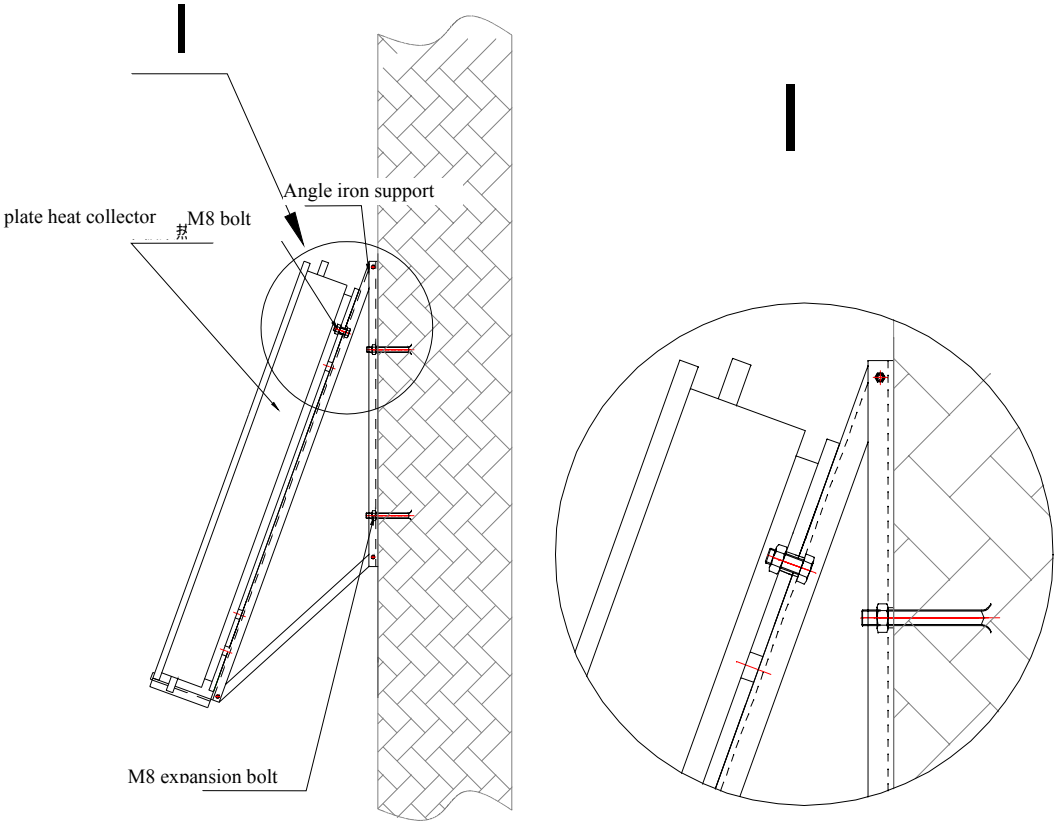


1: Support frame 2: Front support 3: Support connecting rod 4: Expansion bolt 5:Bolt
6: Plate collector 7: Bolt



Step 1: Make support 1, 2 and 3 of the collector with angle steel as per the drawing above and assemble support 1, 2 and 3 with bolt 5; tighten and fix them;
Step 2: Drill holes on the external wall and insert expansion bolt 4 into the holes;
Step 3: Fix the support which has been assembled in step 1 onto the external wall;
Step 4: Put the plate collector 6 onto the support and connect the plate collector 6 with the fixed support with bolt 7 through the outer frame of the plate collector.



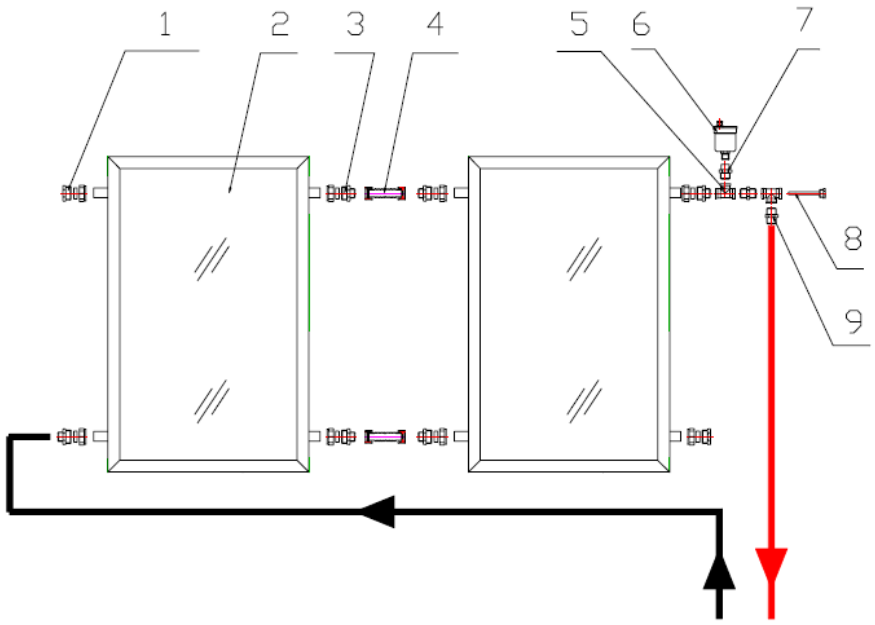


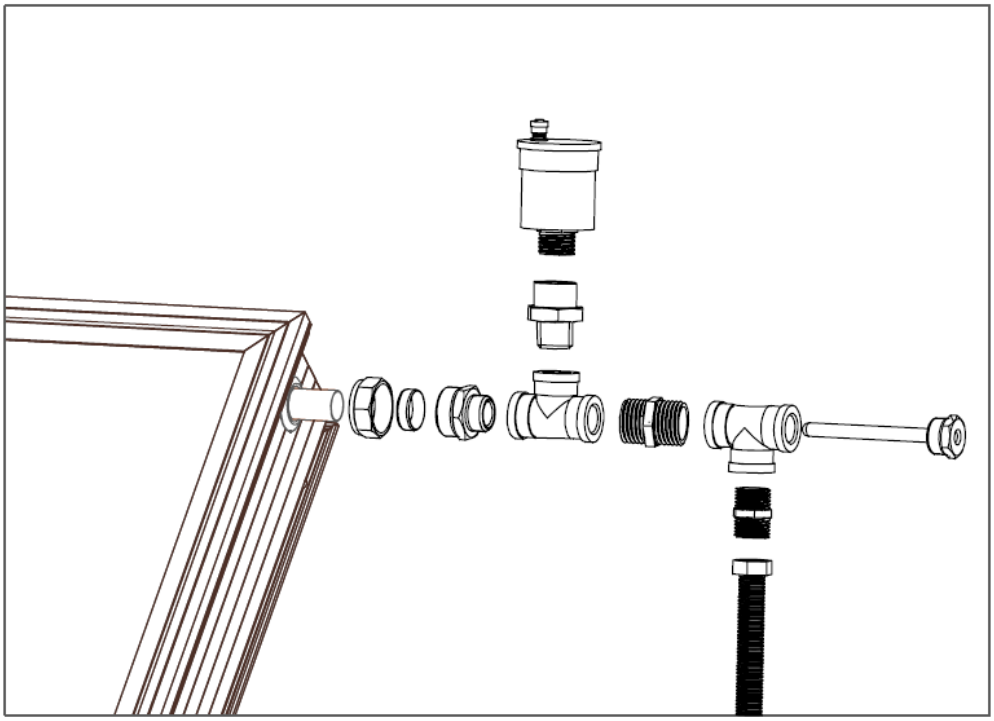
V. Introduction of how to mount pipes for the plate collector

1. How to connect two plate collectors

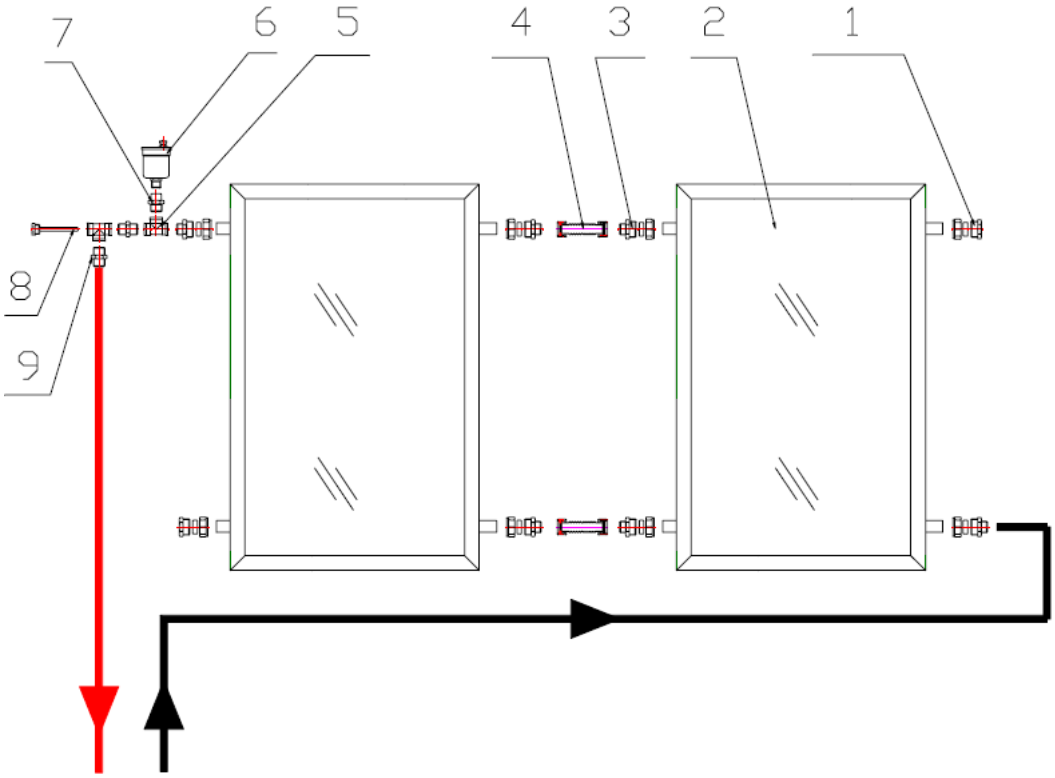
There are two ways to connect two plate collectors next to each other. Such mounting ways can ensure that the pipe distance in the system is equal and can shorten the hot water circulation pile, which can reduce the thermal loss from the pipe and increase the heat collecting efficiency of the solar system.

The 1st Method:



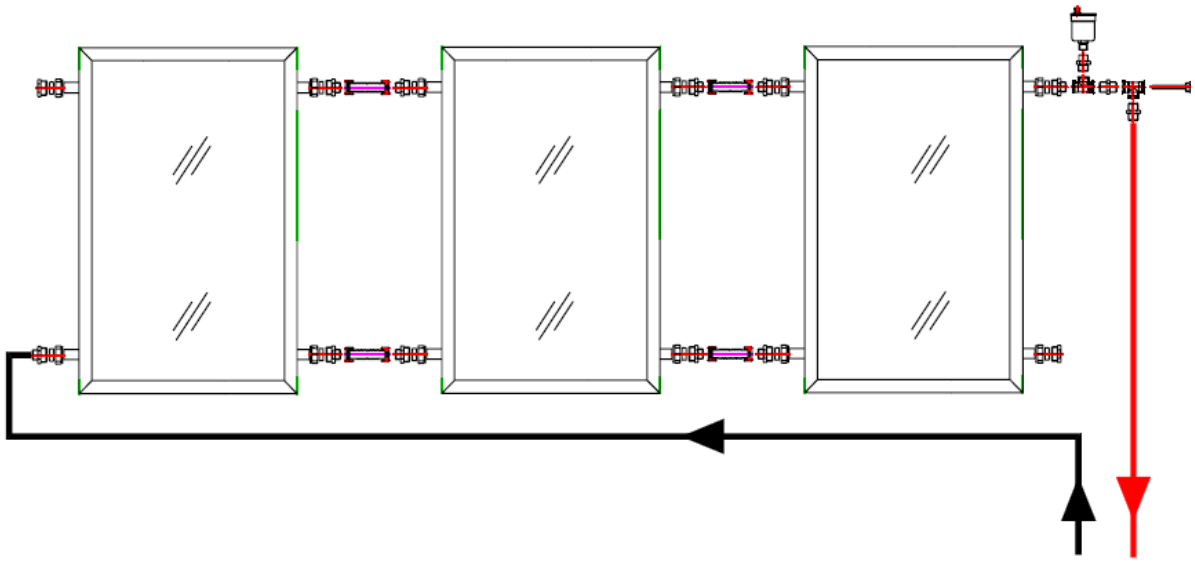


The 2nd Method：



No.	Name	Qty	Specification
1	卡套 Stopper	2 sets	Connect one end to the copper pipe（¢22） and the other end is a G3/4 stopper
2	Plate collector	2	1998*1024*80（mm）
3	卡套 connector	6 sets	Connect one end to the copper pipe（¢22） and another end interface is G1/2 male thread
4	Bellows	2	200mm long; and two end interfaces are G1/2 female thread nut
5	Tee-joint	2	G1/2 female thread to three directions
6	Automatic exhausting valve（Caleffi）	1	G3/8 male thread for the lower end
7	Taper joint	1	G3/8 female thread for the upper end and G1/2 male thread for the lower end
8	测温盲管（Thermometer）	1	G1/2 male thread for one end
9	Double nipple	2	G1/2 male thread for two ends

2. How to connect 3 plate collectors：

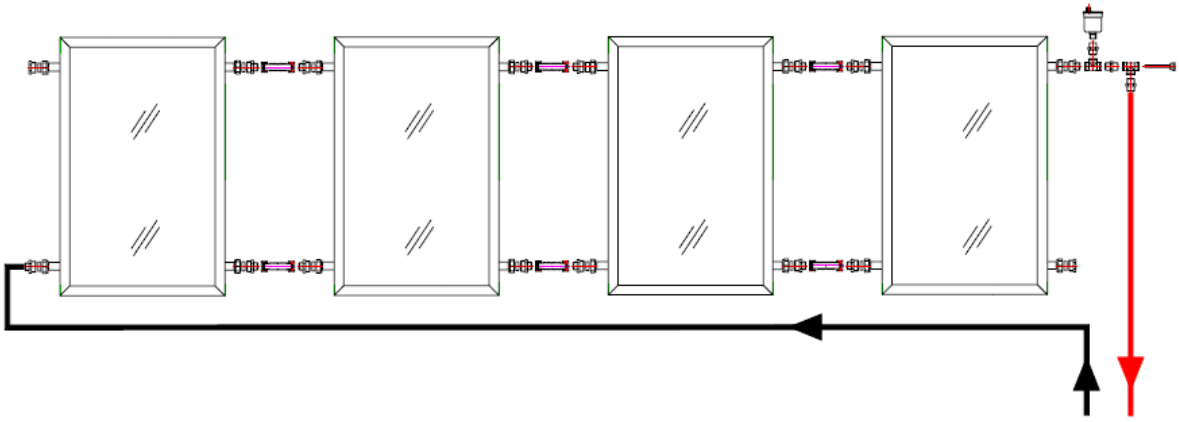


To mount 3 plate collectors, the pipelines can be adjusted left and right according to the actual site conditions. The pipes and fittings shall be mounted in the same way for mounting two collectors above.

3. How to connect 4 plate collectors:

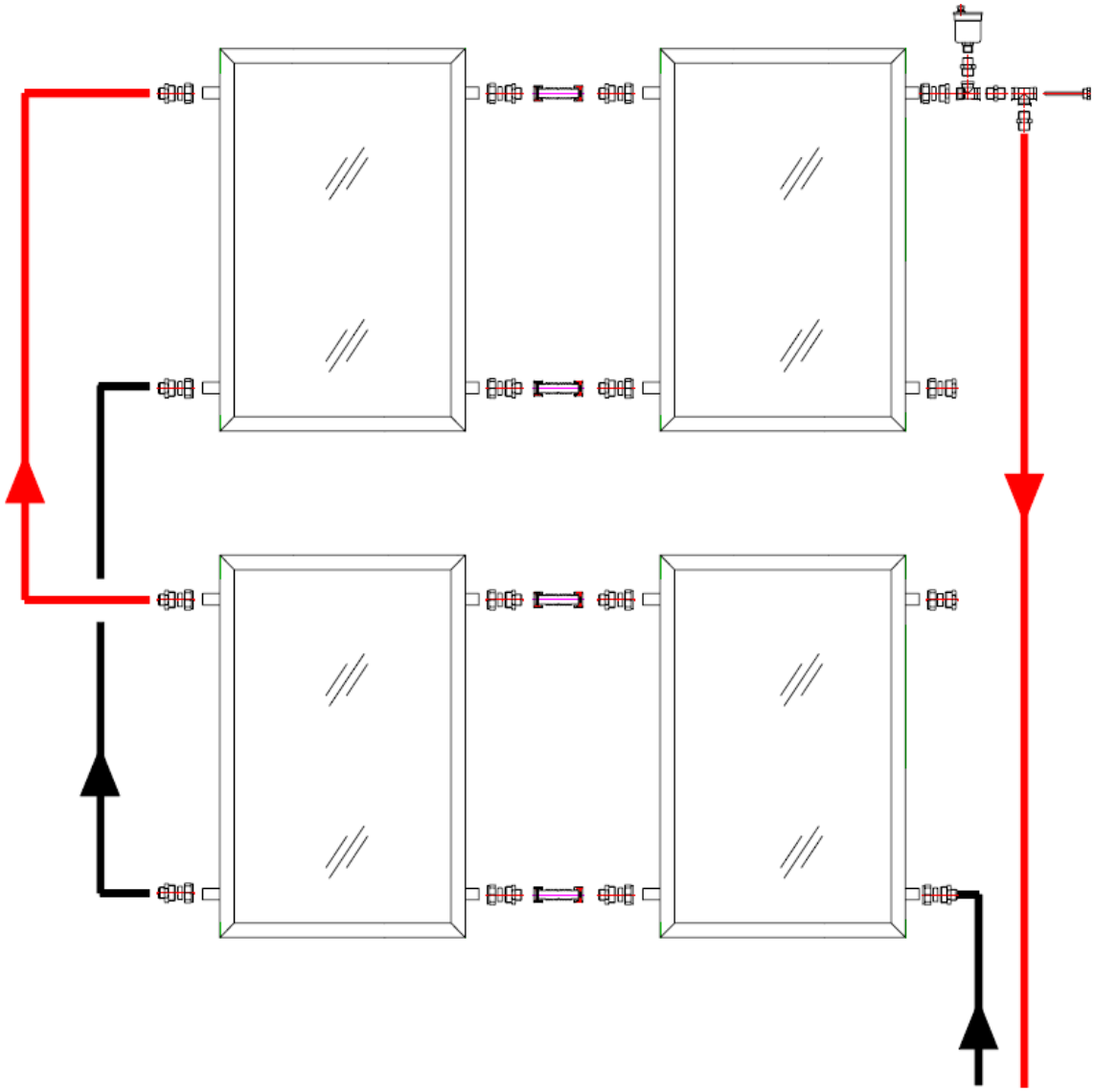
The 1st Method:

Get 4 plate collectors in one row and mount them; this mounting way needs a mounting area big enough.



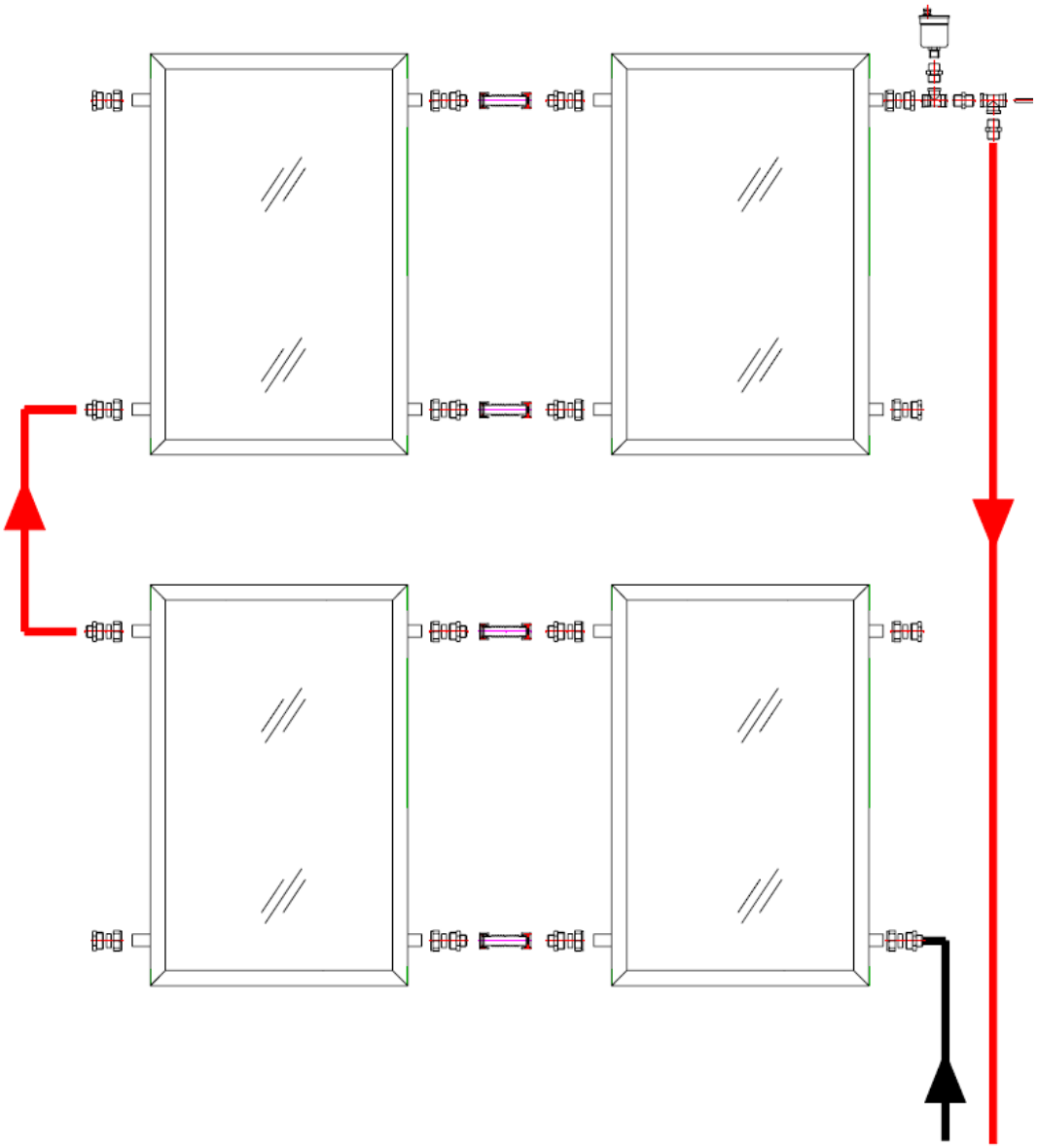
The 2nd Method:

If the mounting area is limited, the collector array may be mounted in the following way. For this kind of array of collectors, 4 plate collectors shall be connected in parallel too and they are not put in one row. The pipes and fittings shall be mounted in the same way as mounting two collectors above.



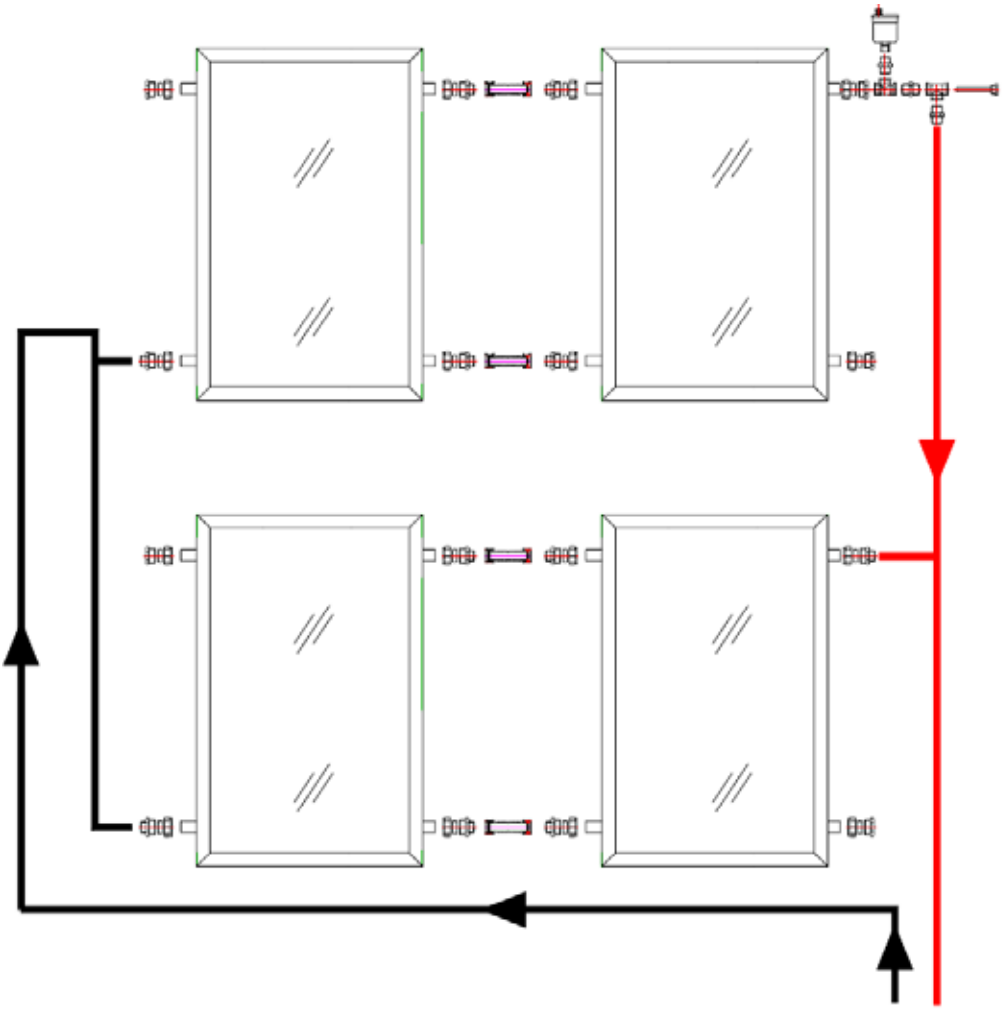
The 3rd Method:

The kind of array of the collector needs less mounting area, but first two collectors shall be connected in parallel and then assemble two sets of the connected collectors in parallel too. The pipes and fittings shall be mounted in the same way for mounting two collectors above.



The 4th Method:

The kind of array of the collector needs less mounting area. To connect the collectors, connect two of them in parallel first and then assemble two sets of the connected collectors in parallel. The pipes and fittings shall be mounted in the same way for mounting the collectors above.



Notes:

- To mount multiple plate collectors in a serial or parallel way, the above array way can be taken as an example.
- When more than 4 plate collectors are going to be mounted on a row, the serial mounting is not recommended, i.e. the 3rd mounting method shouldn't be used since this kind of connection has larger resistance drop. The 1st, 2nd or 4th method is recommended.
- It is recommended that at most 8 plate collectors are going to be mounted in one row when they are mounted in parallel, i.e. when they are to be mounted in parallel, the 4th method should be chosen.