# PROECO JNSC-Series Solar Collector
# Installation and Operation Manual

International Edition

Pro Eco Solutions Ltd.
28-29 The Broadway
W5 2NP London
UK

www.ProEcoSolar.eu info@proecosolutions.co.uk

# Content

# 1. Important information

## 1.1 Products parameter

| Model type | JNSC15-58/1800 | JNSC18-58/1800 | JNSC20-58/1800 | JNSC24-58/1800 | JNSC30-58/1800 |
|---|---|---|---|---|---|
| No. of collector pipes | 15 | 18 | 20 | 24 | 30 |
| Tube diameter(OD) | 58mm | 58mm | 58mm | 58mm | 58mm |
| Panel area | 2.3128m$^2$ | 2.7538m$^2$ | 3.0478m$^2$ | 3.6358m$^2$ | 4.5178m$^2$ |
| L×W×H (mm) | 1960*1180*125 | 1960*1405*125 | 1960*1555*125 | 1960*1855*125 | 1960*205*125 |
| Weight （kgs） | 52kgs | 62kgs | 71kgs | 88kgs | 112kgs |
| Fluid content | 1.2L | 1.4L | 1.6L | 1.9L | 2.3L |
| angle of inclination | 45 | 45 | 45 | 45 | 45 |
| max. temp ℃ | 260 | 260 | 260 | 260 | 260 |
| permissible operating pressure | 12bar | 12bar | 12bar | 12bar | 12bar |
| test pressure | 0.6MPA | 0.6MPA | 0.6MPA | 0.6MPA | 0.6MPA |
| manifold connection diameter | 3/4" | 3/4" | 3/4" | 3/4" | 3/4" |
| Coating of the vacuum tube | ALN/AIN-SS/CU | ALN/AIN-SS/CU | ALN/AIN-SS/CU | ALN/AIN-SS/CU | ALN/AIN-SS/CU |

## 1.2 Table of pressure drop date in Pa

Conditions:

$T_m$ = 20 ℃

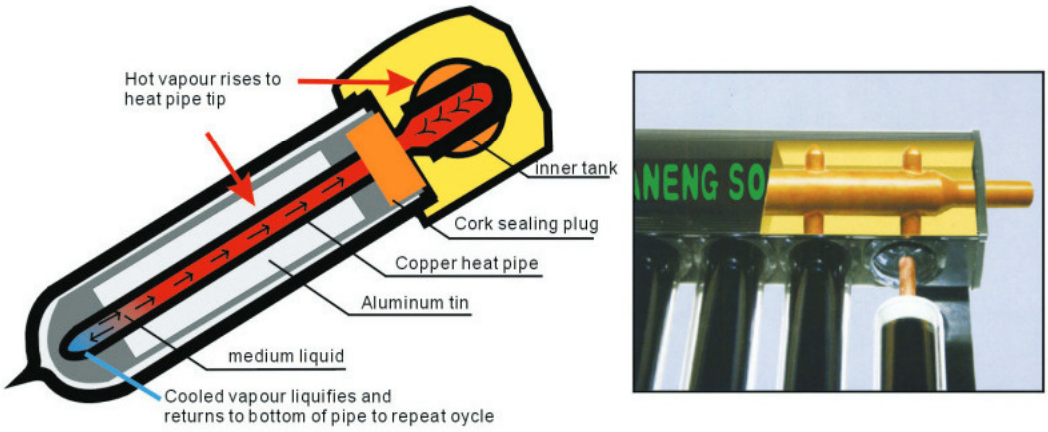
a ) For 15 tube solar collector

| Flow rate [l/h] | 0 | 100 | 200 | 300 | 400 | 500 |
|---|---|---|---|---|---|---|
| Pressure drop [Pa] | 0 | 102 | 286 | 561 | 910 | 1347 |

b) For 30 tube solar collector

| Flow rate [l/h] | 0 | 100 | 200 | 300 | 400 | 500 |
|---|---|---|---|---|---|---|
| Pressure drop [Pa] | 0 | 301 | 676 | 1120 | 1631 | 2218 |

## 1.3 Structure of Solar Collector




a) The heat pipe series solar collector are always connected with existing heating supply device. The selective coating on the inner cover of the evacuated tubes converts solar energy into heat energy and transfers heat to the heat pipes by aluminium fins.The liquid in the heat pipe changes into vapor which rises to the condenser. The heat then passes through the heat exchange and the vapor becomes liquid, returning to the base of the heat pipe. The heat conducts to the heat transfer liquid(anti-freezing liquid or water) via a copper pipe. This transference of heat into the liquid creates a continuous circulation as long as the collector is heated by the sun.
b) Feature: Can operate with water pressure up to 0.6MPa. Can be combined with existing energy source storage do not need be installed above the collector

## 1.4 Local Standards

a) Installation must be completed in accordance with relevant local standards and regulations.

## 1.5Pressure and Temperature Control and Relief

a) Solar loop should be designed for normal operation at<500kPa / 72.5psi, and have an expansion vessel installed to control water expansion. The system design MUST NOT allow stagnation of the collector as a standard form of controlling tank temperature, as this will cause damage to the glycol.
b)Any system design must provide means for allowing pressure release at no more than 800kPa /113psi.
c) It is recommended, and may also be a local regulation, that the pressure/temperature relief valve have a copper pipe connected, running the expelled hot water or air to a safe and appropriate drainage location.
d)It is recommended, and may also be a local regulation, that the pressure/temperature relief valve have a copper pipe connected, running the expelled hot water or air to a safe and appropriate drainage location.

.

## 1.6 Water Quality

a) Water in direct flow through the manifold header must firstly meet potable water requirements, and in addition the following:
Total dissolved solids < 600 p.p.m.

Total hardness < 200 p.p.m.
Chloride < 250 p.p.m.
Free Chlorine < 5 p.p.m
Magnesium < 10 p.p.m.
b) In areas with "hard" water (>200ppm), lime scale may form inside the header pipe. In such regions,it is advisable to install a water softening device to ensure the long term efficient operation of the collector,
or use a closed loop for the solar circulation loop.
c) If using a glycol/water mix, the water must meet the above requirements, and the glycol content of the liquid must not exceed 50%, unless the manufacture specifies that a different ratio is recommended for use with solar water heaters. Glycol must be changed periodically (every 3-5 years) to prevent the glycol from becoming acidic; please refer to the guidelines provided by the glycol manufacturer regarding replacement times.
d) In order to meet health and safety regulations, glycol used should be food grade.

### 1.7 Metallic Corrosion

a) Both copper & stainless steel are susceptible to corrosion when, amongst other factors, high concentrations of chloride are present. The solar collector may be used for heating of spa or pool water, but levels of free chorine must not exceed 5ppm, otherwise the copper header could be corroded.

### 1.8 Freeze protection

Freeze protection must be implemented in any regions that experience freezing conditions at any time throughout the year.
a) It is suggested to use anti-freeze liquid for the circulation line in cold regions.
b) For areas with temperature not below –5℃ / 23℉, simple low temp controller based freeze protection may be used. (ie. Pump circulates if the manifold temperature approaches freezing). If possible backup protection in the form of freeze valves (which open to allow water to dribble out) should also be installed.
c) For areas with temperatures below –5℃ / 23℉, a closed loop filled with a glycol-water mix should be used to provide freeze protection. Please refer to glycol mmanufacturer's specifications about the temperature ranges the liquid can withstand.
d) Evacuated tubes are not susceptible to damage in cold weather, and Jianeng heat pipes are protected against damage that could result from the freezing of the water inside.

### 1.9 Wind Stress

a) When installing the collector, please consider the issue of wind resistance, and the resultant stress on attachment points. Please adhere to relevant building codes/regulations regarding installation of such objects.
b) The standard frame, and frames kits all designed to withstand wind speeds of up to 80mph /128km/h without damage. For areas with wind speeds that may exceed this level an additional front track and rear legs (if applicable) should be installed.
c) If installing the low, mid, high or fixed angle roof frames, stainless steel cables may

be used to further secure the frame, running from the top of the rear legs diagonally backwards.

d) It is the responsibility of the installation officer to ensure that the frame mounting is of suitable strength. Where applicable inspection by builder department officers or equivalent should be completed to ensure the installation is in accordance with relevant regulations.

### 1.10 Snow Load

a) In areas prone to heavy snow falls the solar collectors should ideally be installed at an angle of 50o or greater to help promote snow sliding off the tubes. In addition it is advisable to raise the front of the collector frame 15-20cm off the roof surface as this allows snow to sit beneath the collector and also more easily blow away from under the collector.

b) For flush installations on a suitably pitched roof, component FRFRTRACK-RISER can be used to raise the front tracks 100mm up off the roof.

c) Each tubes is strong enough to withstand >50kg loading, but roof attachment points may need to be reinforced. Please refer to local regulations regarding snow loading precautions.

### 1.11 Hail Resistance

a) The glass evacuated tubes are surprisingly strong and able to handle significant impact stresses once installed. Testing and impact stress modelling proves that the tubes are able to withstand impact from hail up to 25mm /1" in diameter, and even larger when installed at angle of 40° or greater. The ability of the evacuated tubes to withstand impact from hail is greatly influenced by the angle of impact, and so installing the collectors at low angles does reduce their impact resistance.

b) It is recommended that in areas prone to large hail (>20mm / 3/4" diameter) the solar collector should be installed at an angle of 40° or greater to provide optimum protection. As many populated areas in the world fall within the latitude of ±30-70° this angle is generally a common installation anyway.

c) If in the unlikely circumstance that a tube should become broken it can be easily replaced. The solar collector can still function properly with one or more broken tubes, however a reduction in heat output will result (depending upon how many tubes are broken).

d) Please read all installation instruction carefully before beginning system design or installation.The system configuration may need to be customized to suit the specific requirements of the installation. Please ensure that any system design meets local building ,water quality regulation.

## 2. Installation

### 2.1 Unpack and Inspect

2.1.1. Tube & Heat Pipe Inspection

a) Open the tube box(es), which contain the evacuated tubes with heat pipes inserted. Check to make sure the evacuated tubes are all intact, and the bottom of each tube is

still silver. If a tube has a white or clear bottom, it is damaged and should be replaced. The heat pipe should be removed and inserted into a replacement tube.

b) As soon as the evacuated tubes are removed from the box, please put on the rubber tube caps,which are located in the manifold box. This will protect the bottom tip of the glass tube from being broken if Knocked.

c) Do not remove and/or expose the tubes to sunlight until ready to install, otherwise the heat pipe tip will become very hot, sufficient to cause serious skin burns. The outer glass surface will not become hot.

2.1.2. Frame

Unpack the standard frame that is provided together with the manifold,if a flat roof frame or low pitched roof frame is being used,those components will packed separately from the manifold. It may be necessary to purchase bolts or other fasteners to suit the installation surface. The attachment plates and bolts required to attach the manifold and bottom track are already in place on the frame front tracks. For each frame front track, there are two extra sets of bolts that can be used for securing the roof attachment strap.

## 2.2 System Design

2.2.1. System Design

System design should be completed prior to commencing installation. Solar collectors need to beinstalled correctly to ensure high efficiency, and most importantly, safe and reliable operation. Please read all installation instruction carefully before beginning system design or installation.The system configuration may need to be customized to suit the specific requirements of the installation. Please ensure that any system design meets local building ,water quality regulation.

2.2.2. Collector Direction

a) The collector should face the equator, which if in the Northern hemisphere is due South, and vice versa. Facing the collector in the correct direction and at the correct angle is important to ensure optimal heat output from the collector, however a deviation of up to 10° from due North or South is acceptable, and will have minimal effect on heat output

2.2.3. Collector Plane

a) The collector manifold is normally installed on the flat horizontal plane, but may be installed at and angle of +/-5° from horizontal as may be required if installing in a drain-back configuration.

b) The collector must not be installed up-side-down (tubes pointing upwards) or with tubes lying horizontally, as the heat pipes will not function.

2.2.4. Collector Angle

It is common for collectors to be installed at an angle that corresponds to the latitude of the location. while adhering to this guideline, an angle of latitude +/- 10° is acceptable, and will not greatly reduce solar output.

b) The solar collector should be installed at an angle of between 20-80° to ensure optimal heat pipe operation.

2.2.5. Avoid Shade

a) Collectors should be located so that shading does not occur for at least the 3 hours

either side of 12 noon local time.

b) Partial shading due to small objects such antennas and small flues, is not of great concern.

2.2.6. Location

a) The collector should be positioned as close as possible to the storage cylinder to avoid long pipe runs. Storage cylinder positioning should therefore consider the location requirements of the solar collector.

b) The storage cylinder should be located as close as possible to the most frequent draw off points in the building.

2.2.7. Lightning Protection

Install a ligntning conductor, which should be installed higher than the solar collector.

2.2.8. Pipe Connections & Pipe Size

a) Jianeng solar collectors are provided as standard with 22mm OD copper pipe inlet and outlet pipe.

b) Connection to the inlet and outlet may be by use of brass compression fittings (with copper olive), or low temperature soldering.

c) For domestic heating applications with 2 collectors or less, nominal 15mm / ½" piping is suitable.

d) For applications using 2 or more solar collectors in series, it is advisable to use a nominal 20mm /3/4" piping.

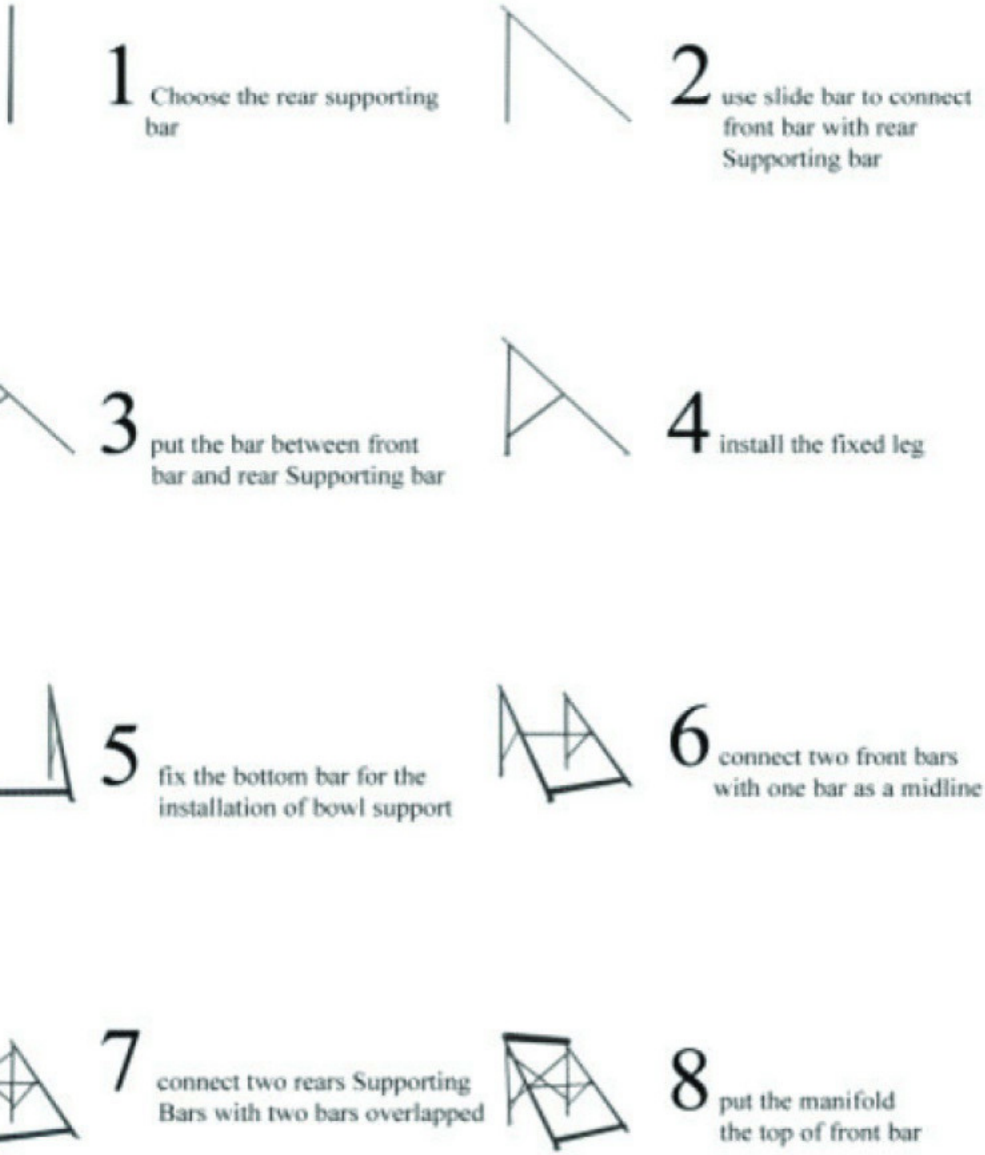
e) For connection of banks of collectors, larger pipe sizes should be used as specified for the given application, with consideration made to flow rates, pressure drop and pump sizing.

f) The material used for the solar line must be able to withstand the operating temperatures and pressures that the system may be exposed to, due both normal and extraordinary conditions (eg. Pump failure, or power outage). Copper pipe is the most widely used piping material for solar applications.

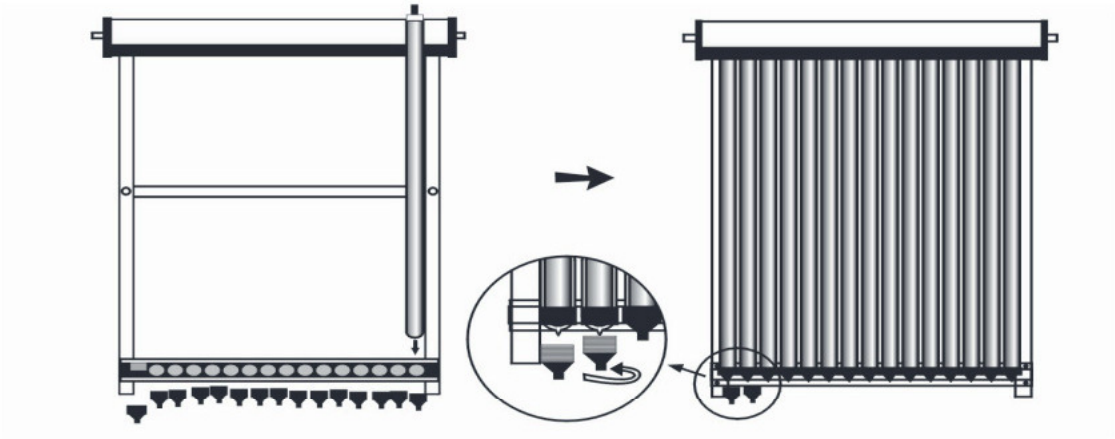
2.2.9. Connection of Multiple Collectors

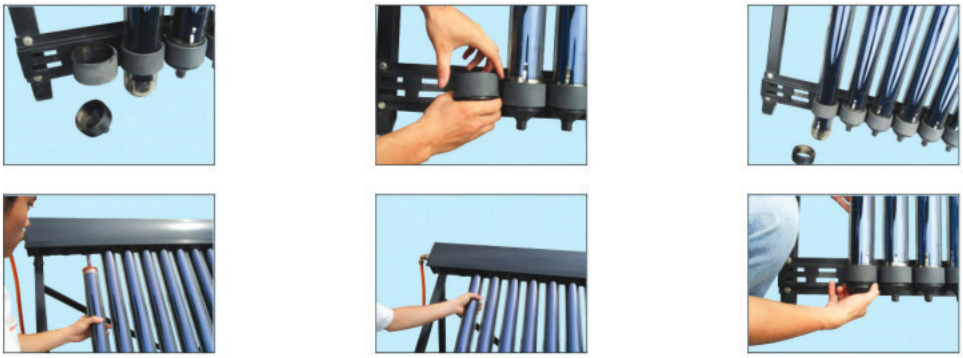
a) When connecting collectors in series (maximum of 150 tubes ， about $20m^2$), flexible connections should be used between each collector, in order to allow for the expansion and contraction of the copper header with temperature changes. Failure to use flexible connections between consecutive collectors may result in damage to the header if the system stagnates.

## 2.3 Frame Installation




## 2.4 Installation Collector



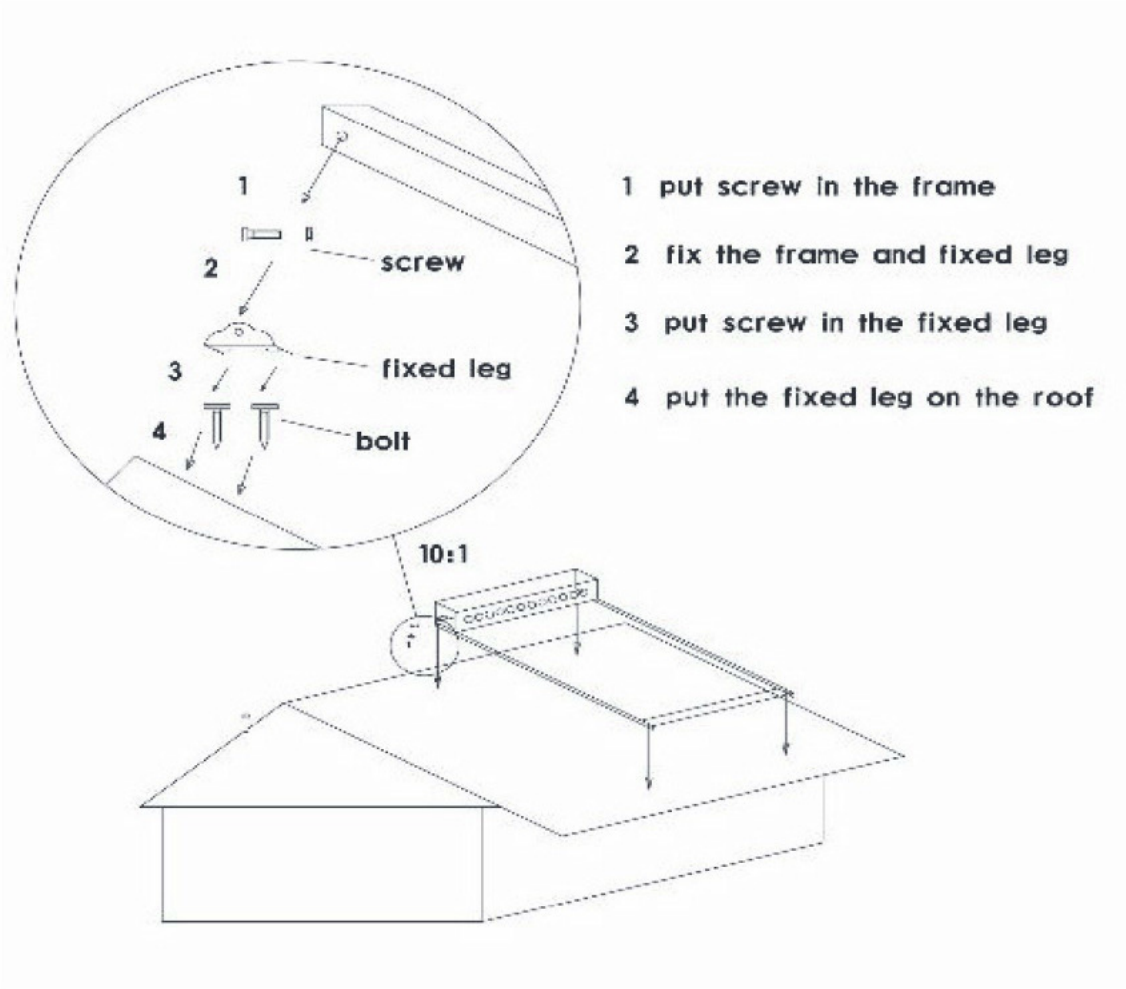


Step 1: First install the nylon cap on the bottom track, then screw off the jacket from the nylon cap.
Step 2: Put the anti-dust rubber ting on the vacuum tube(mild dish washing liquid&water will be very useful).
Step 3: Insert the vacuum tube inside the nylon cap.(be careful :don not touch the vacuum tube on the ground ,or it will be broken)
Step 4: Hold the vacuum tube tightly, then insert it inside the opposite hole which on the manifold slowly.
Step 5: Screw the jacket on the nylon cap.

**2 .5 Flat Roof Installation (Standard Frame)**

a) Frame feet should be bolted to the installation surface using 10mm / 0.4" diameter or larger bolts, or a similarly sturdy fastening method.
b) Ensure the surface is solid and able to withstand the significant "pull" force that may be encountered during high winds.
c) If concrete blocks are used under each foot (ie not directly bolted into the roof), they should weigh at least 30kg / 66pounds each, or >40kg / 88pounds for areas prone to high winds.

## 2.6 Pitched Roof Installation (Standard Frame)




2.6.1. Installation Planning

a) For tiled roofs, carefully plan the location of the manifold, frame front tracks and plumbing pipes in order to minimize the number of tiles that need to be removed (and returned into place), Tiles may have holes cut to allow the roof straps or bolts passing through. Any holes must be covered and/or sealed with standard roofing materials to avoid leaks..

2.6.2. Positioning Manifold

a) The manifold and bottom track can slide left and right in relation to the frame front tracks, so there is some flexibility when selecting the location. The frame front tracks should be located such that they lay flat

and even on the roof (match the tiles/shingles) and also line up with the roof frame.

b) If possible try to locate front tracks under the 2nd or 3rd tube from each end. By locating the front tracks directly under the evacuated tubes, the stainless steel frame will be hidden, improving the aesthetics of the installation. For collectors with three front tracks the middle front track should be positioned roughly centrally, again ideally behind a tube.

2.6.3. Correctly Align Frame

a) Please make sure that the front tracks are both parallel and level before attaching the manifold or bottom track. Using a string to check the diagonal distance between

the top of one track the bottom of the next (should be equal) is a quick and easy method to use. An uneven or unparallel frame may result in damage to the system, in particular, the evacuated tubes.

2.6.4. Manifold and Bottom Track Attachment

Once the front tracks are secured in place, the manifold and bottom track may be attached, taking care to ensure they are correctly aligned. Both the manifold and bottom track will lock into the frame,secured from above with the attachment plates that are already in place.

## 2.7 Post Installation

a) Collector Operation:After installing all the tubes, and given good sunlight, the solar collector will begin to produce heat after a 5-10min "warm up" period. Check the Delta-T controller and pump for correct operation and adjust settings as required.

## 2.8 Precautions

2.8.1. Metallic Components

a) Always wear leather protective gloves when handling solar collector components. All efforts have been made to make the metal components safe to handle, but there may still be some sharp edges.

2.8.2. Evacuated tubes

a) Be careful when handling the evacuated tubes, as they will break if knocked heavily or dropped. Wear gloves if handling any broken glass.

2.8.3. High Temperatures

a) With the heat pipe installed in the evacuated tube, and good sunlight, the heat pipe tip can reach temperatures in excess of 200℃ / 392°F. At this temperature touching the heat pipe will result in serious

burns, so thick leather gloves must be worn when handling hot tubes and heat pipes.

b) In an installed fully plumbed system, if the pump is stopped during good sunlight the collector header and plumbing pipe close to the manifold can easily reach temperatures in excess of 160℃/ 320°F, and therefore caution should be taken when handling such components.

2.8.4. Broken Glass

a) If the evacuated tubes are struck by a hard object with sufficient force (Branch falling on roof), they may break. During installation consideration should be taken as to the possible path any broken glass may take. Where possible protection should be implemented to prevent broken glass from reaching ground level where somebody could walk on it (Eg. Guttering on roof).

b) The home owner should be made aware by the Installation Officer, the location of the solar collector and the possible vicinity of broken glass in the event of an extreme storm or falling object on the collector.

2.8.5. Health & Safety

a) Always wear safety glasses when handling evacuated tubes

b) Wear leather gloves when handling metal components

c) Wear thick weather gloves if handling hot heat pipes.

d) Adhere to safety regulations regarding working on roofs (or at a height)

# 3. Maintenance

### 3.1 Cleaning

a) Regular rain should keep the evacuated tubes clean, but if particularly dirty they may be washed with a soft cloth and warm, soapy water or glass cleaning solution.

### 3.2 Leaves

a) During autumn, leaves may accumulate between or beneath the tubes. Please remove these leaves regularly to ensure optimal performance and to prevent a fire hazard. (The solar collector will not cause the ignition of flammable materials).

### 3.3 Broken Tube

a) If a tube is broken it should be replaced as soon as possible to maintain maximum collector performance.
b) The system will still operate normally and safely even with a tube broken.
c) Any broken glass should be cleared away to prevent injury.
d) To replace a tube:
-Remove the tube clip(s), slide broken tube out and carefully pick up any glass pieces. Protective gloves must be worn when handling broken glass.
- When removing the broken tube, the rubber ring in the manifold casing may pop out. Just return this ring into place before inserting the new tube.
- Avoid touching the glass wool insulation with bare hands, as it can cause mild skin irritation.
- If the heat pipe is not easily removed, it can be left in place and a new evacuated tube inserted, guiding the heat pipe down the groove between the evacuated tube inner wall and heat transfer fin.
– If the heat pipe is easily removed, the easiest option is to replace the heat pipe and evacuated completely.

### 3.4 Insulation

a) The plumbing pipes running to and from the collector should be heavily insulated. This insulation foam should be checked periodically (at least once every 3 years) for damage.
b) For any insulation that is exposed to sunlight, ensure any protective cover/wrap/foil is in good condition, replacing as required.

### 3.5 Other Components

a) Other parts of the system such as the pump and storage tank (electric or gas water heater) should be serviced/inspected according to their manufacturer's own maintenance guidelines.

### 3.6 Freezing

a) During extended sub-zero periods with concurrent pump/controller failure or power outage, a direct flow (water) system may suffer from freeze related damage, indicated by no pump flow due to pipe blockage, or in most cases leaking due to a split pipe.
b) The most likely area of freeze damage is exposed copper piping, particularly near elbows or connections. One the system thaws, leaks will indicate any areas of damage

which require replacement.

c) To repair, isolate flow to the collector or drain the system and repair/replace any damaged piping, then recommission the system.

d) If freezing is a regular occurrence, consider installing a battery power backup system to ensure continued operation of the pump and controller during a power outage. To provide complete protection the system may need to be upgraded to a closed loop anti-freeze (potable grade heat transfer fluid) system.

# 4. Troubleshooting

| Problems | Cause | Solution |
|---|---|---|
| Not enough hot water | Electric or gas booster is not configured correctly. | Ensure gas booster is operational.<br><br>For electric systems, fit an automatic timer for the element power supply set to run from 3pm to 6pm, providing a boost each day.End user can over-ride to turn the element ON for a few hours if they need additional hot water. |
| Hot water dumping | High temperature setting in controller not functioning to turn off pump. | Check to ensure TOP-OUT function is set to 70℃. Check TANK sensor contact. |
| Excessively hot water delivered to house taps | No tempering valve installed | Install tempering valve, providing 50℃ water supply to house. |
| Banging noise in pipes when hot water tap is opened. | Steam formation in collector when hot water tap is opened after a period of collector stagnation. Often occurs when inlet cold pressure is low (<400kPa) | Check cold supply water pressure. Install pressure pump to raise cold supply pressure above 400kPa. |
| Banging noise in pipe even when hot water is NOT being used. | Check valve (duo-valve) may not be installed on cold mains line,combined with low supply water pressure (<400kPa) | Install check valve (duo-valve) on cold line before tank. Install pressure pump to raise cold supply pressure above 400kPa |

| Problems | Cause | Solution |
|---|---|---|
| Poor solar contribution | Damaged tubes | Check to ensure tubes are all intact.<br>Replace any damaged tubes. |
| | Incorrect installation of heat pipes | Heat pipes are not inserted into the ports correctly, or do not have coating of heat transfer paste. |
| | Low installation angle, reducing winter output (If angle is less than latitude). | Increase installation angle to at least latitude angle, and preferably 10-15°greater than latitude. |
| | Low installation angle, reducing winter output (If angle is less than latitude). | Ensure all exposed copper pipe is insulated and protected against UV degradation. |