



Solar Hot Water Systems

Installation Manual

Providing Insight into hot water, solar systems and various components used within a SolarArk Solar Hot Water System. This is a confidential document for SolarArk representative use only. This document is to be taken as a comprehensive introduction into solar heating. This document is for the use of SolarArk accredited installers only.

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Thank you for your decision to purchase a SolarArk Evacuated Tube Solar Hot Water System.

The content of this manual provides detailed information on maintenance, troubleshooting, safety precautions and warranty that should be thoroughly read and adhered to following installation.

Should you have any questions regarding the information contained, please contact SolarArk on Ph: 1300 760 966 for support.

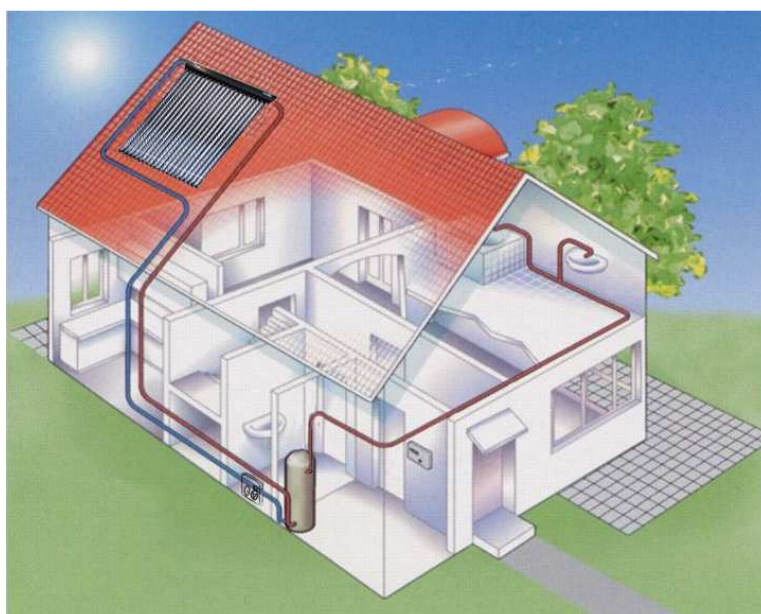
Introduction to Solar Water Heating

The design of the cylindrical evacuated tubes allows maximum absorption of the sun's energy to convert it to heat.

The cold water from the bottom of the storage tank is pumped up to the insulated manifold of the solar collector, which passes through the heat exchanger. It absorbs the heat and is returned back to the storage tank.

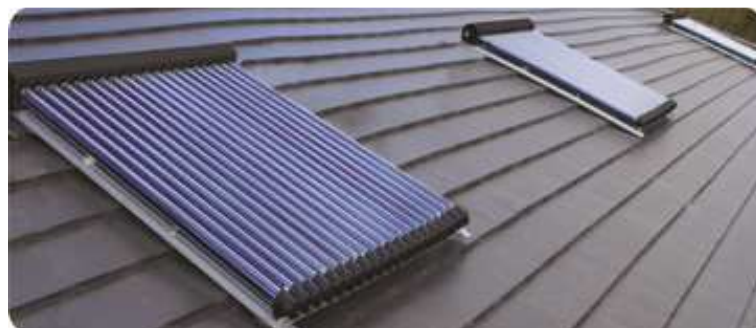
The controller measures the differential temperature between the water supply from the bottom of the tank and the water return from the collector to maintain the set temperature within the storage tank.

The circulating pump operates intermittently throughout the day to maintain maximum hot water output and minimise energy consumption.



Key Features

- SolarArk utilizes copper, aluminium and titanium as part of a three target film technology. This provides excellent heat retention that exceeds other standard tubes by more than 12%.
- The diameter of the heat exchanger has been specifically designed to maintain low pressure drop.
- High density Rockwool insulation is used to ensure maximum solar heat gain by minimising the amount of heat loss even in cold temperatures.
- The solar controller will maintain the temperature at the bottom of the tank to a pre-set temperature of 65°C to 70°C. The on/off differential settings of the controller are designed to ensure optimum pump cycling as the water in the manifold heats up. If the collector reaches 8°C hotter than the tank the controller turns the circulating pump on, and off again once the temperature decreases to 2°C.
- SolarArk solar collector tubes and heat exchanger are individually tested for vacuum and pressure to guarantee high quality and performance.
- The tubes are designed to withstand hail and high winds, have long lasting performance and are cheap and easy to replace if damaged.
- The complete system is lightweight for easy installation and the stainless steel frame is resilient to corrosion.
- SolarArk are proud to provide a 15 year warranty on their complete solar collector.



Tempering Your Water Supply

Tempering valves are mandatory throughout Australia. They are to comply with local regulations as a safety device to reduce hot water supply to a maximum of 50°C. AS/NZS 3500.4:2003 details the requirements of the tempering valve.

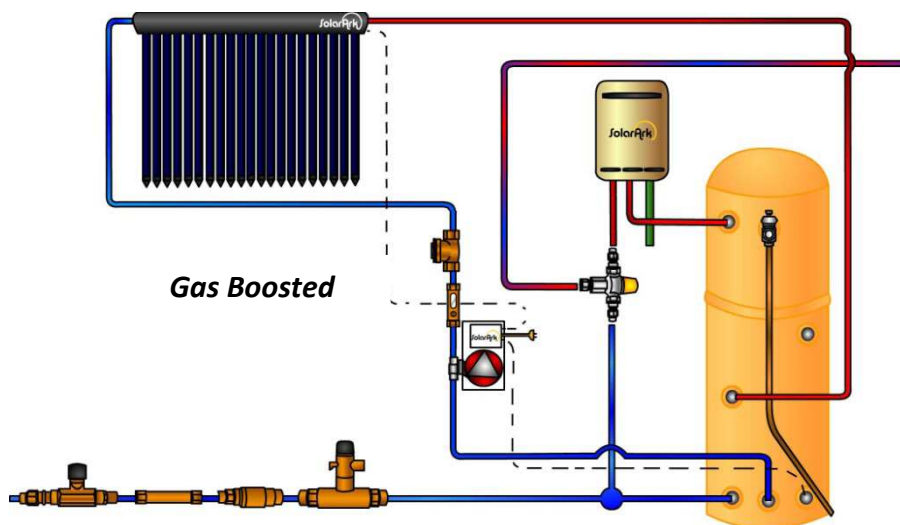
The function of the tempering valve is to reduce the 65-75 degree water leaving your hot water storage tank and blending it with cold water to achieve 50°C. To reduce the possibility of scalding the tempering valve must be installed to the hot water supply line incorporating all sanitary household hot water outlets.

Only a solar rated tempering valve to be used with the SolarArk hot water system.

Tempering valve should be inspected and correctly adjusted every year, replaced every five years. All adjustments of a tempering valve should only be carried out by a licensed plumber.

Boosting Options

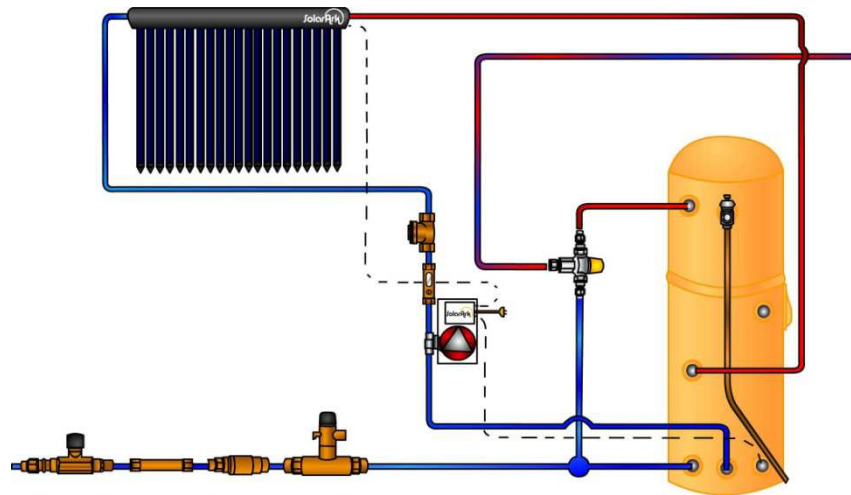
For further procedures please follow gas booster model instructions.



NOTE:

When using a direct flow system in high mineral content water areas (hard water), scale may form in the solar loop reducing collector performance and increasing pressure drop that may also render the system inoperable due to flow restriction.

It is recommended in such areas a water treatment system be installed to remove scale forming minerals or prevent scale layers from forming.



During periods of low solar contribution, gas or electric boosting is required to maintain 60° temperature.

Gas Boosting

The instantaneous gas booster is activated if the water passing through is less than 55°C. The gas booster will automatically turn off when boosting is not required, therefore increases energy efficiency.

The gas booster is designed for outdoor installation and can be mounted on the storage tank or on the wall within a short distance of the storage tank. For indoor installation an indoor flued model can be used. If wall mounting is used insure that the piping from the storage tank to the gas booster is as short as possible and well insulated without any exposed section.

Points to Note:

- The gas booster operates when there is a minimum of flow rate of 2.4 l/m of hot water flowing through the booster. The use of water saving devices that have less than 9lpm flow rate or that have restrictors may interfere with the operation. To ensure operation, open the hot tap fully to check if the gas booster comes on.
- The S20 gas booster requires a minimum of 120 KPa water pressure and the S26 requires a minimum of 160 KPa water pressure to achieve the maximum flow rate and optimal function. If the pressure is less than the required pressure, a water pressure pump should be installed.
- Instantaneous gas booster electronic temperature controllers will not work with SolarArk systems and are not to be used.



Water Flow

S21 or S26 hot water gas boosters have limited hot water flow due to the flow rate of the gas booster (21 or 26 litres per minute).

To ensure that your instantaneous unit functions effectively, it is advisable to use a AAA rated showerhead with a minimum flow of 9 l/m. It is also recommended to periodically check showerhead for any debris or deposit built-ups as this may affect water flow and temperature.

Model Name		Model Number	
		S20	S26
Factory Default Temp	°C	70	70
Colour		Dune	
Water Pressure (kPa)	Min	120	160
	Max	1000	
Gas Rate LPG (MJ/hr)	Min	11.3	14.7
	Max	125	188
Gas Rate NG (MJ/hr)	Min	10.9	13.8
	Max	125	188
Flow Rate 25°C Rise (lpm)	Min	16	24
Flow Rate Max (lpm)	Max	20	26
Connection Sizes Gas/Hot/Cold	(mm)	20/20/20	

Electric Boosting

An electric boosted water cylinder is supplied with a 3.6kW electric boosting element as standard. The thermostat is set to 60°C. If the solar contribution is low, the electric boosting element will activate to compensate for heat loss.

Generally, the required heating time would occur overnight during the off-peak Tariff. If off-peak is not available, the continuous Tariff will require an automatic timer setting to be activated early evening or overnight when solar radiation is at its lowest. Depending on the water usage pattern the timer can be operated manually to activate boosting as you need it to avoid running out of hot water, however it may take 3-4 hours to heat your water.



Water Delivery & Recovery Rates

Delivery / Recovery Rate	Gas Boosted			Electric Boosted		
	250L - S21	315 - S21	315L - S26	S160L	S250L	S315L
Available Water Delivery in First Hour (Litres)	873	936	1089	210	330	395
Hot Water Recovery for 50°C rise (litres)	609	609	762	80	80	80

Local Standards

Installation must be completed in accordance with the requirements of AS/NZS 3500.4 (AS/NZS3500.4.2 “National Plumbing and Drainage Code Hot Water Supply Systems – Acceptable Solutions”), or in New Zealand, Clause G12 of the New Zealand Building Code, as well as any relevant local standards and regulations.

SolarArk Accreditations

BSI Benchmark Certification is an Australian Company originally established in 1993 to provide independent certification services to companies wishing to achieve formal recognition of their management systems. ISO 9001, QS-9000 and ISO 14001 and Product Certification.

Accreditation by JAS-ANZ also implies that companies approved by BSI Benchmark Certification is recognised and accepted in each country where JAS-ANZ has signed a Memorandum of Understanding with other National Accreditation Board.

The Institute for Thermodynamics and Thermal Engineering (ITW) has been working in thermal solar energy since the early 1970s. In 1993 the Research and Testing Centre for Thermal Solar Systems (TZS) was established. TZS is the largest testing centre for solar thermal components and systems in Europe. TZS has long standing established experience in testing the full spectrum of solar thermal experience in testing the full spectrum of solar thermal products as well as in conducting research and development projects with partners from research organisations and industry.

SolarArk System Compliance

SolarArk solar hot water system approved to AS/NZS 2712:2007 Solar and Heat Pump Heaters Design and Construction. The system is designed to allow stagnation when tank maximum temperature is reached without dumping a large amount of water from the TPRV.

All SolarArk evacuated tubes solar collectors are modelled to meet the following standards and requirements for thermal performance, energy consumption calculations, potable water suitability. AS/NZS 2535, AS/NZS 4234:1994, AS/NZS 4020:2005.

All electric and gas storage water heaters are manufactured to Australian Standards AS 1056.1 and AS 3142.

SolarArk solar collector has been tested to pass the frost tolerance to -15°C level 2 frost protection.



Authorised Installers

All installation of SolarArk solar hot water systems must be installed and checked by a SolarArk authorised licensed plumber who holds all relevant qualifications.

Any installation, inspections, repairs or maintenance that is required should only be carried out by a person authorised by SolarArk Pty Ltd.



Safety Precautions and Legionella

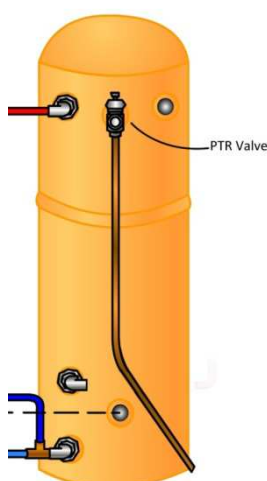
In order to kill Legionella bacteria it is an Australian standards requirement (AS3498-2009) that the hot water in the storage tank be heated up to at least 60°C on a regular basis, either while in the storage tank (solar electric) or to 70°C by a post boost (gas continuous flow).

Bottom element electric: The hot water storage tank must reach 60°C at least once a week. The element should be activated at least once weekly during winter months and overcast weather. The element is located at the bottom of the tank.

Mid element electric: The hot water storage tank must reach 60°C at least once daily. The element should be activated daily during winter months and overcast weather. The element is located in the middle of the tank, lowering boosting costs by boosting half of the tank until the solar unit kicks in again.

Gas boosted systems: Gas booster must be left on at all times. It will only boost the water if it is less than 60°C.

Pressure and Temperature Control and Relief



The pressure & temperature Relief Valve is supplied with the water heater from the manufacturer. The valve must be installed into the socket marked “RELIEF VALVE”. No hot water storage tank should be operated without the PTRV fitted and functional. The PTRV should be checked for correct operation or replaced at intervals not exceeding 5 years. .

The lever on the relief valve must be lifted and lowered very slowly to operate the valve at least once every 6 months. Failure to operate the relief valve at least once every six (6) months may result in the water heater exploding.

The relief valve and its drain outlet pipe must not be sealed or blocked.

Water Quality

All hot water storage tanks have been manufactured to suit water conditions of most Australian metropolitan supplies. Water supplies outside of the specifications specified can have a damaging effect on the water heater and its longevity. Information can be obtain from your local water supply authority regarding water quality details

Water Acceptability Composition Range for Stainless Steel Tanks

Water Quality	
Total Dissolved Solids	<600 mg/litre or ppm
Total Hardness	<200 mg/litre or ppm
Chloride	<250 mg/litre or ppm
Sodium	<150 mg/litre or ppm
Magnesium	<10 mg/litre or ppm
PH Levels	6.5 – 8.5
Electrical Conductivity	850 µS/cm

Water Acceptability Composition Range for Vitreous Enamel Tanks

Water Quality	
Total Dissolved Solids	<600 mg/litre or ppm
Total Hardness	<200 mg/litre or ppm
Chloride	<300 mg/litre or ppm
Sodium	<150 mg/litre or ppm
Magnesium	<10 mg/litre or ppm
PH Levels	6.5 – 9.5
Calcium	20 mg/Litre
Iron	1 mg/litre

The water heater is designed for use in areas where the Total Dissolved Solids (TDS) content of the water supply is less than 2500 mg/L. In areas where the TDS exceeds 600mg/L it is possible that the magnesium alloy anode (supplied in glass lined heaters only) may become over reactive.

To alleviate this, the magnesium alloy anode should be replaced with an aluminium alloy anode, available from your local plumbing supplier. Water can also be very corrosive, the measure of this is the saturation index, if the water saturation index is greater than 0.40 an expansion control valve should be fitted and where the index is greater than 0.80 the water heater installed should be a Hard Water Model. Please consult SolarArk for advice if required. In regions with “hard” water (<200mg/L or ppm), it is advisable to install a water softening device. This will ensure the long term efficient operation of the solar collector.

Corrosion

When high concentrations of chloride are present, both copper and stainless steel are susceptible to corrosion. Therefore, the use of this system to heat chlorinated pool or spa water will void warranty. SolarArk will not warrant any equipment failure due to corrosion related damage. Chloride levels present in most reticulated public potable water supplies are safe for use in the solar collector provided there is no use of bore waters in the reticulated supply.

Freeze protection and Snow Loading

The solar collector is protected by a frost protection controller. Evacuated tubes are impenetrable against damage due to cold weather. A low manifold temperature pump circulation feature turns the pump on if the manifold temperature drops to 4°C and turns off again when the temperature rises to 6°C. In areas prone to heavy snow fall, the solar collectors should be installed at an angle of 50° or greater to promote snow sliding off the tubes. Each tube is tested to withstand >50kg of loading.

Water is the most suitable heat transfer fluid in regions where freeze protection is not a concern. A closed loop system should be used in regions subject to freezing temperatures, a food grade heat transfer fluid to be used normally polypropylene glycol or glycerine based product.

POWER TO THE CONTROLLER SHOULD NEVER BE INTERRUPTED AS IT IS ESSENTIAL FOR THE OPERATION OF THE FREEZE PROTECTION FEATURE.

WARRANTY WILL BE VOID IF DAMAGE OCCURS DUE TO POWER SUPPLY INTERRUPTED

Hail Resistance

The SolarArk evacuated tubes are able to handle significant impact from hail of up to 25mm/1” in diameter. The ability of the evacuated tubes to withstand impact from hail is greatly influenced by the angle of impact and so installing collectors at low angles will reduce their impact resistance.

Wind Stress

When installing the SolarArk collector please consider the following points: wind resistance caused by high strength winds and the stress applied upon attachment points due to these winds. The

pitched roof frame and angle frame are designed to withstand high wind speeds without damage. However the roof attachment points may not be as strong. For areas with the possibility of high winds, additional arrangements for reinforcing attachment points should be considered.

Lightning Protection

Where the solar collector is installed in an area that is prone to lightning it is recommended to earth the solar collector copper circulation loop to aid in avoiding lightning related damage and safety issues, installers should refer to the local building codes and regulation regarding lightning protection and grounding.

Collector Dimensions & Weights

Collector Size:	10 tubes	20 tubes	30 tubes
Gross Weight (Empty):	45 Kg	78Kg	115 Kg
Absorber Area:	0.8m ²	1.6m ²	2.4m ²
Aperture Area:	0.94m ²	1.88m ²	2.82m ²
Gross Area:	1.57m ²	2.96m ²	4.35m ²
Fluid Capacity:	754ML	1546ML	2338ML
Overall Width:	810mm	1560mm	2310mm
Overall Height:	155mm	155mm	155mm
Overall Length:	2000mm	2000mm	2000mm
Distance between Inlet and Outlet	930mm	1680mm	2435mm

Roof Structural Integrity

Collector weight is minimal and will not cause excessive weight stress on the roof structure. No reinforcement of the roof structure is required for flush mounted collectors. The SolarArk collectors weigh approximately 78kg for 20 tubes and 115kg for 30 tubes.

If installing at a raised angle (adjustable frame) in a high wind region, high winds will cause vertical and horizontal loads on the frame. Please ensure that the roof structure is able to withstand such forces.

Stagnation and Excess Heat

Evacuated tube solar systems have the ability to heat water well above 100°C during periods of high solar radiation and minimal hot water usage. The controller has an inbuilt guard against hot water entering the storage tank. Once the bottom sensor has reached the pre-determined setting of 65°C, or 70°C (known as TOPOUT) power is no longer sent to the pump. This is needed as it is a requirement that heat in storage tanks does not exceed 80°C. During these periods of high solar contribution and minimum hot water usage, the solar collector can generate more heat than is

required at these times, the controller will turn off the pump to prevent the tank from overheating and the hot water tank temperature will not increase further, when water is no longer circulating through the solar collector that would cause stagnation due to the energy still getting absorbed and not getting used, the temperature will rise in the manifold there for pressure will start to build-up. In some cases a crackling noise may be heard in the pipes when the hot water tap is opened if steam had formed in the solar collector. This noise may occur recurrently if the cold water supply pressure is low <400 KPa. Installation of a pressure pump may help reduce the occurrence of this noise.

Not having the pump cycling will cause stagnation in the manifold. This could potentially occur during periods of high radiation and little to no water usage in the home. Throughout these conditions the manifold will reach around 160°C. At this temperature the water does not boil as it is under pressure, the pressure relief valve on the tank is set to 850kPa. This means that the water would have to reach roughly 180°C before any steam could form. Whenever the hot water in the home is used pressure in the system will drop equalizing with the water supply pressure which is normally between 500 to 800 kpa depending on your local water pressure supply and the pressure limiting valve. Due to that pressure drop steam may form.

If the pump stops running due to power blackout or pump failure, a Pressure Temperature Relief Valve (PTRV) is incorporated into the hot water storage tank as a safety precaution which releases high temperature water and steam from the tank should it reach 95°C or 850KPa. The PTRV must have a downward facing copper pipe connected, running expelled water to an appropriate drainage point. It is important to ensure the relief valve or drain tube not be sealed or blocked. A regular maintenance check at six month intervals is recommended.

During stagnation conditions or for households with a cold water delivery <400kPa, large amounts of steam may be formed in the collector when the hot water tap is opened causing a loud “banging” sound within the copper pipes and the storage tank. Installing a pressure booster pump that can achieve >400kpa pressure is recommended. An air eliminator should be installed on the water return outlet of the solar collector to help reduce or eliminate this problem. This is applicable for installations with main water supply or tank water. A check valve must also be installed on the cold main line before the tank.

If noises is heard when hot water is not used that may indicate a fault with the cold water supply check valve (duo-valve) or check valve not installed. A check valve must be installed to allow the system to operate at high pressure and prevents hot water flowing back down the cold water inlet line damaging low temperature rated components.

SolarArk can provide a closed loop system for application with low water pressure situation to eliminate the noisy piping, as a closed loop system is not governed by the water supply pressure it has a constant pressure with an independent pressure relief valve rated at 850kpa. Solar loop has an operating pressure between 650 to 750kpa.

Water Boiling Point

When operating a hot water system under pressure the boiling point at which the water will turn to steam will change as per the following chart.

Gauge Pressure KPa	Boiling Point °C
0	100
100	120
200	133
300	143
400	152
500	159
600	165
700	170
800	175
850	177

Automatic Air Eliminator

An automatic air eliminator should be installed on the solar collector to provide an escape point for any air that may be trapped in the solar loop supply and return lines. It will aid in preventing the solar collector from overheating in high levels of solar gain and low water usage also in the event of a power outage.

An automatic air eliminator should also be installed for systems with low water pressure supply and systems with water supply booster pumps to aid in venting steam from the solar collector manifold.

Piping Connection and Valves

Only well insulated copper piping to be used for solar flow and return lines as per AS/NZS 3500.4:2003 Section 8 details insulation requirements. Any material used for the solar loop must be appropriately rated for high temperatures and operating pressures that a SolarArk system capable of producing in normal and high stagnation conditions. Fitting should be temperature rated to >180°C. Component within a 50cm of collector inlet or out let should be >230°C rated.

Always use copper or brass fittings for the installation of a SolarArk solar hot water system never use plastic olives or synthetic piping.

Brazing copper piping directly to manifold ports is not recommended as brazing may damage rubber components on solar collector header .do not over tighten or twist the copper piping on manifold that could also cause damage only use brass compression fittings supplied.

There are two 22mm ports on the manifold of the solar collector both ports have a 6mm sensor well located near them that can be used for inlet or outlet. The roof sensor should be installed on manifold outlet (solar return) an air eliminator also to be installed on solar return.

There are two compression fittings supplied with the solar collector manifold 22mm compression to ½ inch flare connection if connecting multiple collectors for commercial applications a 22mm compression to ¾ BSP brass fittings may be used. Only Australian standard approved brass fittings should be used. For domestic heating application up to 60 tubes DN 15 / ½” copper piping can be used.

For applications above 60 tubes or with a pipe run longer the 40m of combined flow and return lines it is recommended the use of DN18 / 3/4” copper piping.

Pipe Sizing	Recommended Total Pipe Run Flow + Return
DN 15	Up to 40 Metres
DN20	Up to 60 Metres

Applications with the use of multiple collectors a specified pipe size should be used based on the flow rate and pressure props of the system.

Flexible connection should always be used when connecting multiple collectors to avoid damage due to expansion and contraction of the copper header with temperature changes.

Flow control valve should be used to insure the correct solar loop water flow. The system performance is based on the correct water flow passing through the solar collector and returning to the hot water storage tank.

An expansion control valve (ECV) can be installed as it limits the maximum pressure in pressurised, unvented water heating systems by reliving excess pressure to an approved drain point. 700KPa rated ECV should be used.

Expansion control valve to be installed on the cold water supply into the hot water storage tank. One of the benefits of installing an expansion control valve, it releases pressure at the cold water supply saving energy by not purging heated water. It is mandatory to install an expansion control valve in some states in Australia where the water heater is installed in scaling water area. It is also mandatory to install a non return and an isolating valve for the installation of pressurised water heaters throughout Australia.

A combined non return isolating valve can be installed to prevent the backflow of water from a water heater to the main cold water supply. This serves the dual purpose of protecting the mains supply from contamination and the loss of water that has already been heated. The isolating valve component is useful as a means of controlling inlet water supply to unvented storage water heaters.

A pressure limiting valve of 500-550KPa must be fitted to reduce the main water supply pressure to protect the storage tank from damage, failure to install a pressure limiting valve will void the warranty .

For closed loop system an expansion vessel/tank should always be used to prevent the system from dumping the heat transfer fluid. For domestic use of up to 90 tubes a 10-12L expansion vessel should be used. The expansion vessel will accept system pressure increase; refer to expansion vessel manufactures for correct sizing on large systems.

Storage Tanks

The storage tank is typically an insulated metal tank with an electric heating element in the bottom or middle of the tank. Gas boosting is also available as an alternative option to electric boosting. The storage tanks promote thermal stratification that prevents incoming cold water from mixing with the hot water at the top of the tank.

Gas boosted systems provides optimum energy conservation, as it is only required when the temperature in the tank falls below 55°C.

A thermostatically controlled electric element in the bottom of the cylinder can be connected to full tariff or "off Peak" power supply. The heated water rises up the cylinder by natural convection to the top where it is ready for use. As hot water leaves the storage cylinder, it is replaced by cold water, which enters at the bottom of the cylinder. SolarArk recommends flushing the water heater at regular intervals as advised by your licensed plumber flushing will clear any build up solids that have escaped the line strainer. The tank may be used either indoor or outdoor and should be installed by and located in accordance with your licensed plumber's recommendation, but usually close to the outlet where there is the greatest usage of hot water. Installation must comply with Australian Standard AS 3500.4 and any local authority regulations.

Galvanic Reaction

Some metals can cause corrosion when in direct contact with one another, Zinc or Zn/AL galvanised components should not be installed in direct contact with the collectors' stainless steel frame. Always use stainless steel roofing screws along with the rubber frame mounting blocks provided, if using different metals to fix the collector in place always use neoprene washers for contact separation.

Safety Reminders

- Water heater and control box access covers will expose 240V wiring high risk of electrocution only to be removed by authorised personnel.
- Care should be taken when handling evacuated glass tubes, if knocked or dropped they may break. Do not expose the tube to direct sunlight during installation, as the heat pipe will get very hot in just a short exposure to sunlight.
- Always wear leather gloves and safety glasses at all times during installation and commissioning
- Solar pipes and fittings can reach temperatures of over 100°C extreme care should be taken when installing or servicing SolarArk solar hot water systems
- If hot water system is not used for two weeks or more, a quantity of highly flammable hydrogen gas may accumulate in the water heater. To discharge this gas safely, it is recommended to turn on a hot water tap for several minutes until all gas discharge is ceased. A sink, basin or bath outlet should be used. DO NOT USE THE DISHWASHER, CLOSE

WASHER.DRYER OR ANY OTHER APPLIANCE. During this procedure there must be no, SMOKING OPEN FLAMES OR ANY ELECTRICAL APPIANCES OPERATING NEARBY. If hydrogen is discharged through a tap similar to air escaping noise will be herd.

- All safety percussion should be taken before any parts of the installation are started.

Tanks – Stainless Steel

Stainless steel storage tank can be heated using “full” or "off-peak" Tariff electricity. Long life marine grade stainless steel capable of handling high temporisers up to 95°C

The latest aspects of design and material selection include:

- Hi-grade stainless steel cylinder
- Control of thermal stratification
- Dual Positive Domed Cylinder resulting in optimum location of element(s) water supply and delivery and flushing-through of suspended solids
- Highest level of insulation due to the use of a polymeric external casing combined with thick polyurethane insulation



Tanks – Vitreous Enamel (Glass Lined)



The Vitreous Enamel (glass lined) tanks are an efficient option for water heaters. Some features include:

Glass lined tanks have a magnesium sacrificial anode that ensures potable water quality. Suitable to poor water quality areas as an aluminium anode can be installed to extend the life of the tank.

The release of hydrogen can sometimes occur if the water is not used for long periods of time. To combat hydrogen built up, all water heaters have a pressure and temperature release (PTR) valve fitted to Australian Standards.

If the water has been stagnant for two or more weeks, pull the lever on the PTR valve to “purge” the system for 30 seconds. This will expel any hydrogen built up. Caution need to be taken when purging as the water will be HOT.

Safety Drip Tray

The safety tray is a requirement for all water heaters to protect property from damage. As per The National Plumbing Code AS/NZS 3500.4:2003. The safety tray must comply with Clause 4.4 and Sub Clauses 1 to 5 of the Code.

Gas Boosted Storage Tank

The gas boosted hot water storage tank is a standard tank with an instantaneous gas booster that can be attached to the tank or mounted on the wall close by the gas booster is a Type-A appliance.

The gas boosters are available for connection to either Natural Gas (NG) or Liquefied Petroleum Gas (LPG).

The S20, S26, and S32 solar gas boosters are pre-set to 70°C all general work and safety requirements should be followed as per relevant codes and standard.

Wall Mounted



Stainless Steel

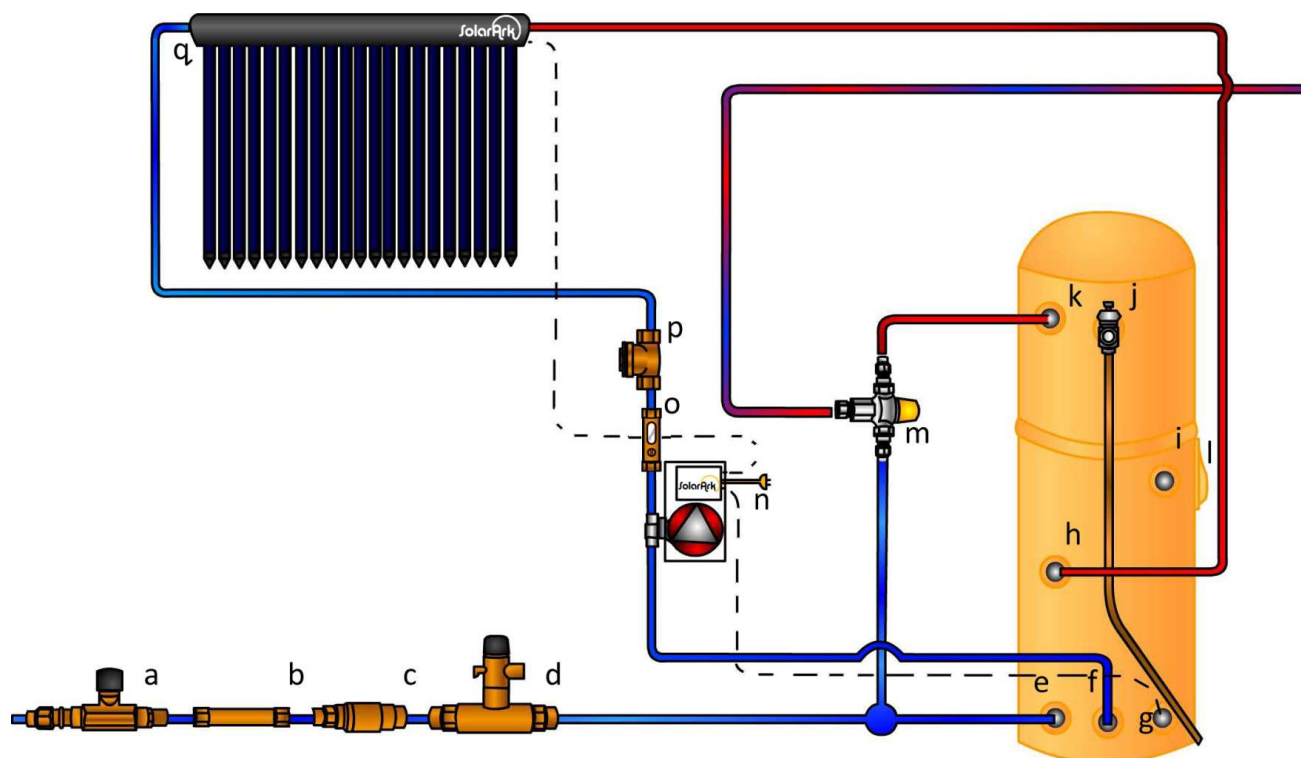


Glass Lined



Basic System schematic

System Schematic-Electric Boosted Stainless Steel Tank



Parts Schematic – Not all components are Provided by SolarArk

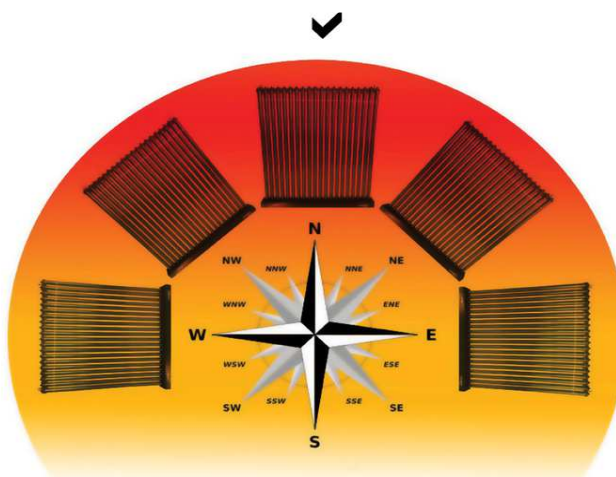
Component Name	Qty	Supplier: Part Code	Notes
a Non-Return Isolating Valve	1	Australian Standards Approved	1. Optional Inclusion, compulsory in some states
b Line Strainer	1	Australian Standards Approved	2. Allow 30cm of straight pipe before either side of pump
c Pressure Limiting Valve (500kPa)	1	Australian Standards Approved	3. Allow 50cm of straight pipe before brass swing check valve
d Expansion Control Valve	1	Australian Standards Approved	4. For runs longer than 20m use DN18 copper pipe
e Cold Water Inlet	1	Australian Standards Approved	5. Temper valve MUST be installed
f Solar Flow	1	Australian Standards Approved	6. Only brass flip swing check valve can be used, no synthetic seats.
g Lower Sensor Port	1	Australian Standards Approved	System diagrams have been approved in line with S/NZS2712 requirements. The installer must not change the design of the major system components. It is the responsibility of the installer/contractor to ensure that the system design meets all relevant standards, regulations and guidelines, and is safe and operating correctly. The installation of SolarArk products must be in accordance with the guidelines outlined in the latest version of the SolarArk installation manual. Any installer/contractor must be legally certified to install solar water heating systems and have attended an accredited SolarArk training session before completing the installation of any SolarArk products.
h Solar Return	1	Australian Standards Approved	
i Upper Sensor Port	1	Australian Standards Approved	
j PTR Valve	1	Australian Standards Approved	
k Hot Water Supply	1	Australian Standards Approved	
l Electric Element	1	Australian Standards Approved	
m Solar Rated Tempering Valve	1	Australian Standards Approved	
n Pump and Controller	1	Australian Standards Approved	
o Flow Control Valve	1	Australian Standards Approved	
p Brass Swing Check Valve	1	Australian Standards Approved	
q SolarArk Solar Collector	1	SolarArk SA-M-20, SA-M-30	

Collector Positioning

Some major factors need to be considered when installing the evacuated tube collector

Location	Latitude	Acceptable Pitch Angle	Optimum Angle
Adelaide	35°	20-55°	55°
Alice Springs	23°	20-43°	43°
Brisbane	27°	20-47°	47°
Canberra	35°	20-55°	55°
Darwin	12°	20-32°	32°
Hobart	42°	20-62°	62°
Melbourne	37°	20-57°	57°
Perth	32°	20-52°	52°
Sydney	34°	20-54°	54°

To achieve optimum efficiency, the solar collector needs to face the equator in Australia and New Zealand is due north. With the cylindrical shape of the evacuated tube solar collector installation angles of up to 45° away from north have minimal effect on the yearly solar production. Collectors facing east, achieve higher solar input of the morning. Collectors facing west, achieve higher solar input of the afternoon. However if the solar collector is installed east or west facing a pitching frame can be installed at an angle between 35-40° to improve output by exposing the tube to perpendicular sunlight.



To avoid over heating in summer it is recommended to install the solar collector for winter sun exposure which is 15-20° above the latitude angle. This angle reduces collector output in summer and increases in winter. Attention needs to be paid to shading from nearby trees or buildings at any time of the day, predominantly between 8am and 4pm, the highest solar input times. Remember that longer shadows are cast in winter than in summer.

The solar collector installation angle range is in between 20-80° due to the working fluid contained within the heat pipe is gravity influenced.

Storage Tank Location

The hot water storage tank should be installed as close as possible to the most frequently used hot water outlet point. Electrically boosted hot water storage tank can be installed indoor or outdoor. The ideal location of the solar collector should be around the 10m range away from the hot water storage tank.

Pipe Insulation

Regardless of the length of the pipe run, it is vital the flow and return lines are insulated with high temperature closed cell insulation, no less than 15mm wall thickness. Ensure that the manifold inlet and out let are insulated all the way and no exposed fittings are visible to minimise any heat loss, Any insulation that is exposed to sunlight should be UV protected with a metallic foil wrap. Ensure the sensor ports are sealed after installing roof sensor with high temperature silicon sealant to prevent water from entering sensor port; the insulation should also have a watertight seal. Ensure the structure of the roof is suitable to sustain the weight of the collectors. The SolarArk collectors weigh approximately 78kg for 20 tube and 115kg for 30 tube collector.

Installation Procedure

The following installation procedure will cover the requirement for the SolarArk evacuated tube solar hot water system detailed installation instruction to be followed in order to achieve a correctly functioning solar hot water system. The installation must only be carried out by a SolarArk accredited installer.

Mounting frame

All SolarArk Collectors come with a 1.5mm stainless steel flush mount roof frame that is suitable for tiled or corrugated pitched roof equal or greater than 20°. For roofs lower than 20° an adjustable roof frame should be used. The frame is strong and corrosion resistant, it is important that all frame attachment points and fasteners are also of suitable structural strength and corrosion resistance.

Stainless steel fasteners are made from 304 grade therefore is susceptible to locking if excessive force is used, it is virtually impossible to remove without snapping off. Using a suitable lubricant may reduce the locking effect (Silicon based lubricant).

SolarArk adjustable roof frame kit is an all in one framing system which will suit most installation situations, adjustment range between 30°- 67° components can be used creatively. Additional holes may be drilled in the frame as required, drilling a 9mm bolt holes will suit bolts supplied. The frame comes with a bottom track as standard however round feet can also be supplied as an optional extra for concrete slab mounting or for wall mounting.

Manifold and Bottom Track Attachment

The manifold and the bottom frame tube holders track are secured to the frame front track using special holding attachment plates. The plates are design in such a way that when loosed it allows the front frame tracks to slide left and right to simplify adjustment process for rafter locating.

Manifold and Bottom Track Attachment Process

1. Position the front tracks parallel and laying flat on the roof, as seen in image on the side.
2. Insert the front of manifold casing into the top raised grooved section of the front track be sure to hold each track firmly while you insert the manifold into place.
3. Once in place secure the top of manifold with the attachment plate and finger tighten repeat the process to all front tracks.
4. Insert the bottom tube holder bottom track into bottom raised grooved section of the front track in place.
5. Align the bottom track with the manifold using the centre of the bottom tube holders as a visual guide to align with the centre of the manifold tube holes.
6. Once in place secure the top of the tube holder bottom track with the attachment plates and finger tighten repeat the process to all front tracks.
7. Once the frame is correctly aligned tighten all nuts and bolts.



Installation Planning

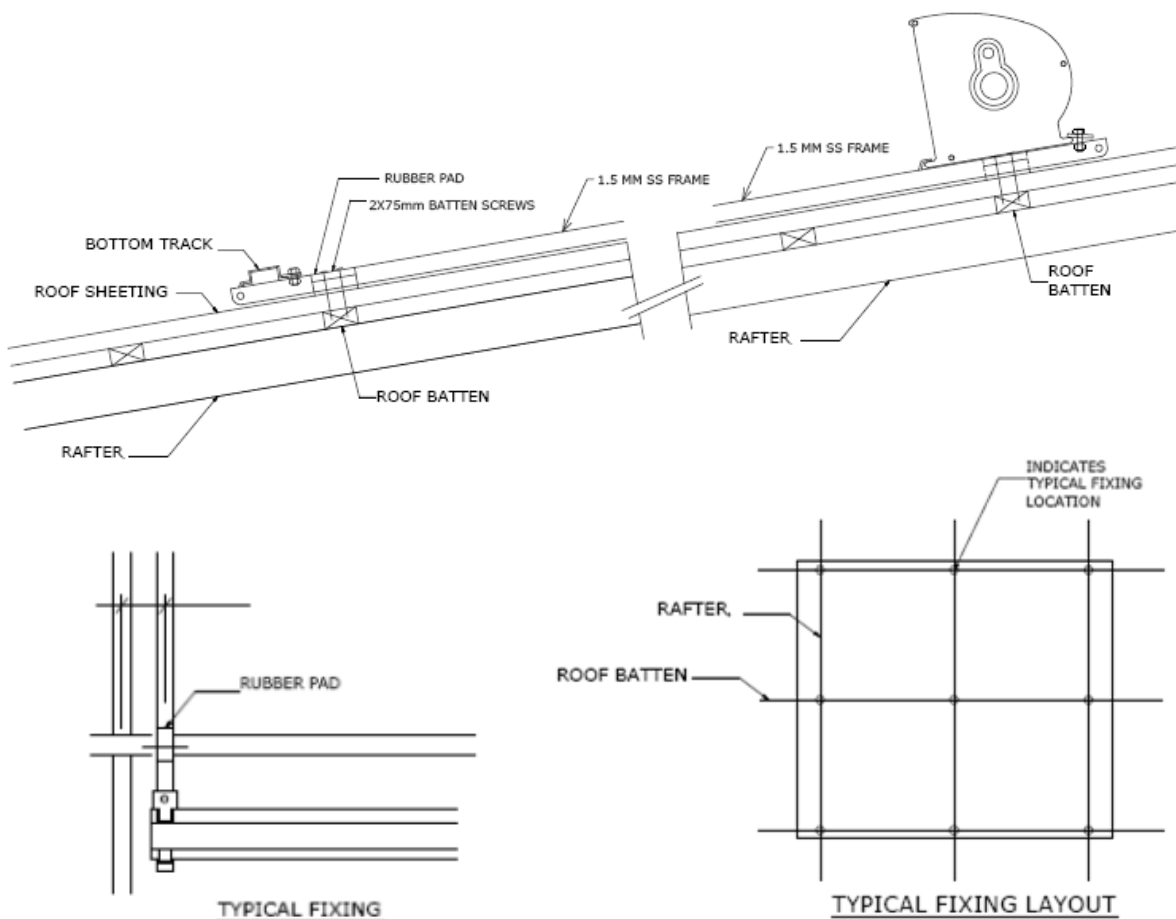
The location of the manifold should be carefully planned for tiled roofs in order to minimize the number of tiles that needs to be removed and returned into place for the correct pipe and frame locations.

Positioning Manifold

The frame front tracks should be located such that they lay flat and even on the roof, the manifold and frame track can slide left and right in relation to the frame front tracks so there is some flexibility when selecting suitable location for the frame front tracks. Generally it should match the tiles/shingles and also line up with the roofs rafters or as close as possible.

Attachments to Roof Frame

The collectors mounting frame should be fixed to the roof in accordance with SolarArk guidelines contained within this document .For non-cyclonic wind regions (wind <100km/h), and a flush mounting format, one Ø6x75mm stainless steel batten screw may be used per attachment point (3 per frame front track and 3 per rear). For high wind/cyclonic regions, two Ø6x75mm stainless steel batten screws must be used per attachment point. An additional hole may need to be drilled in the rubber pad to facilitate the second screw (Note there are 3 attachment points per frame front track and 3 rear). If unsure of regional wind levels treat as cyclonic regions requirements.



Wind Loading

Wind loading and wind resistance issue should always be considered during the planning stage of the collector installation process. The local Building codes and regulation should always be followed in regarding to installation of such objects.

The SolarArk standard frame kits are designed to withstand high wind speeds of up to 220km/h, as per frame kit assembly diagram contained within this document.

For flush mounting in high wind regions refer to roof mounting instruction diagram. Any other mounting method in high wind areas should only be conceded by obtaining an authorized engineering design approval.

It is the responsibility of the installer to ensure that the frame mounting is of suitable strength that meets building regulations and any other relevant requirement.



Snow Load

In heavy snow fall areas the solar collector should ideally be installed at an angle of 50° or greater to help promote snow sliding off the tubes.

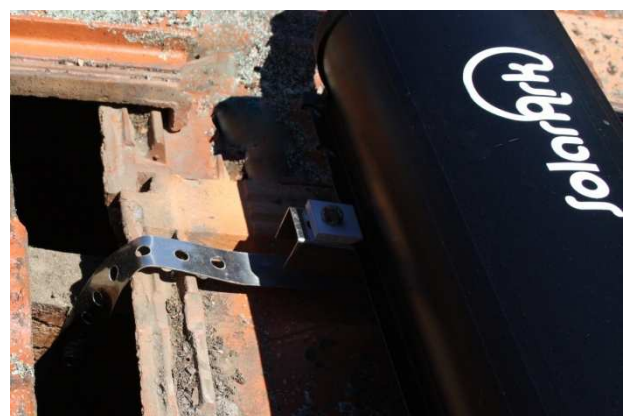
Always install the collector with a raised front tube holder frame. A distance of 20-25cm should be allowed off the roof surface, allowing snow to settle beneath the collector so it can be easily cleared away.

A SolarArk front track extension should be used for this purpose. Each evacuated tube is capable of withstanding a load >50kg. However roof attachment may need to be reinforced. Local snow loading regulation should be followed.



Tiled Roof Attachment

For flush mounting collector on tiled roofs, the pre drilled stainless steel strap should first be mounted on the manifold end off the front track using 8mm bolts supplied and the other end of the strap to be fastened under the tile to the roof rafter using stainless steel batten screws. Repeat the process to all front tracks.



FRONT FRAME STRAP



Once the upper straps are attached and secured adjust the bottom straps to provide support to the bottom end of the collector. Attach, adjust and tighten the bottom straps to ensure that they too are providing adequate support.

The rubber blocks should be fitted to the underside off the front track, secure with a small amount of silicon. This will eliminate the frame from contact with the roof tiles.

The stainless steel straps should be positioned so that they go down the trough of the tiles. If you find that the rafter does not exactly line up with the trough in the tiles, you can bend the stainless steel strap after connecting it to the rafter so it will be in the correct position.

In high wind areas roof attachment straps should NOT be used, instead direct bolting through the tiles into the roof frame is recommended. Care should be taken when drilling a hole in the tiles to avoid breakage.

Colorbond/Zincalume/Galvanised Corrugated Roof

For installation on corrugated iron roof the rubber mounting blocks must be used along with M6 x 75mm stainless steel hex head roofing screws to be fastened through the centre hole of the rubber block.

Small amounts of silicon to be used under the rubber block forming a water tight seal. The hole in the centre of the rubber block should also be filled with silicon along with the thread of the stainless steel roofing screw.

Note: additional 9mm holes can be drilled if need be for correct aligning with roof structure. Always avoid direct contact between the stainless steel screws and roofing sheets to prevent galvanic reaction. A 10mm Ø hole should be drilled in roof sheets. NOTE do not over tighten the screws and cut through the rubber blocks.



Asphalt Tiled Roof

For installation on an asphalt tiled roof the standard frame can be directly mounted to the roof surface. Alternatively the round feet and rubber feet can also be used; round feet and rubber are an optional extra to be purchased separately.

Flat Roof Installation (Adjustable Frame)

The adjustable angle frame to be used for flat roofs or with roofs under 20° pitch, adjustments from 27°-67° allows for a wide range of installation including reverses pitch slop. Included in the adjustable frame kit is the entire component required to assemble the complete frame. Round feet complete with suitable rubber mounts can also be used for installation (round feet and suited rubber pads are an optional extra).

There are four models of adjustable frames: 10, 20, 22, and 30 tubes the following is the attachments provided with each frame.

10 tubes frame uses 2 x front tracks, 2 x rear legs, 2 x bottom roof track, 1 x rear cross brace, 1 x bottom tube holder track, and 1 x front horizontal brace and 4 x rubber blocks.

20 tubes frame uses 2 x front tracks, 2 x rear legs, 2 x bottom roof track, 1 x rear cross brace, 1 x bottom tube holder track, 1 x front horizontal brace and 4 x rubber blocks.

22 tubes frame uses 3 x front tracks, 3 x rear legs, 3 x bottom roof track, 2 x rear cross brace, 1 x bottom tube holder track, 1 x front horizontal brace, and 6 x rubber blocks.

30 tubes frame uses 3 x front tracks, 3 x rear legs, 3 x bottom roof track, 2 x rear cross brace, 1 x bottom tube holder track, 1 x front horizontal brace, and 6 x rubber blocks.



Adjustable frame Front Track

The front track is fixed in position as directed by the fixing of the rear cross braces and front brace positioning. If the front racks need to be adjusted for aligning purpose additional holes can be drilled in different locations on the cross braces and front brace to allow for the new position.

Adjustable frame Round Feet Anchoring

The round feet on the adjustable frame should be bolted through the two predrilled 12mmØ holes with an M10 or larger stainless steel masonry anchors/ bolts or roofing screws. The installation surface that the frame to be installed on must be solid and able to withstand significant lifting force that may be encountered during high winds.

Adjusting Frame Angle

The rear legs of the flat roof frame comprise two interlocking pieces. The top and bottom legs slide into each other to allow the length of the rear leg to be adjusted, thus changes the collector angle from between 27°-67°. If an angle of less than 27° is required the top leg may be cut short to lessen the angle. However a minimum of 20° angle is required for collector performance. If the top leg is cut short, the rear cross brace holes will not match the rear legs holes, in which case additional holes in the rear cross brace must be drilled the rear cross brace must be installed, as it provides lateral rigidity to the frame.

Collector Plumbing

Once the manifold and mounding frame are assembled and fixed in place the manifold can be connected to the plumbing.

The evacuated tube and heat pipes should only be installed after the system plumbing installation is completed and filled with water, all the air is purged out. Filling a hot dry solar collector will generate a large volume of hot steam that could be dangerous and will take a long time to purge out of the system.

There are two sensor ports located on the manifold near the copper flow and return ports, either ports can be used as flow or return sensor to be installed on the solar return port.

The controllers' temperature sensor should be coated with thermal paste and inserted into the sensor port the full depth, a small amount of high temperature silicon should be used to cover the sensor port after insertion of sensor



Do not run the sensor wire underneath the insulation along the copper pipe, high temperature can damage the sensor wire. Always run sensor wire on top of insulation, securing in place every 15cm with UV resistant nylon cable ties.

The pipe insulation must be installed tightly and covering all pipe work and fittings all the way to the manifold and sealed against the end plates of the collector with silicon seal all around to prevent water from entering the inside of the pipe work.

Braze copper piping directly to manifold ports is not recommended as brazing may damage rubber components on solar collector header .do not over tighten or twist the copper piping on manifold that could also cause damage only use brass compression fittings supplied.

There are two compression fittings supplied with the solar collector manifold

- 22mm compression to ½ inch flare connection if connecting multiple collectors for commercial applications
- 22mm compression to ¾ brass fittings may be used. Only Australian standard approved brass fittings should be used. For domestic heating application up to 60 tubes DN 15 / ½” copper piping can be used.



System Filling and Air Purging

Once the system installation is completed the tank is filled with water and the system itself is flushed of air. Please be advised this should be carried out prior to installation of glass evacuated tubes.

- Open cold water supply to tank to commence filling. Ensure PTR valve lever is held open to allow release of air. Close PTR valve once tank is full and water is expelled from TPR valve.
- For open loop mains pressure systems the collector loop is automatically purged of air for systems fitted with air eliminators. For systems without air eliminators, loosen the union on the return end of the collector port to allow air release. Run the circulating pump at full speed be sure to open the furthest hot water tap from the tank also open TPR valve to assist in expelling all the air out of the tank.
- For low pressure open loop systems with an auto-air eliminator run the pump at high speed, operate the PTR valve to release any air that may be trapped in top of tank. If no air eliminator installed loosen the collector outlet fitting to release the air.
- For closed loop system the tank is fitted with an internal coil heat exchanger for the solar loop. The solar loop water is not in direct contact with potable water in the storage tank. Purging the solar collector loop is as follows.
- Open the drain valve and flush the solar loop for several minutes to clear any dirt/debris out of the system then close the valve.
- Run the circulating pump for several minutes and slowly crack open the drain valve slightly to allow any remanding air out then close valve repeat this process after few minutes of the system running to be sure all the air is expelled.
- Upon commissioning be sure to remove the drain valve handle to avoid accidental water dumping or tampering.
- For closed loop anti-freeze charged systems contact SolarArk for details.

Draining Solar Collector

Draining the solar collector may be required to service, repair or remove. Such work should be carried out by appropriately qualified personnel only to avoid injury and collector damage.

Turn off the water supply to the hot water storage tank.

Isolate the power supply to the hot water storage tank, pump and controller before any water is drained.

If the hot water tank is not to be drained and the aim is to drain the collector only, close both valves on the flow and return lines at the tank end isolating valve should already be fitted, immediately open both drain cocks **CAUTION** the water may be extremely HOT, once the water is drained and the collector is dry repair or disconnection can start.

If there are no isolating valves installed undo both fittings on solar flow and return let water drain out completely before commencing any repair or disconnection **CAUTION HOT PIPING AND FITTINGS.**

Once repair is completed carry out the installation process in this document.

Tempering Valve

Tempering valves are a requirement as a safety device to reduce hot water supply to a maximum of 50°C. AS/NZS 3500.4:2003 details the requirements of the tempering valve.

The function of the tempering valve is to reduce the 65-75 degree water leaving your hot water storage tank and blending it with cold water to achieve 50°C. To reduce the possibility of scalding the tempering valve must be installed to the hot water supply line incorporating all sanitary household hot water outlets.

Only a solar rated tempering valve (99°) to be used with the SolarArk hot water system.

Tempering valve should be inspected and correctly adjusted every year, replaced every five years. All adjustments of a tempering valve should only be carried out by a licensed plumber.



Flow Control Valve

For optimum solar collector performance a flow control valve should be installed and set to the right water flow as nominated by SolarArk.

The water flow valve should be installed on the water flow side of the solar loop after the pump outlet pointing toward the solar collector as indicated on the water flow valve directional arrow.

The flow control valve can be adjusted using a screwdriver once the pump is running and all the air is purged from the system set the pump speed to low and turn the dial on the flow control valve until the bottom of white float indicates the correct flow. The following is the minimum flow rate.

Collector	Number of Tubes	Minimum Flow Rate
SA-10	10 Tubes	0.6L/min
SA-20	20 Tubes	0.8L/min
SA-30	30 Tubes	1.25L/min
SA-40	40 Tubes	1.5L/min



Automatic Air Eliminator

The Automatic Air eliminator is designed to prevent any air from staying in the system in the event of a power failure or stagnation. The air eliminator will automatically release any air or steam that may accumulate in the system this will help the solar hot water system to operate efficiently.

The air vent should be mounted vertically at the same or higher level of the manifold outlet port on a female T-piece to allow it to operate correctly and is mounted directly on to the 22C x 15M union via female T-piece at the collector outlet (return line) or a SolarArk attachment fitting can also be used. Technical specifications for the Automatic Air Vents are contained in the SolarArk Component Specification Manual.



SolarArk Attachment Fitting



T-Piece



Circulating Pump

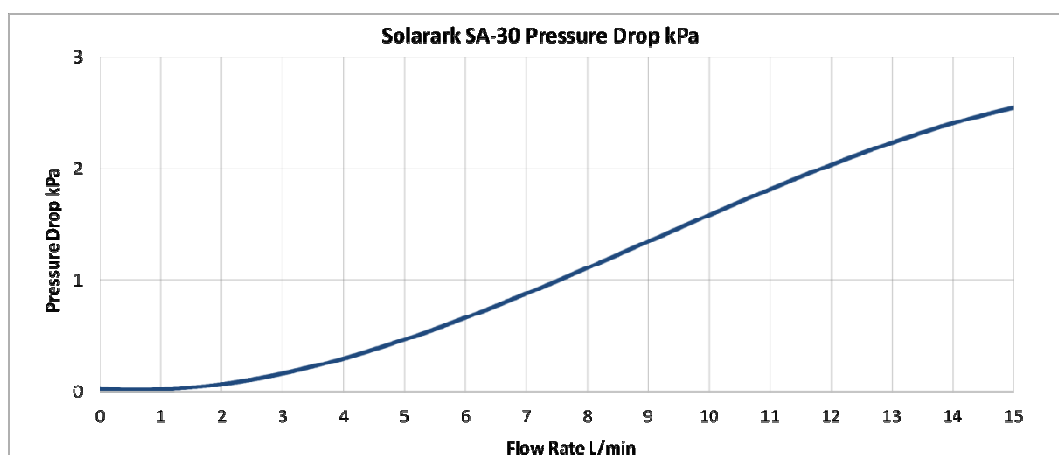
The circulating pump supplied with the SolarArk system is a 3 speed pump to provide adequate pressure and flow to circulate water through the solar loop. The pump is suitable for use with SA-10, SA-12, SA-20, SA-22, SA-30 and SA-40 flow rate between 0.6 l/min and 2.4 l/min which ensures maximum system performance.

For multiple collector installation the minimum indicative flow rate of 0.06 l/min per tube should be used. The water flow may be adjusted for higher or lower temperature delivery to suit different application.

For multiple collector installation consult SolarArk for specific water flow requirement.

When installing solar loop piping always consider the pressure drop throughout the pipeline, bends, tees, elbows, pipe runs and pipe size all components contribute to pressure drop.

The pressure drop for a SolarArk 30 tube header at 1.5l/min 20°C 0.01 KPa. The pressure drop is influenced by temperature. As the temperature increases the pressure decreases.



The solar collector installation will differ in pipe runs and height from job to job there for the pump requirement may change in order to simplify the installation SolarArk pump has a 3 speed settings to suit the site conditions for most installation speed 1 is used for longer pipe runs and two or three story homes the higher pump speeds can be used to achieve correct flow rate. Always start with low speed.

A flow control valve should be used to set the correct water flow for optimum performance. Use the water flow rates supplied in this document in the flow control valve section as a guide.

If a flow control valve is not installed correct system operation can also be achieved by observing the pump cycle for correct water flow. Under normal conditions with sunny weather the pump should run continually for 10-15 min some time longer depending on sun shine. If the pump is cycling more than once every 2-3 minutes, these indicate high water flow which is not recommended. During cloudy days the pump cycles on and of every 3-5 minutes or there about.

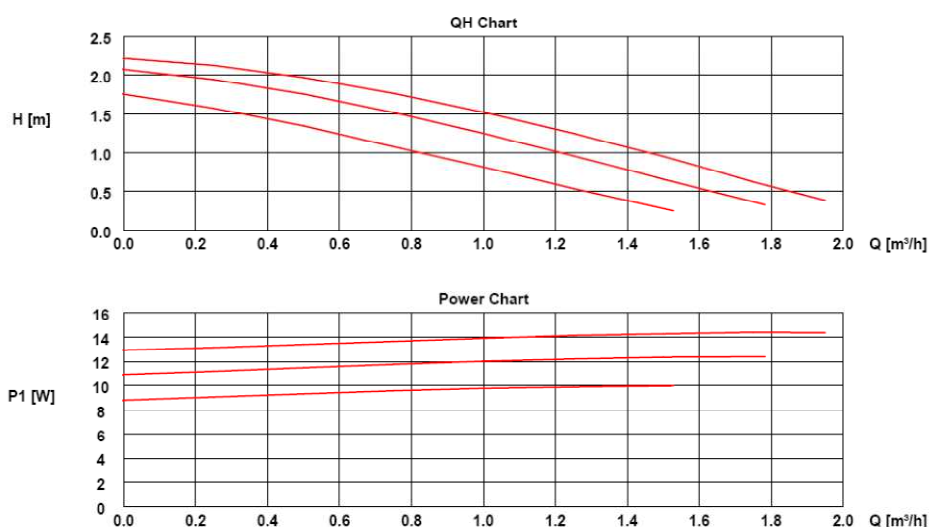
The return line should be around 5-10°C hotter than the supply. If the return line temperature is too hot that would indicate that the water flow is too low, if the water return is similar in temperature to supply that would indicate no water flow. That could be due to an air lock or pump head pressure is insufficient.

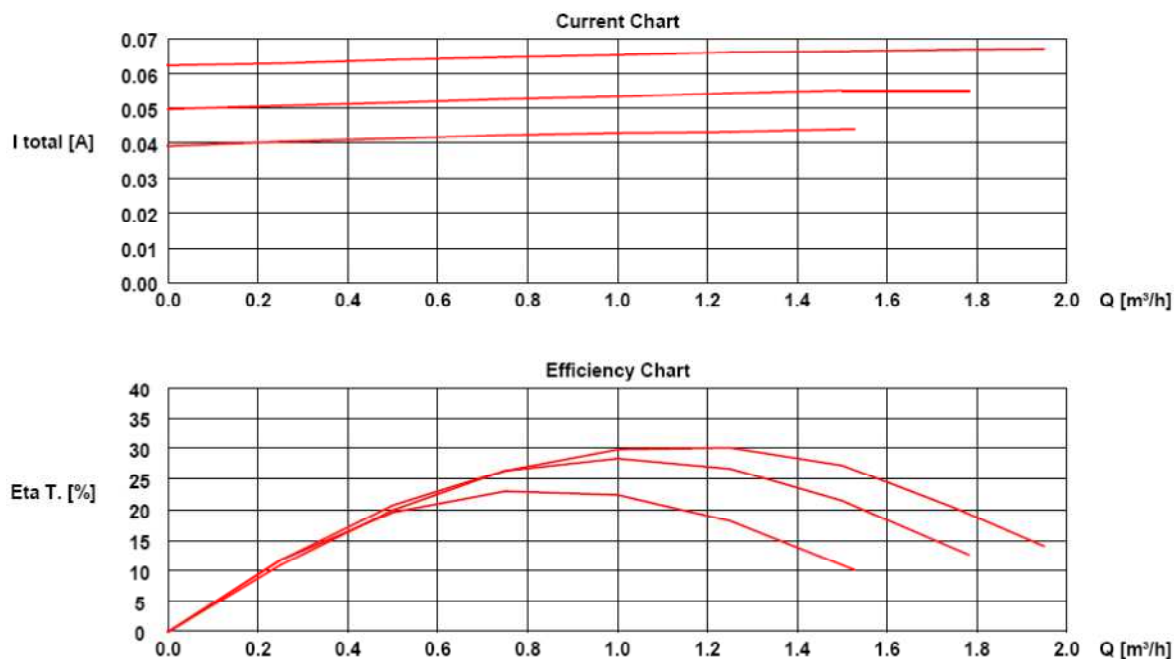
For systems with a digital display model controller the temperature can be monitored. Under normal operation conditions the collector temperature should gradually increase depending on the solar radiation levels that would influence the speed at which the temperature will increase by. Within a few minutes the temperature in the manifold should rise 8°C higher than the water temperature in the bottom of the tank. At that point the pump should start and the temperature in the manifold will initially increase by 2-3°C as the hot water from the inlet port passes through the manifold and past the sensor. Within around 60 seconds or there about the temperature in the manifold should gradually drop back down to 2°C higher than the temperature at the bottom of the tank. If the temperature within the manifold does not gradually decrease that would indicate inefficient circulation, however if the temperature props to quick that would indicate that the water flow is too high. High water flow would lead to turbulence in the storage tank and irregular pump cycling.



Solar circulating pump should always be rated to 110°C and installed on the water supply line to the solar collector with a high temperature check valve installed on the pump outlet. Always allow 20cm of straight pipe both sides of the pump prior to the installation of any bends or valves to avoid pump cavitation and pump performance issues.

The GRUNDFOS SOLAR 15-20 CIL2 pump supplied by SolarArk should always be installed in a vertical position.





Controller Function & operation

The solar hot water system works by extracting heat from the solar collector and storing it in the hot water storage tank. The controller works by means of cycling the pump on and off through a temperature differential control. The roof temperature sensor measures the collector outlet temperature while the tank sensor measures the temperature at the bottom of the tank the temperature difference is referred to as a delta-t (Δt). For the SolarArk systems when the collector temperature is 8°C hotter than the temperature in the bottom of the tank the controller will power up the pump transferring the collected heated water to the storage tank. When the temperature of the collector drops to a 2°C higher than the temperature at the bottom of the tank the controller will cut the power to the pump. The cycling process will continue throughout the day the number and length of cycles will depend on the amount of solar radiation levels throughout the day. Once the storage tank reaches 70°C the controller will no longer power up the pump until the temperature in the tanks drops below 70°C.

The solar system controller also provides frost protection in the event that the temperature in the manifold drops down to 4°C the controller will power up the pump circulating small amount of hot water through the solar loop to increase the temperature to 6°C once the temperature is at 6°C the controller will cut the power supply to the pump.

There is no need for the installer to change or program the controller it is preset by SolarArk to the correct settings.

Both controller models come with a pump override button by holding down the PUMP button that will run the circulation pump for as long as you keep holding it down. The button is a helpful fetcher to be used during system commissioning.

The following is the pre-set program settings:

PUMP ON: 8°C

PUMP OFF: 2°C

TOPOUT: 70°

FROST: 4°C



The standard controller that is supplied with the SolarArk system does not have a digital screen display it is factory set and cannot be reprogrammed on site. There are four indicator lights on the front of the controllers which indicate the functions. POWER, PUMP ON, FROST, TOPOUT.

POWER: indicates power is on and the controller is active

PUMP: indicates circulating pump is running.

FROST: indicates frost function is active.

TOPOUT: indicates tank has reached 70°C.



Controller Temperature Sensors

The standard SolarArk controller has one roof sensor and one tank sensor or there is an optional controller with a digital display which has one roof sensor, one bottom tank sensor and one top tank sensor.

The roof sensor has a 20m long cable that should be installed on the manifold sensor port on the outlet end (solar return line).

The tank sensor for the standard controller should be installed in the tank sensor port located at the bottom of the tank.

The controller with the digital display model the upper sensor should be installed in the tanks upper sensor port and the bottom sensor should be installed in the tanks bottom sensor port.



All controller temperature sensors should be coated with thermal paste and inserted into the sensor ports the full depth, a small amount of high temperature silicon should be used to cover the sensor port after insertion of sensor.

Do not run the sensor wire underneath the insulation along the copper pipe, high temperature can damage the sensor wire. Always run sensor wire on top of insulation, securing in place very 15cm with UV resistant nylon cable ties.



Pump and Controller Box

The pump and controller can be supplied in one box to assist in installation and provide weather protection to the circulating pump. The pump is not water proof and should always be installed avoiding direct water contact. Pump warranty will be void if fault occurred due to water damaged.



System Start Up

Once the cold water supply is opened and all the air expelled from the system allow the main water supply pressure to completely fill and pressurise the system, check the piping for water leaks.

Power up the solar controller, turn the pump on by pressing the pump button on the solar controller if the system is fitted with an air eliminator remove the cap on the air eliminator until a steady flow of water is expelled. Once the process is completed replace the valve cap ensures that it is tightened then backed off one complete turn.

Gas supply and power to the gas booster may be turned on, gas unit piping should be checked for leaks it is important to be sure that the gas booster operation is checked and functioning correctly.

Installation Reference Guide

1. Read and understand this manual for installation process.
2. Ensure all safety precautions are followed for a safe system installation.
3. Unpack all parts and check against packing slip.
4. Select collector position (NORTH FACING ROOF).
5. Mark frame position on roof and slide back the appropriate tiles for mounting points.
6. Assemble frame on the roof including roof attachment straps.
7. Install manifold and bottom track.
8. Insure that the manifold and bottom tube locking caps are aligned on the front roof frames.
9. Fix collector frame in place and drill 16mm hole in the roof tiles for the flow and return piping.
10. Select the best tank position in pace ideal pipe run of 8 to 10 m each way for flow and return pip run
11. Secure the tank in place on a suitable base.
12. Install the pump away from direct water contact in a vertical position.
13. Install a double power point within 1m of pump and controller location.
14. Connect plumbing supply water to tank complete with solar rated tempering valve and connection into the home.
15. Connect solar loop plumbing and roof temperature sensor.
16. Check gas booster for compatibility with gas supply NG or LPG.
17. Check gas meter and gas supply piping for suitability.
18. Connect gas booster to gas main line with 3/4" copper piping.
19. Plumb up the gas booster from the hot water out let of tank than into the home.
20. Plug in the instantaneous gas booster to power outlet.
21. Fill up the system with water to equalise with water supply pressure and check for leaks.
22. Purge system to release all air that may be trapped in piping and water tank.
23. Power up the controller and plug the pump into controller socket marked pump.
24. Adjust flow control valve for the correct flow rate.
25. Ensure that the pump is cycling on and off as the collector heats up.
26. Open a hot water tap and check instantaneous gas booster is igniting and heating water.
27. Complete and sign the installation report and send back to SolarArk.
28. Complete and sign warranty form.
29. Complete and sign all government rebate forms for the customer to post and claim rebates.
30. Supply customer with invoice for the installation of the SolarArk solar hot water system
31. Supply the customer with an owner's manual and a run down on the system operation.
32. Clean collector and remove all rubbish from the installation job site.
33. Complete the SolarArk check list and a copy to SolarArk for job record.
34. Take photos of the job for your record and email a copy to SolarArk.

Troubleshooting

Any system adjustments, repairs or maintenance should only be carried out by a qualified technician.

Insufficient hot water	<ul style="list-style-type: none"> ▪ If the gas booster is not turned on before sending water through, it may default to 40°C. To reset the system, turn the gas booster off via the power point or take the plug out of the controller and wait two minutes before turning the system back on. ▪ If connected to full tariff, the element can be turned on for a few hours if additional hot water is needed. Ensure there is a timer fitted for full tariff connection <p>Lack of hot water will generally be related to the gas or electric heating booster system. Contact your SolarArk dealer.</p> <p>It is an Australian standard requirement for the water to be heated to 60°C to inhibit the growth of Legionella Pneumophila bacteria, the booster system should never be turned off or set below 60°C.</p>
Lack of Solar Contribution	<p>During winter months, and periods of rainy or overcast weather, the amount of energy produced by the solar collector will be reduced.</p> <ul style="list-style-type: none"> ▪ Firstly, check if there is power supply to the controller - the green light should be ON at all times. The pump light indicates that the pump is running and should be cycling ON and OFF. The pump should not be continuously running for very long periods of time. ▪ Check for broken tubes and/or excessive water leaks. ▪ Incorrect installation or collector configuration. <p>Should there be a controller or pump malfunction, contact your SolarArk dealer. For plumbing or electrical related problems always appoint qualified personnel to carry out repairs.</p>
“Banging” Noise in Pipes/Tank	<ul style="list-style-type: none"> ▪ The hot water has remained stagnant for a long period of time. ▪ Mains water supply to the tank is $\leq 400\text{kPa}$. ▪ Solar collector oversized for the tank. ▪ Short pipe run between the collector and the tank. ▪ High Solar contribution and low levels of water usage ▪ Check valve (duo-valve) not installed or faulty – Contact your SolarArk dealer.
Releasing of Hot Water from TPR Valve	<p>Few litres daily are normal.</p> <p>To test the system, run the hot water tap in the bathrooms or kitchen for 3 minutes to release some heat from the system (caution: water is hot). If after this period the tank is still regularly releasing hot water, it indicates a definite problem. Contact your SolarArk dealer.</p>
System producing more hot water than is required.	<p>This will be most apparent in the summer months when solar contribution levels are high.</p>

Troubleshooting Guide

System Troubles	Possible Fault	Solution
Insufficient hot water or no hot water	Boosting not working (Electric)	Check power supply from distribution board and to the storage tank. Check tank thermostat if manual reset is triggered. Check electric element for fault. Change to full tariff and install a timer set to run depending on your water usage pattern.
	Boosting not working (Gas)	Check power supply to gas booster. Check gas supply is available and is turned on. Open one or two hot water taps to ensure a water delivery of 2.4l/m or higher to activate booster.
	Incorrect Solar Hot Water sizing for customer requirement.	Refer to SolarArk owner's manual for correct sizing requirement or call SolarArk for selection assistance.
Insufficient hot water or no hot water	Hot water wastage from pressure and temperature relief valve (TPRV)	It is normal for the TPRV to allow a small quantity of hot water to be discharged during heating cycle. Place a bucket under the TPRV. If in 24 hour period a volume of more than 15L is discharged there may be a problem. Lift the lever on the TPRV slightly for a few seconds to reduce pressure. HOT WATER will come out if the valve discharges at high flow that would indicate water supply pressure to tank is too high contact your SolarArk dealer.
	Replacing TPRV	Never replace the TPRV with a higher rated valve.
	Expansion control valve (ECV)	It is normal for the ECV to allow a small quantity of hot water to be discharged during heating cycle. Place a bucket under the ECV. If in 24 hour period a volume of more than 15L is discharged there may be a problem. If the valve dribbles continually try lifting the lever to discharge some water for a few seconds. If the discharge continues contact your SolarArk dealer.
Circulating pump always ON	Air lock in manifold	Ensure system is bled properly by opening the return line drain ball valve and closing the ball valve on the return line into the tank of the solar loop. If no ball valve is fitted loosen the union brass fitting on the solar return line at the tank. Very hot water or steam will be released.

Circulating pump always ON	Insufficient or no flow rate	Pump cavitation could cause a lack of water flow loosen the union on the pump outlet be care full very hot water or steam will come out. Ensure there is 20cm of straight pipe both sides of the pump prior to any bends or elbows installation. Inspect the check valve for correct operation. Change pump speed to medium then high observe the flow control valve for correct water flow. If necessary remove bends replace with large radius elbows and remove unnecessary bends. Flush solar loop to remove and dirt/scale that could be causing blockage.	
Pump not cycling during good weather and collector is hot	Roof sensor not installed correctly	Insure that the roof sensor is inserted in the manifold sensor port correctly and coated with thermal paste.	
	Sensor fault	Check sensor operation (sensor resistance)	
		Temperature	Resistance
		0°C	27.25
		25°C	10.00
50°C	4.162		
75°C	1.925		
100°C	0.973		
Above 150°C or ‘short’ Sensor Light Slow Flash	< 0.300		
Below -40°C or ‘open’ Sensor Light Fast Flash	> 200		
Topout	The tank reached maximum temperature the pump will not run.		
Pump running at night	Frost mode	This is a normal function however the pump should not run more than once every hour. If pump runs frequently upgrade piping insulation	
TPR Valve dumping water	Controller Topout setting to high	Maximum Topout 70°C. Check tank sensor for correct installation.	
	TPRV Normal operation	It is normal for the TPRV to allow a small quantity of hot water to be discharged during heating cycle.	
	Faulty TPRV or Pressure reducing valve not fitted	Place a bucket under the TPRV If in 24hour period a volume of more than 15L is discharged there may be a problem. Lift the leaver on the TPRV slightly for a few seconds to reduce pressure HOT WATER will come out if the valve discharges at high flow that would indicate water supply pressure to tank is to high contact your SolarArk dealer.	

Rattling/banging noise in pipes when hot water is used.	Steam forming in the manifold due to stagnation more so in low pressure water supply.	Install an air eliminator on collector outlet. Increase cold water supply pressure to 400 kpa +. Install collector for winter sun performance.
	Duo-valve not installed or faulty. Combined with low water pressure supply < 400KPa	Install/replace Duo-valve on cold water supply to storage tank. Install pressure booster pump (above 400KPa). Install Air Eliminator on collector outlet. ECV or PTRV should be dumping water daily.
Little to no solar gain	Insufficient flow rate	Pump cavitation could cause a lack of water flow loosen the union on the pump outlet be care full very hot water or steam will come out. Ensure there is 20cm of straight pipe both sides of the pump prior to any bends or elbows installation. Inspect the check valve for correct operation. Change pump speed to medium then high observe the flow control valve for correct water flow. If necessary remove bends replace with large radius elbows and remove unnecessary bends. Flush solar loop to remove and dirt/scale that could be causing blockage.
	Booster is turned off.	In winter or cloudy condition there will be a reduction in solar contribution. The solar may not heat the tank to full temperature there for the boosting must not be switched off. It is an Australian regulation requirement for boosting NOT to be turned off.
	Increased hot water demand.	The higher the water consumption the lower the solar contribution. To accommodate the increased hot water usage an additional may be installed.
	Incorrect collector angle.	The solar collector should not be installed at an angle lower than 20° or to latitude angle. Preferably 15-20° greater than latitude.
	Thermal paste not used /heat pipes not installed correctly.	Ensure that the heat pipe is coated with heat transfer past and inserted all the way into the manifolds' heat pipe port.
	Damaged tubes.	Be sure to inspect the tubes for any damage or loss of vacuum. Replace if necessary.
	Excessive heat loss in solar loop/damaged insulation.	All exposed copper includes brass fittings should be well insulated with UV protected insulation. Inspect the insulation for UV degradation damage and replace if necessary.
	Collector shading.	If the solar collectors are shaded by trees or any other objects the collectors' output will be reduced. Trim the trees or relocate collectors.
	Power to controller switched off	The solar collectors will NOT operate if power to the controller is interrupted. Damage to solar collector due to power interruption will void warranty.
Water Hammer	Plumbing in the premises	Pipe work should be clamped. Install a pressure limiting valve & water hammer arrestors if required.

Installation Instructions



Safety – Before you Start

Important Note:

Do not commence an installation until you have satisfied yourself that all Safety issues associated with working on and lifting components onto a roof have been addressed

All work associated with the installation must comply with local authority regulations

- Always wear safety glasses when handling evacuated tubes
- Always wear leather gloves when handling components
- Take extreme care when working at heights

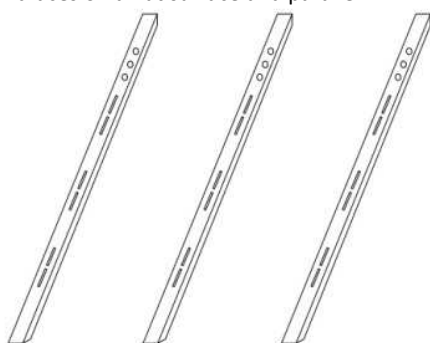
It is the responsibility of the installer to adhere to all relevant health and safety precautions as specified by your relevant government regulations

Frame and Manifold Assembly

Step 1

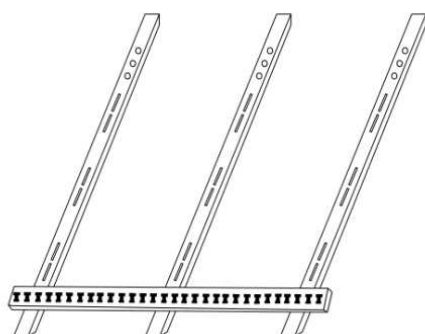
The frame can be assembled at ground level then carry onto roof or assembled on the roof.

Lay main braces on a flat surface and parallel



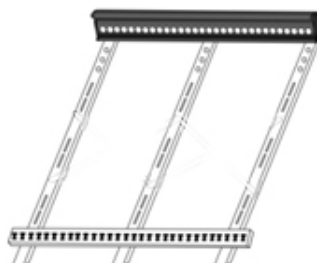
Step 2

Connect the bottom track to main braces using bolts supplied



Step 3

Slide front of manifold into slots on frame, followed by inserting clip into groove on rear of manifold and tighten. Finish manifold assembly by coating O-rings with solid soap or oil to aid with insertion of evacuated tubes. Attaché straps to Frame assembly.



Frame mounting on roof

Pitched Roof Installation

Installation Planning

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).

Positioning Manifold

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, or as close as possible to, the roof's rafters.

Attachment to Roof Frame

For non-cyclonic wind regions (wind <100km/h), and a flush mounting format, one Ø6x75mm stainless steel batten screw may be used per attachment point (3 per frame front track and 3 per rear). For high wind/cyclonic regions, two Ø6x75mm stainless steel batten screws must be used per attachment point. An additional hole may need to be drilled in the rubber pad to facilitate the second screw. (Note there are 3 attachment points per frame front track and 3 rear).

Tiled Roof Attachment

For flush mounting on tiled roofs, there are attachment straps provided for fixing frame in place; 2 per track one to be fixed on the bottom and one on the top of track. The other end is connected to the roof rafter using 2 x Ø6x75mm stainless steel batten screws. Once the upper straps are attached and tightened, adjust the bottom straps to ensure that they too are providing support to the frame.

In high wind areas roof attachment straps should NOT be used, instead direct bolting through the tiles into the roof frame is recommended. Care should be taken when drilling a hole in the tiles to avoid breakage.

Corrugated Steel Roof

For installation on a corrugated steel roof, the standard rubber pads can be used to separate the frame from the roof and also to seal the hole. It will bend to match the shape of the ridge. Never install in the valleys.

Where possible only use stainless steel screws. Direct contact between the screw and the roofing material should be avoided to prevent galvanic reaction and therefore a >10mm diameter hole should be drilled. If the roofing screw is galvanized steel, direct contact between the screw and the frame must be avoided by use of a nylon or rubber washer.

Cover the bottom side of the rubber pad with a layer of outdoor grade silicone sealant to ensure a waterproof seal with the roof is formed. Also put a small amount of silicone sealant on the thread of the screw to form a waterproof seal with the rubber pad hole.

System Basics

- Collector should be faced due north (+/-20°)
- Collector installation angle of ideally 20°+
- Locate tank as nominated by SolarArk or an authorised dealer. Or as indicated with in this document.

Plumbing

CONNECTION FROM TANK AND MOUNTING TO SOLARARK CONTROL BOX

To complete the mounting of SolarArk control box if used, connection from tank to SolarArk control box and from control box to collector

The procedure is as follows:

- Mount control box on wall no more than 1.5m from GPO and 1.5m from tank sensor port.
- Connect ½"insulated copper pipe from solar loop feed from tank to flow side of SolarArk control box with no less than 20cm of straight insulated copper pipe prior to any bends
- Connect flow out from Solar Ark control box using 1/2" insulated copper tube to ½" flare fitting on Solar Ark collector provided. Always install a swing type brass check valve with no synthetic material to pump outlet
- Insert tank sensor from Solar Ark control box or controller to tank sensor port located on the bottom of the tank. Coat sensor with heat paste provided and seal end of sensor port with high temp silicon.

CONNECTION TO THE COLLECTORS FOR OPEN CIRCUIT SYSTEMS

- To complete the collector installation and connections on the collector array

The procedure is as follows:

- Fit 22mm male thread compression gland to 1/2" flare fitting supplied to flow side of collector
- Attach 1/2"insulated copper pipe from control box to ½" flare fitting supplied
- Fit 22mm male thread compression gland to 1/2" flare fitting supplied to return side of collector
- Fit insulated ½" copper pipe from flow return on collector to solar return on tank provided.
- Coat sensor with heat paste and insert roof sensor to return side of collector. Seal end of sensor port with high temp silicon. Ensure that the connection is secure and safe. (It is important that the sensor cable DOES NOT contact the hot collector return pipe)



Commissioning

Once all flow, return lines are completed, the main cold feed to the tank can be opened to fill tank. To aid in filling of tank open a hot water tap, if further clarification is needed to aid in commissioning refer to details within this documents.

- Check system for leaks
- Connect sensors at the controller if they got removed for installation purpose.
- Connect power cord off pump to socket on controller
- Always bleed air from solar loop by disconnecting solar loop return from tank and running pump on high speed to discharge air from line. If pump is not being cycled by controller, press pump button on the controller or pump can be connected direct to power.
- Do final leak check
- Install tubes following instructions listed

Evacuated Tube installation

- Pull out each heat pipe by 15cm. Hold top plate in place. Coat each pipe tip with thermal paste- squirt thermal paste into short piece of insulation, push over each heat pipe.



- Lubricate mouth of evacuated tube (outer wall) with weak dish wash liquid and water mix. Use sponge or spray bottle

DONT SPRAY WATER INSIDE TUBE

- Guide the heat pipe up into the header port - push in full depth



- Push the evacuated tube into place. Don't twist more than 1/8th left and right turn
- If the heat pipe is inserted properly no clear glass should be visible

DO NOT PULL THE EVACUATED TUBE DOWN



- Once all tubes are installed ensure they are aligned neatly
- Clean each tube and any dirty marks

Clip Process



Final Solar Ark commissioning

- Wipe and clean tubes using soft clean cloth.
- Check that the pump is cycling correctly, if there is good sunlight available the system will cycle every 2-4 minutes for 1 minute at a time depending on available sunlight. . If pump is not being cycled by controller, pump can be connected direct to power or press pump button on controller.

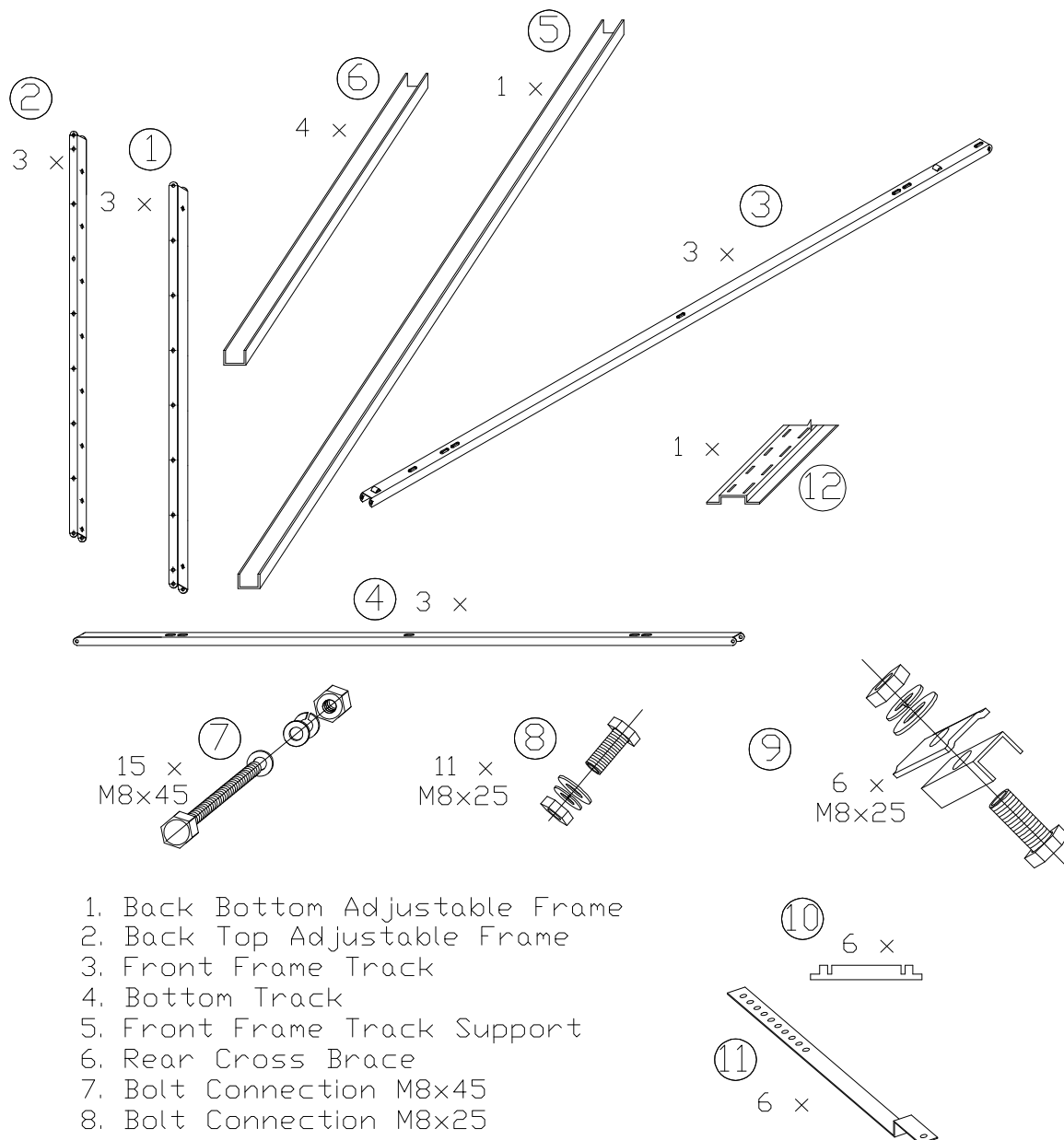
Supply customer with the following:

- Owner's manual
- Tank warranty forms
- SolarArk Warranty Forms



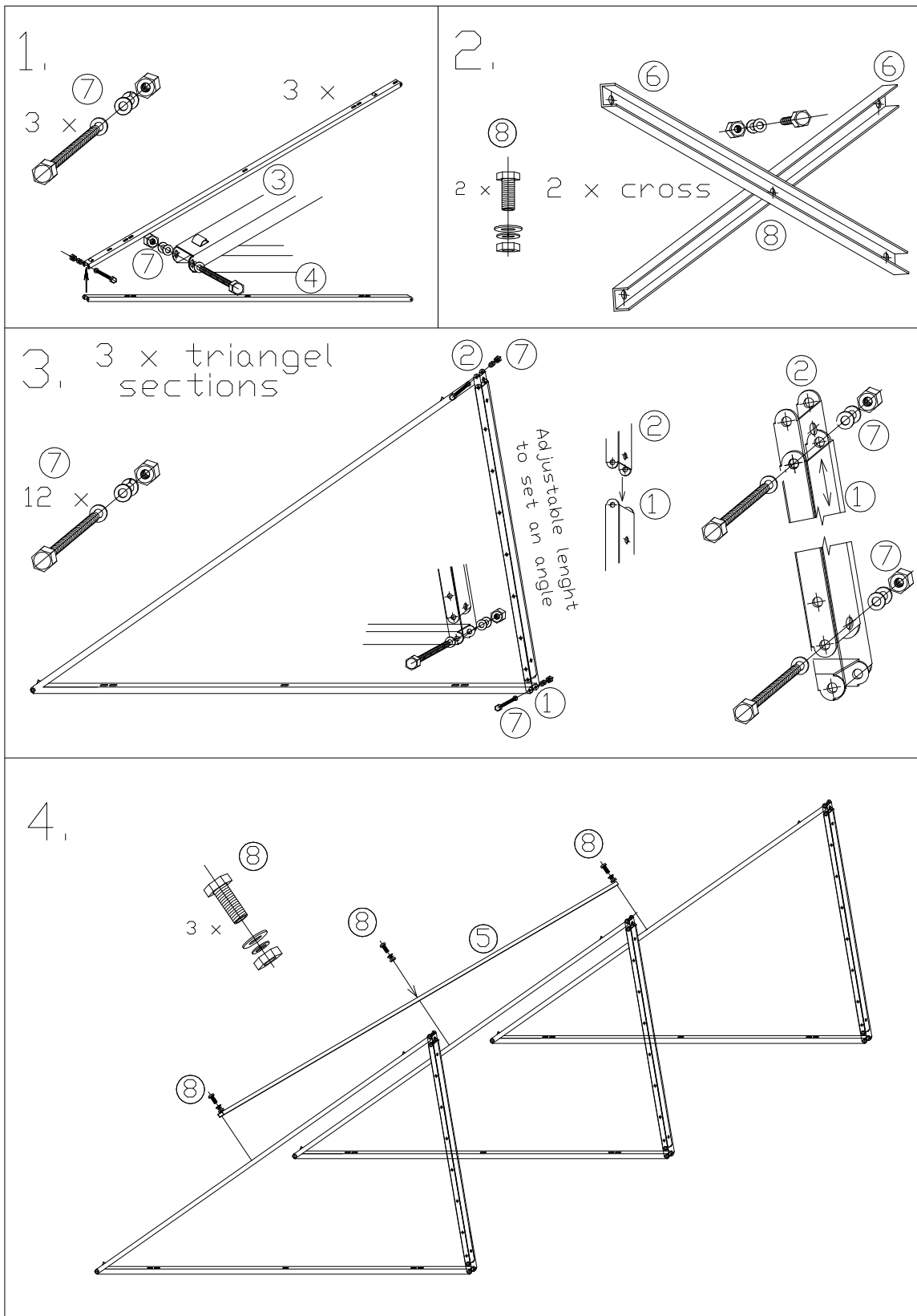
Flat Roof Frame Assembly Guide-30 Tube Collector

30 Tube Collector Pages 1 of 4

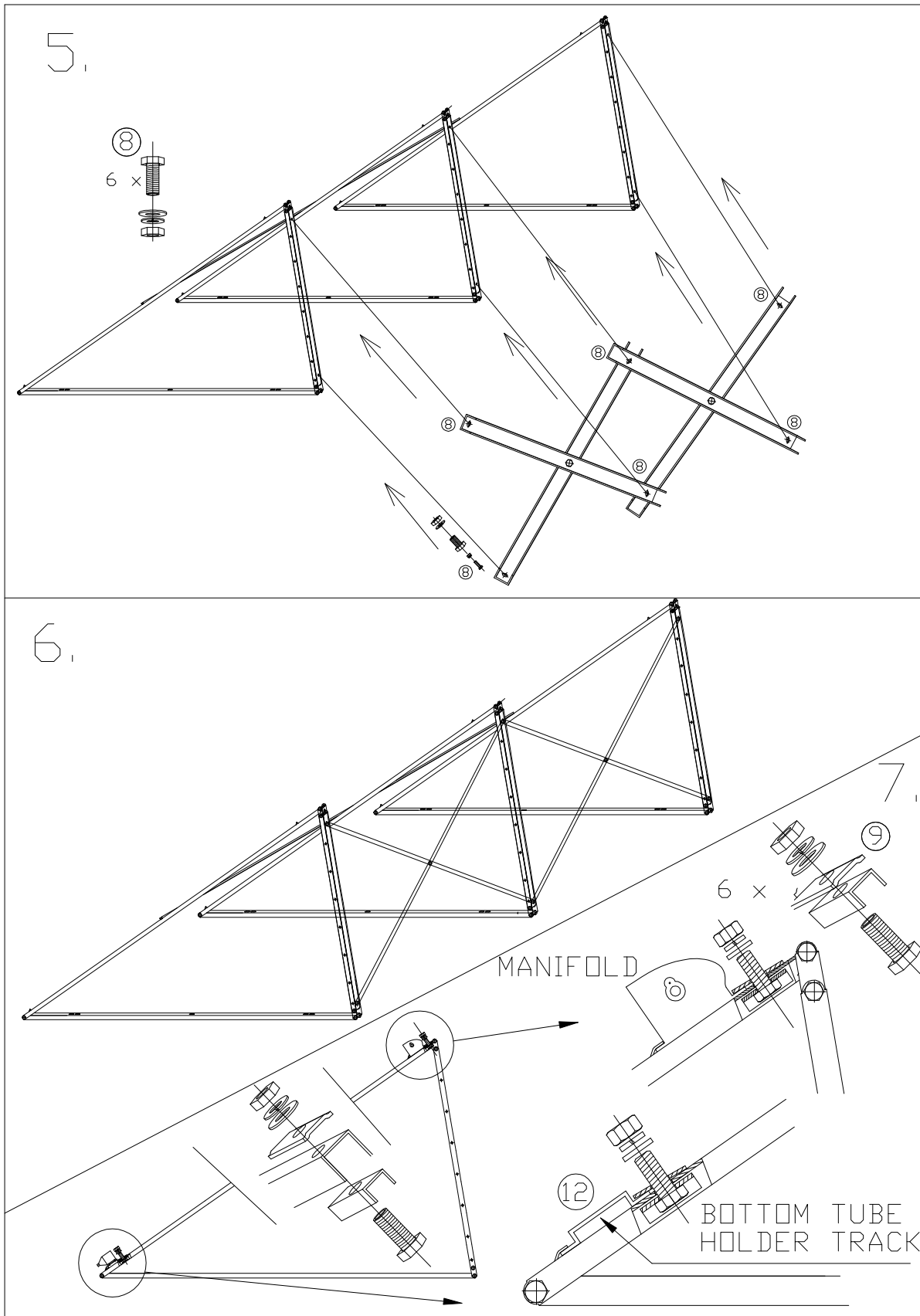


1. Back Bottom Adjustable Frame
2. Back Top Adjustable Frame
3. Front Frame Track
4. Bottom Track
5. Front Frame Track Support
6. Rear Cross Brace
7. Bolt Connection M8x45
8. Bolt Connection M8x25
9. Bolt Connection M8x25
10. Rubber Block
11. Roof Strap
12. Bottom Tube Holder Track

30 Tube Collector Pages 2 of 4



30 Tube Collector Pages 3 of 4

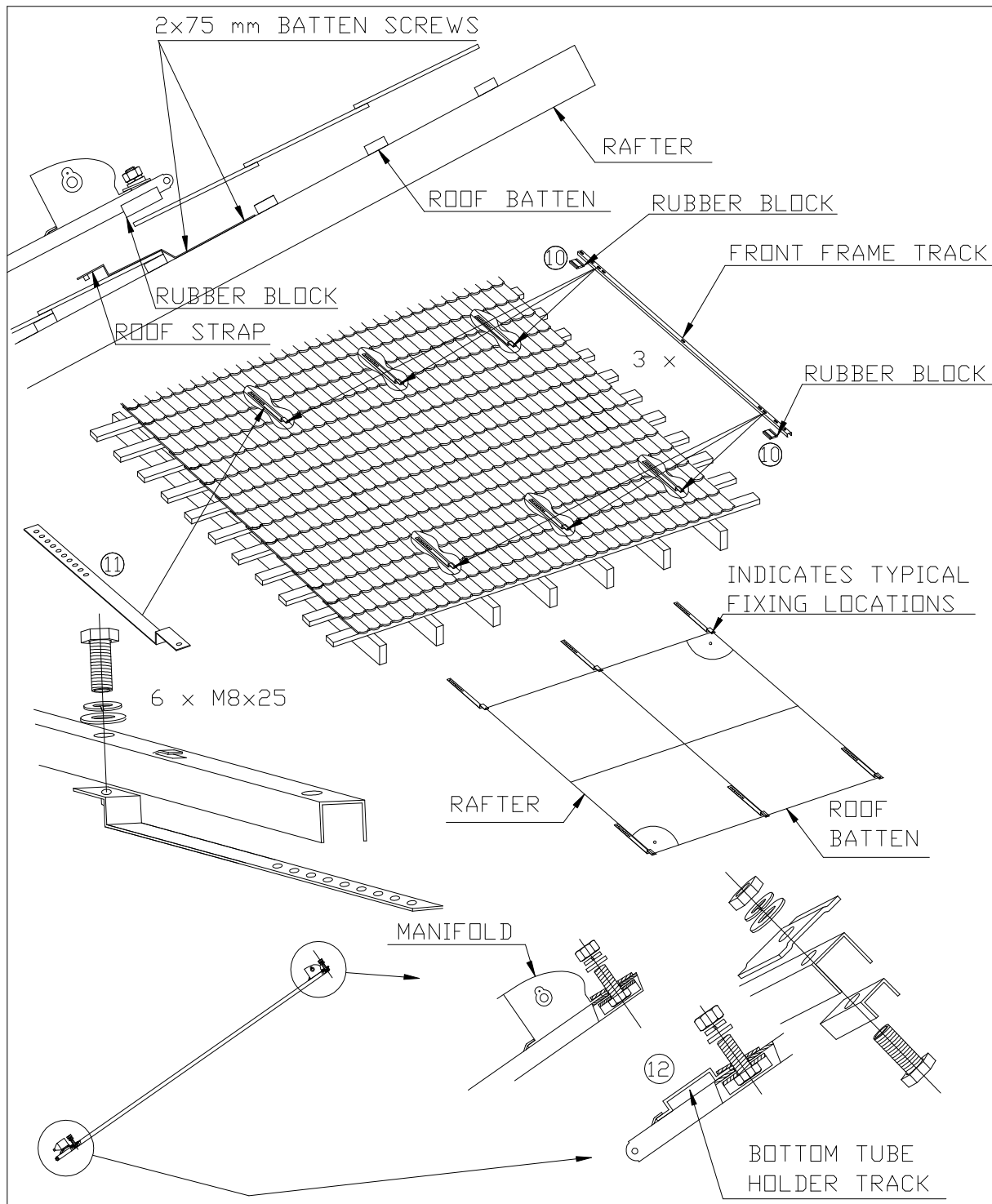


30 Tube Collector Pages 4 of 4

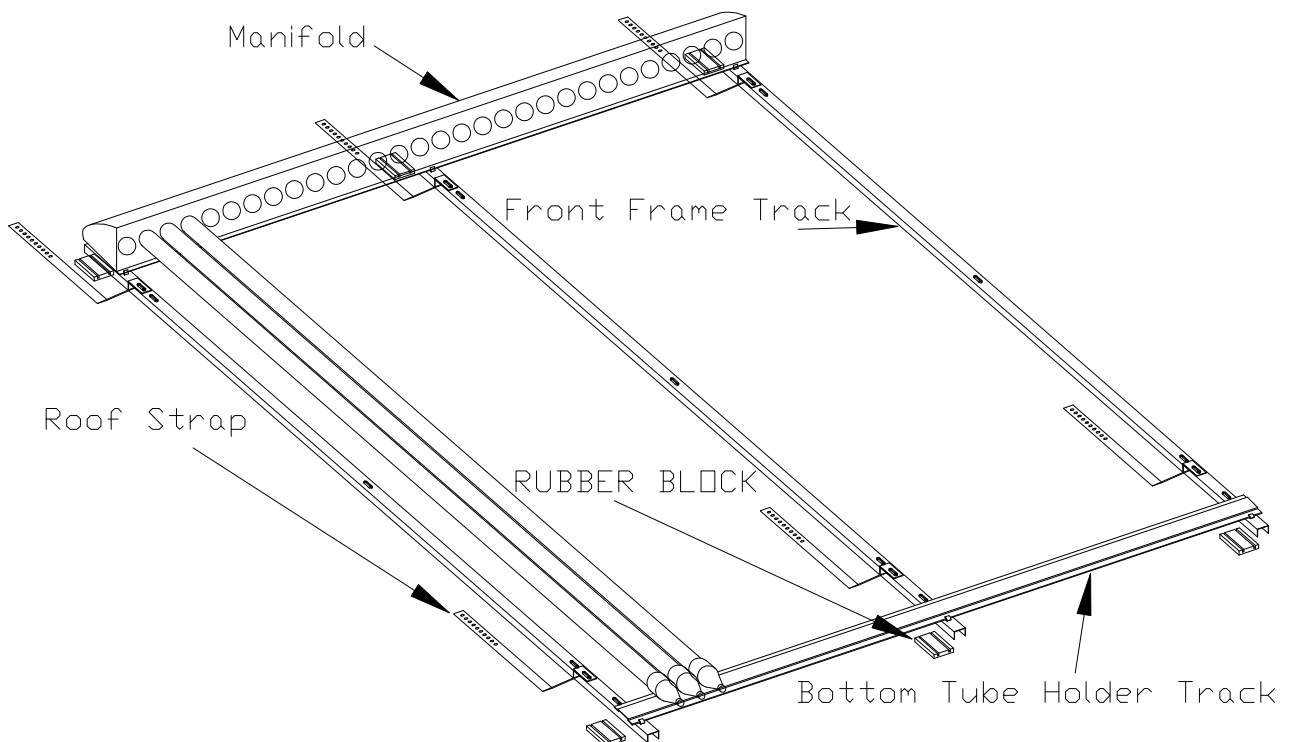
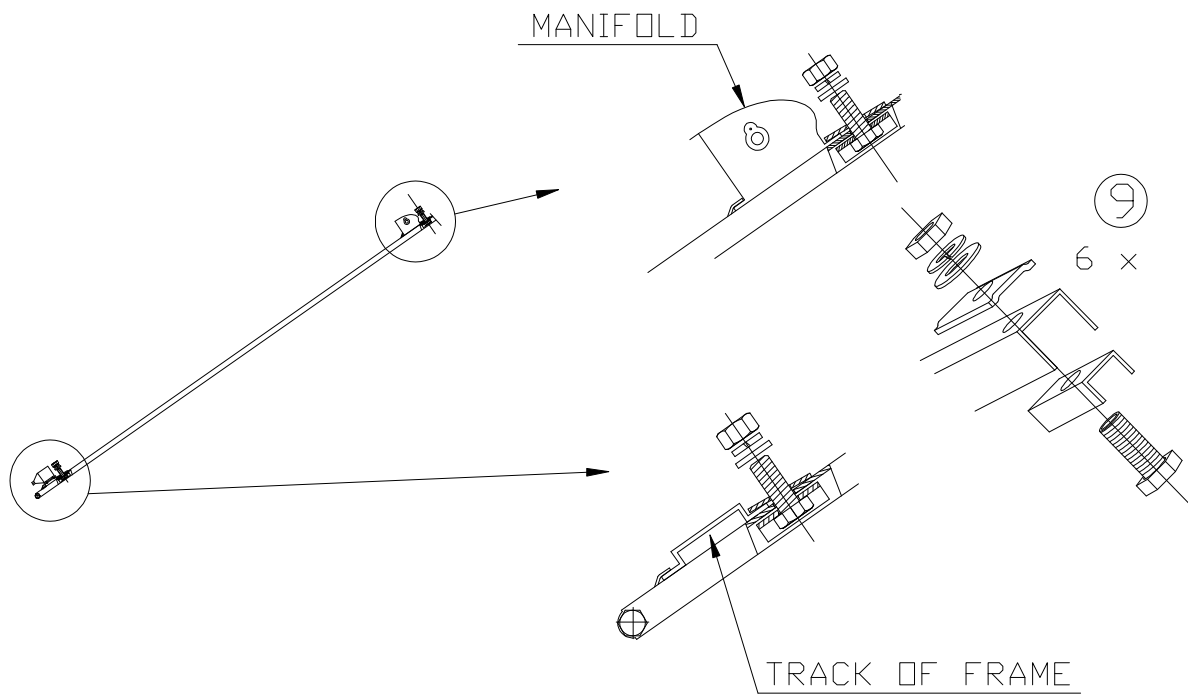


Standard Tubes Assembly Guide -30 Tube Collector

30 Tube Collector Pages 1 of 2

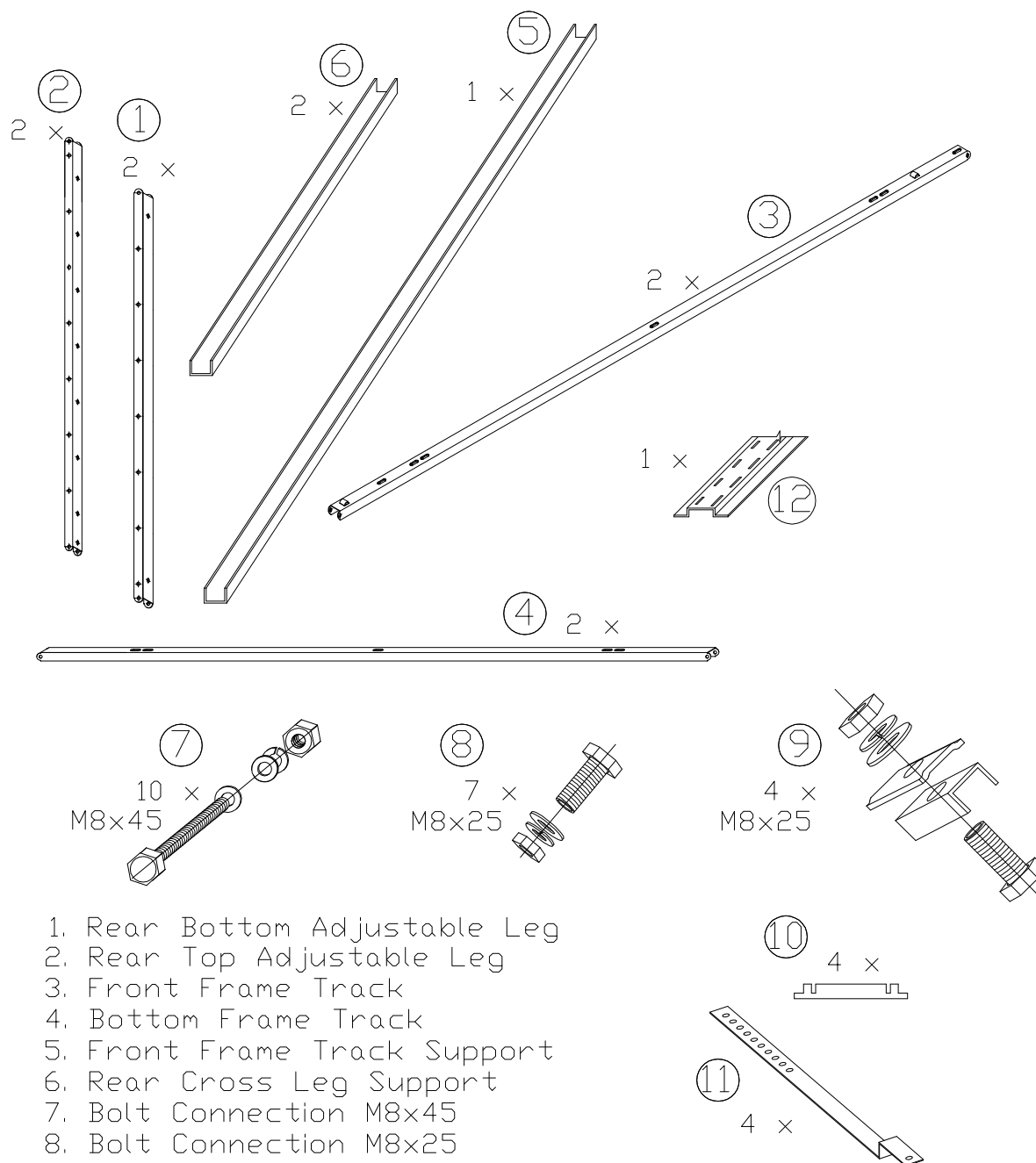


30 Tube Collector Pages 2 of 2



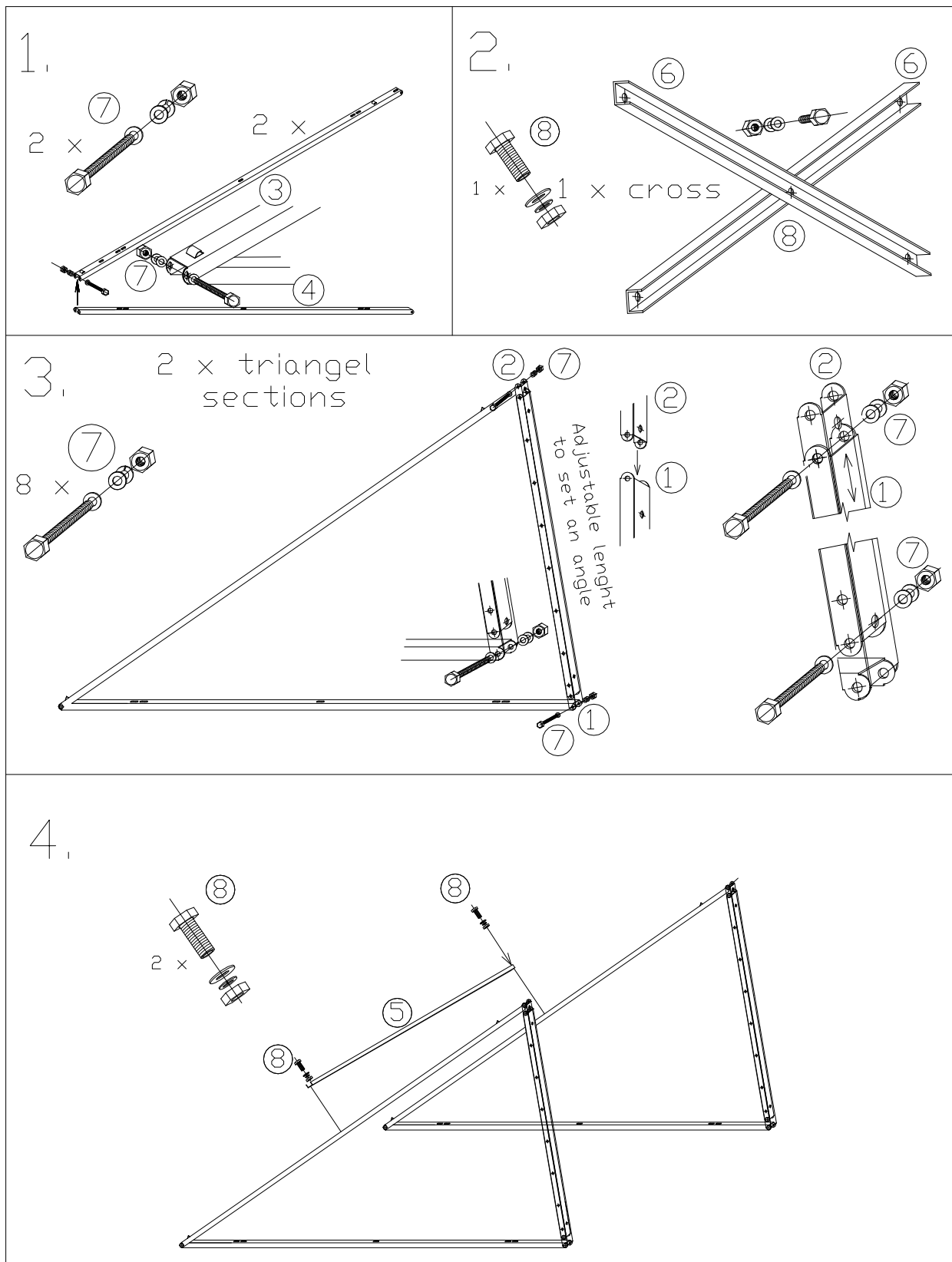
Flat Roof Frame Assembly Guide-10 and 20 Tube Collector

10 and 20 Tube Collector Pages 1 of 3

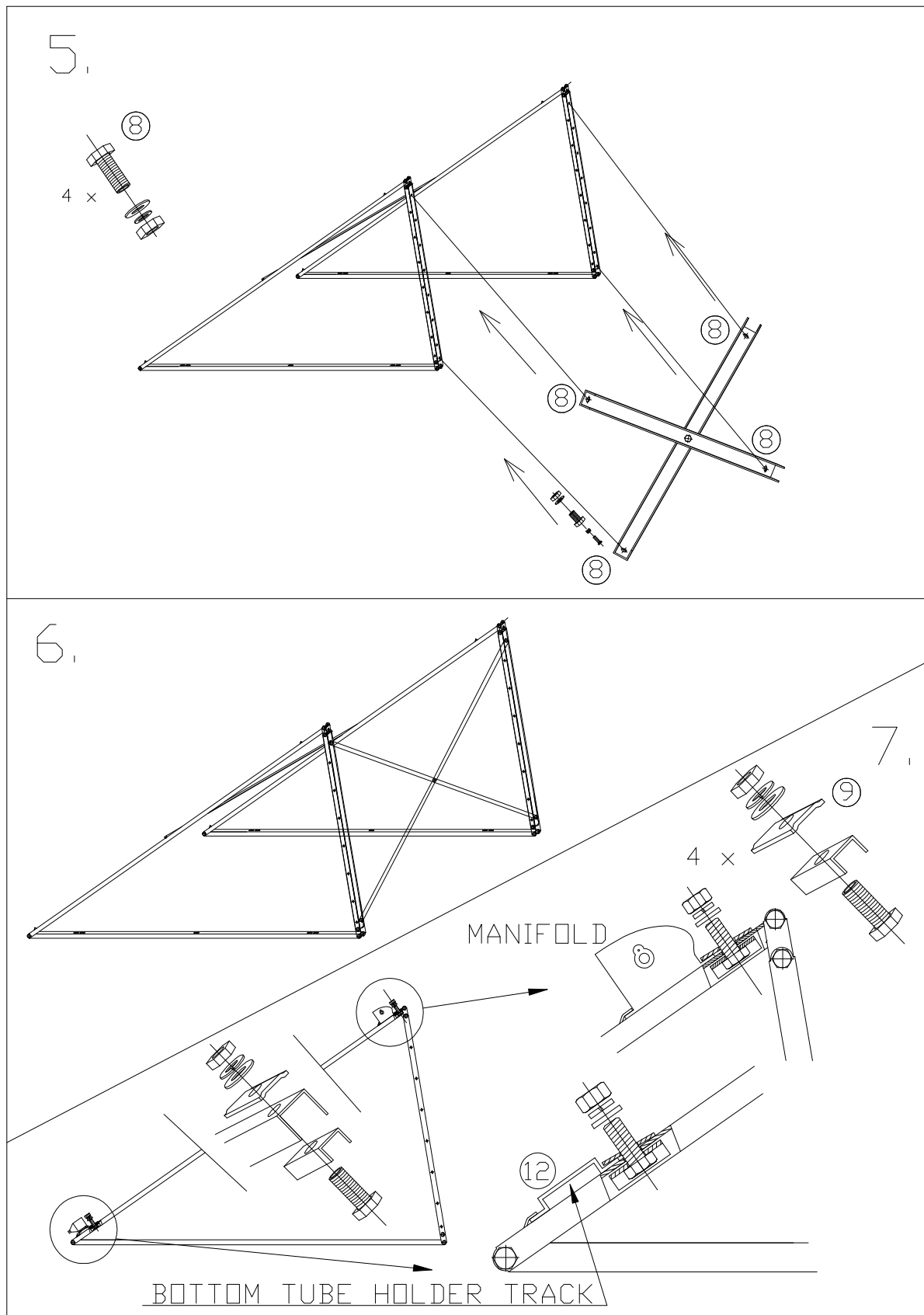


1. Rear Bottom Adjustable Leg
2. Rear Top Adjustable Leg
3. Front Frame Track
4. Bottom Frame Track
5. Front Frame Track Support
6. Rear Cross Leg Support
7. Bolt Connection M8x45
8. Bolt Connection M8x25
9. Bolt Connection M8x25
10. Rubber Block
11. Roof Strap
12. Bottom Tube Holder Track

10 and 20 Tube Collector Pages 2 of 3

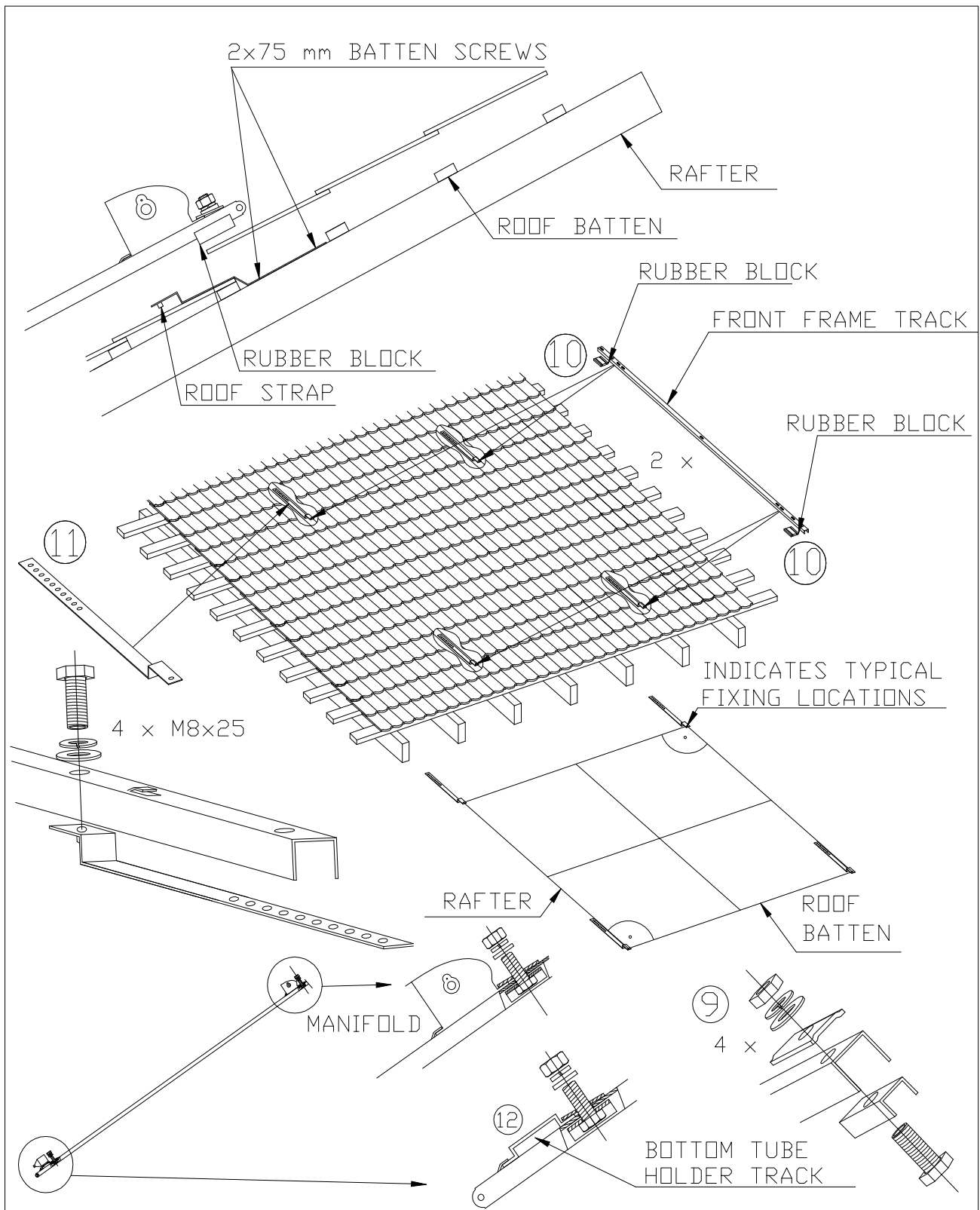


10 and 20 Tube Collector Pages 3 of 3

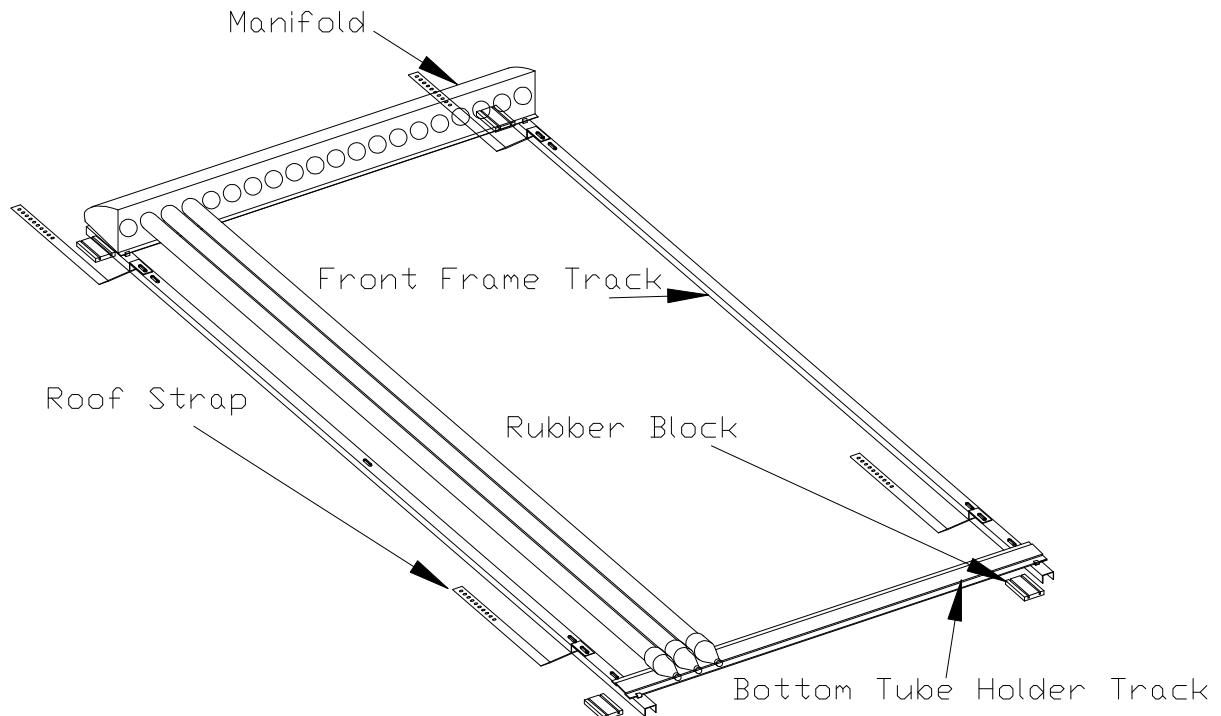
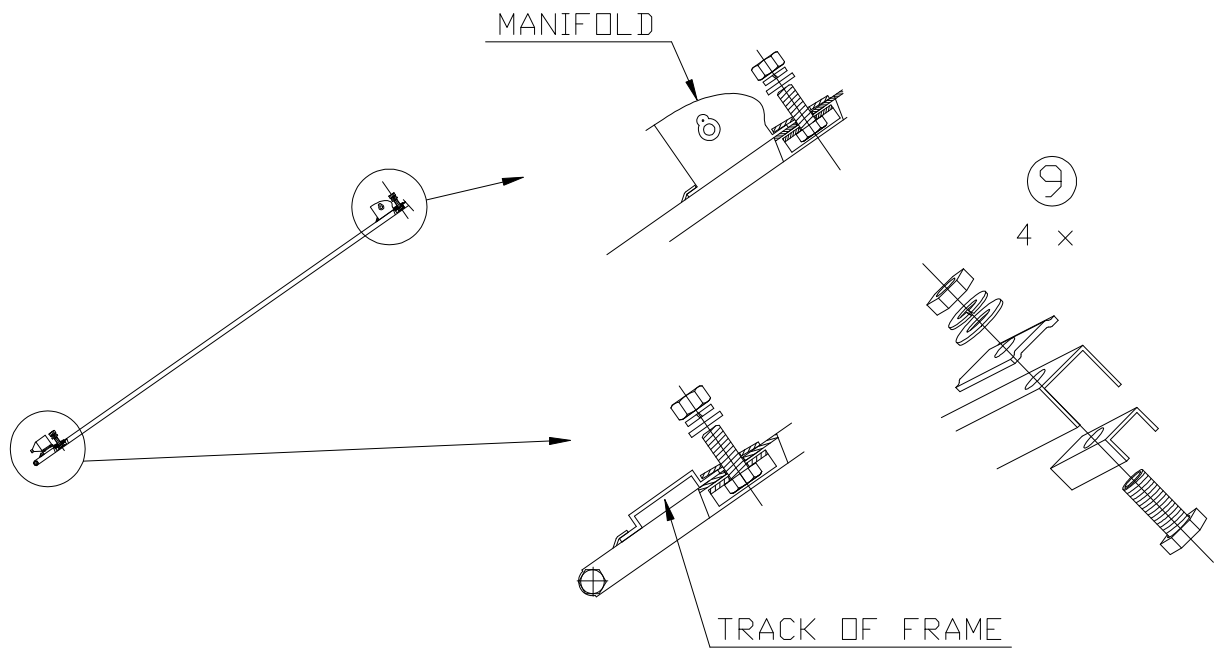


Standard Tube Assembly Guide -10 and 20 Tube Collector

10 and 20 Tube Collector Pages 1 of 2

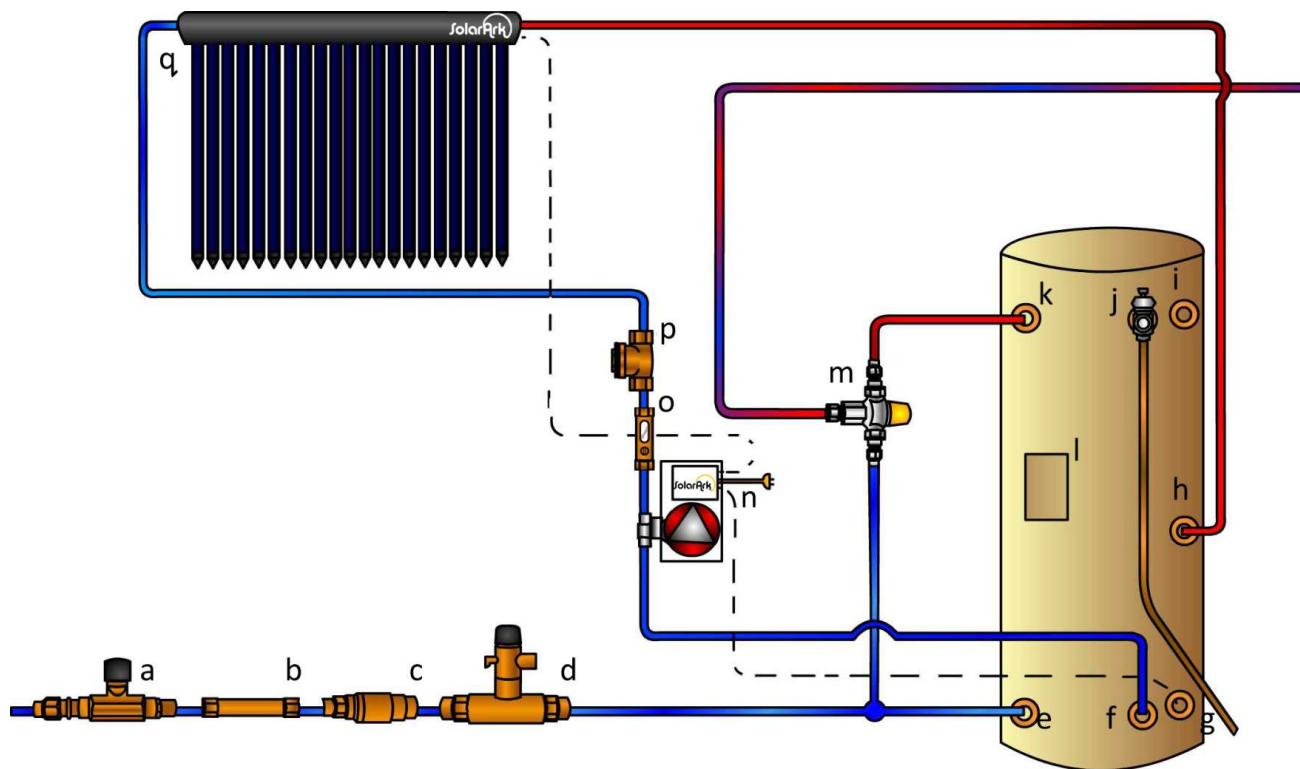


10 and 20 Tube Collector Pages 2 of 2



Bill of Materials

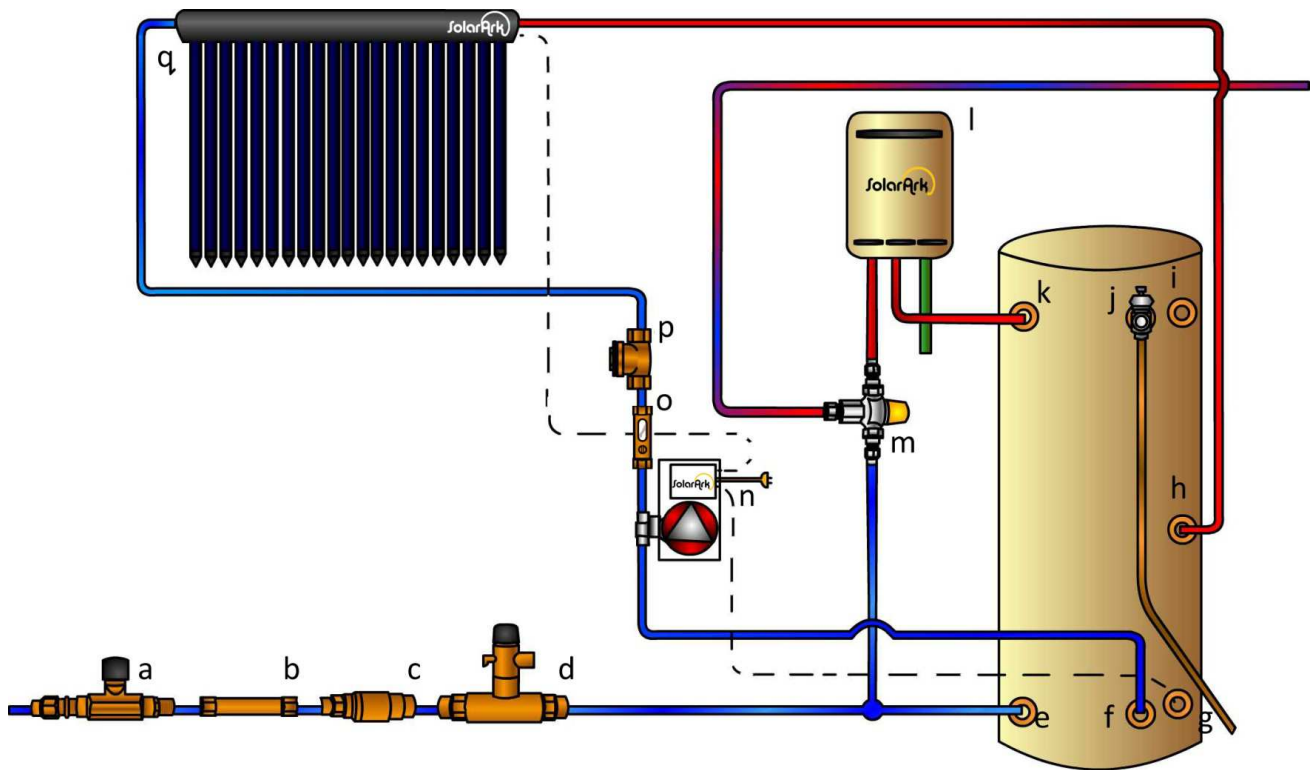
Glass Line Tank Electric Boost Solar Water Heater



Parts Schematic – Not all components are Provided by SolarArk

Component Name	Qty	Supplier: Part Code	Notes
a Non-Return Isolating Valve	1	Australian Standards Approved	1. Optional Inclusion, compulsory in some states
b Line Strainer	1	Australian Standards Approved	2. Allow 30cm of straight pipe before either side of pump
c Pressure Limiting Valve (500kPa)	1	Australian Standards Approved	3. Allow 50cm of straight pipe before brass swing check valve
d Expansion Control Valve	1	Australian Standards Approved	4. For runs longer than 20m use DN18 copper pipe
e Cold Water Inlet	1	Australian Standards Approved	5. Temper valve MUST be installed
f Solar Flow	1	Australian Standards Approved	6. Only brass flip swing check valve can be used, no synthetic seats.
g Lower Sensor Port	1	Australian Standards Approved	System diagrams have been approved in line with S/NZS2712 requirements. The installer must not change the design of the major system components. It is the responsibility of the installer/contractor to ensure that the system design meets all relevant standards, regulations and guidelines, and is safe and operating correctly. The installation of SolarArk products must be in accordance with the guidelines outlined in the latest version of the SolarArk installation manual. Any installer/contractor must be legally certified to install solar water heating systems and have attended an accredited SolarArk training session before completing the installation of any SolarArk products.
h Solar Return	1	Australian Standards Approved	
i Upper Sensor Port	1	Australian Standards Approved	
j PTR Valve	1	Australian Standards Approved	
k Hot Water Supply	1	Australian Standards Approved	
l Electric Element	1	Australian Standards Approved	
m Solar Rated Tempering Valve	1	Australian Standards Approved	
n Pump and Controller	1	Australian Standards Approved	
o Flow Control Valve	1	Australian Standards Approved	
p Brass Swing Check Valve	1	Australian Standards Approved	
q SolarArk Solar Collector	1	SolarArk SA-M-20, SA-M-30	

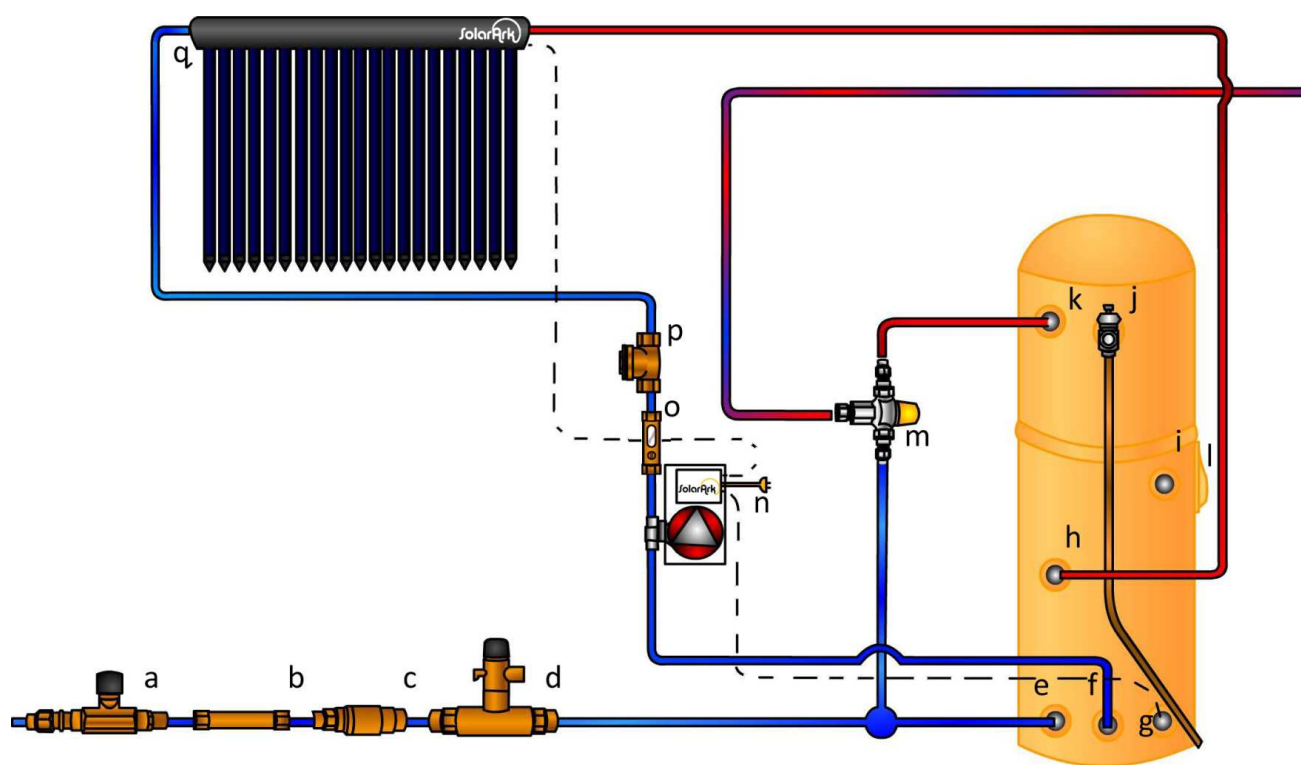
Glass Line Tank Gas Boost Solar Water Heater



Parts Schematic – Not all components are Provided by SolarArk

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l Gas Booster	1	Australian Standards Approved	
m Solar Rated Tempering Valve	1	Australian Standards Approved	
n Pump and Controller	1	Australian Standards Approved	
o Flow Control Valve	1	Australian Standards Approved	
p Brass Swing Check Valve	1	Australian Standards Approved	
q SolarArk Solar Collector	1	SolarArk SA-M-20, SA-M-30	

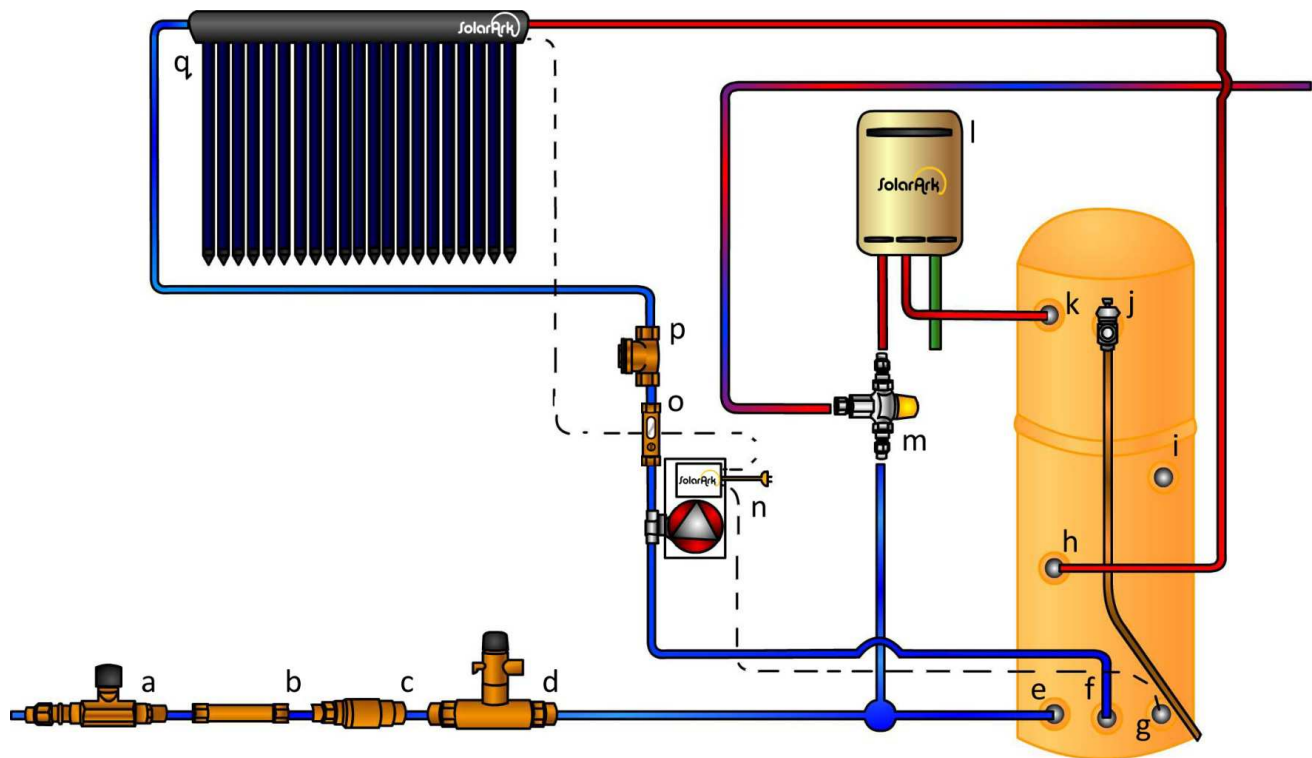
Stainless Steel Tank Electric Boost Solar Water Heater



Parts Schematic – Not all components are Provided by SolarArk

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a Non-Return Isolating Valve	1	Australian Standards Approved	1. Optional Inclusion, compulsory in some states
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m Solar Rated Tempering Valve	1	Australian Standards Approved	
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o Flow Control Valve	1	Australian Standards Approved	
p Brass Swing Check Valve	1	Australian Standards Approved	
q SolarArk Solar Collector	1	SolarArk SA-M-20, SA-M-30	

Stainless Steel Tank Gas Boost Solar Water Heater



Parts Schematic – Not all components are Provided by SolarArk

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o Flow Control Valve	1	Australian Standards Approved	
p Brass Swing Check Valve	1	Australian Standards Approved	
q SolarArk Solar Collector	1	SolarArk SA-M-20, SA-M-30	

Installation Checklist

Inspection report to be completed and returned to SolarArk along with installation photographic evident for future reference

Installation Checklist	Please tick	
	YES	NO
1. Collector orientation (North Facing) if NOT what aspect is the collector facing _____		
2. Collectors angle 20° or more if NOT what angle _____		
3. Collector pipe run less then 8m flow and 8m return if yes Flow _____ Return _____		
4. Collector shaded at any time of the day if YES? From what time to what time _____		
5. Any risk of damage to collector due to falling objects if YES _____		
6. Collector installed at an angle greater than 40° in an area prone to large hail(20Ømm+)		
7. Collector installed in a cyclone prone area if YES appropriately fixed to structure _____		
8. Collector secured to a structurally sound roof framing or to building wall		
9. Piping insulation high temp and UV protected against sunlight with foil wrap or equivalent		
10. Pump, controller and all electrical connection are wether protected (rain)		
11. Pump installed in a vertical position		
12. Pressure limiting valve has been installed.		
13. Has the solar loop piping been well insulated		
14. Plumbing is leak free and all valve are open		
15. Tank fitted with PTR valve and drained correctly.		
16. Thermal paste has been applied to heat pipes and sensors.		
17. Powered up controller from a separate power supply to electric element.		
18. Electric booster wired up and power turned on		
19. Is there an air eliminator fitted if YES..... did you back of the vent screw one full turn		
20. Controller functional and cycling the pump on/off		
21. Is there a flow control valve fitted		
22. Has the tempering valve been installed		
23. Evacuated tubes cleaned		
24. Gas delivery checked		
25. Water quality has been checked		
26. Commissioning process completed as per SolarArk instructions		
27. The basic system operation has been explained to customer		
28. All warranty documents supplied to customer include owner's manual.		

Installation Report Form

After completing the installation the following information must be completed by the installer and returned to SolarArk. Failing to complete and return may void warranty.

Customer Details

Customer Name:

Customer phone Number:

Installation Address:

Invoice number:

System Model & Serial Number:

Tank Model & Serial Number:

Instantaneous Gas Model & Serial Number:

Installer Details

Installer Name:

Installer Phone Number:

Installer License Number:

Installation Date:

Company Name:

Company Address:

Disturber Details

Where did you purchase the SolarArk solar hot water system from?

Retailer:

Retailer Address:

Date of Purchase:

Warranty Form

Customer Reference No: _____

SOLARARK WARRANTY FORM

CUSTOMER

Last Name: _____ First Name: _____

Address: _____

Suburb: _____ State: _____ Postcode: _____

SITE INSTALLATION

Address: _____

Suburb: _____ State: _____ Postcode: _____

INSTALLER

Last Name: _____ First Name: _____

Address: _____

Suburb: _____ State: _____ Postcode: _____

License Number: _____

Date of Installation: _____

SYSTEM DETAILS

System Installed Model Number: SA _____

Solar Tube Collector Serial Number: - _____ - _____

Hot Water Tank Model and Serial Number: _____

PLEASE RETURN TO SOLARARK PTY LTD WITHING TEN (10) WORKING DAYS OF PRODUCT INSTALLATION

MAIL TO: PO BOX 2719 TAREN POINT NSW 2229

FAX TO: (02) 9531 4500

EMAIL TO: warranty@solarark.com.au

OFFICE USE ONLY

DATE OF RECEPTION: _____

APPROVED BY: _____ SIGNATURE: _____

SolarArk Maintenance

PTRV

It is recommended that the lever on the pressure and temperature relief valve (PTRV) on the side of the hot water tank be operated once every 6 months to ensure reliable operation and replaced every five years. It is important to raise and lower the lever smoothly. Please be careful as the water released from the drain pipe will be HOT. If required ask your SolarArk representative to tell you where the valve is located if in doubt.

Glass Breakage

If adverse weather to prevail causing large hail, debris or falling branches it is possible that a tube or tubes will be broken. The evacuated tubes are made of glass so please be aware of any glass that may have found its way from the roof to surrounding grounds. This should be cleaned up and disposed of in a sensible manner. Your SolarArk service agent is to be called to check the system and replace any damaged tubes.

Any broken tubes should be replaced as soon as possible to maintain maximum performance.

The SolarArk system will still operate normally even with broken tubes however the system will operate at a reduced efficiency.

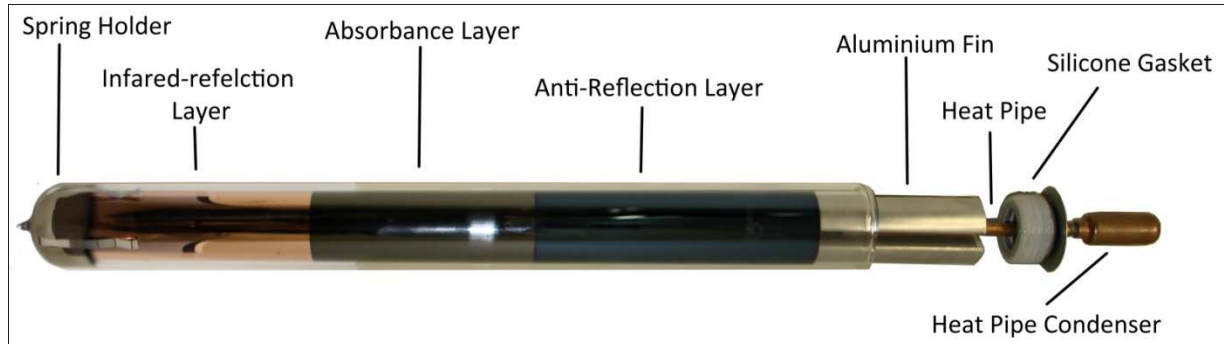
Replacement of Broken Tubes

Open the tube locking cap by unscrewing the tube holder at the base of the solar collector. Slide the existing tube out and remove any broken glass pieces from the solar collector. If the O-ring in the manifold pops out while removing the tube, reinstall and spray with soapy water before re-inserting the replacement tube. Avoid contact with the Rockwool insulation as this may cause skin irritation.

Unpacking New Tubes

Ensure that the tubes are unpacked in a shady area (away from direct sunlight) as this may cause the heat pipe bulbs to heat up and cause major burns if touched.

The heat pipes are pre-inserted into the evacuated tubes. Open the box on the ends to expose the heat pipes and allow for the heat transfer paste to be applied, keep tubes covered and away from direct sunlight. Remove tubes from packaging and check that the heat pipe is securely inserted into the centre of the aluminium fin of the evacuated tube. Ensure that the top of the heat pipe is straight. The silver at the bottom of the evacuated glass tube indicates good vacuum. The presence of white colour at the bottom of the tube indicates lack of vacuum and this tube should not be used. SolarArk does not warrant the evacuated tubes or heat pipes against failure as a result of damage incurred during transport or installation.



Tube with Loss of Evacuated Air



Tube with Evacuation intact

Evacuated Tube Installation

- Pull out each heat pipe by 15cm. Coat each pipe tip with thermal paste by squirting thermal paste into a short piece of insulation. Insert the heat pipe, rotate clockwise and then anti-clockwise to ensure the tip is thoroughly coated with paste. Insert heat pipe fully into the manifold port.
- Lubricate the mouth of evacuated tube (outer wall) with soapy water using a sponge or spray bottle.



DONT SPRAY WATER INSIDE TUBE

- Push the evacuated tube into place. Do not twist more than $\frac{1}{8}$ th left and right turn.
- If the heat pipe is inserted properly no clear glass should be visible.



DO NOT PULL THE EVACUATED TUBE DOWN

- Once all tubes are installed ensure they are aligned neatly and clean each tube of any dirty marks.
- After the insertion of the heat pipe, secure the glass tube in the locking cap by closing the locking cap and carefully tightening the screw located at the base of the locking cap until the tube is secure. Do not over tighten, as the screw only needs to be up against the protective cap on the base of the evacuated tube to stop it from moving.



Insulation Inspection

The insulation of the plumbing pipes should be checked annually for damage as deterioration can occur over time. High temperature UV stabilised foam or metallic wrap are suitable insulation. Significant heat loss can occur if sub-standard insulation is used.

Cleaning Of Solar Collector

Regular rain should keep you evacuated tubes clean. However if your evacuated tube solar collector is located in a positioned that can be accessed safely; it can be cleaned with a soft cloth and warm soapy water or glass cleaning solution. High-pressure cleaner can also be used to safely clean your collector. If the use of a stepladder is needed to access your collector it is recommended to contact you SolarArk service agent to carry out the cleaning.

Other System Components

The pump, storage tanks and gas/electric boosters should be inspected by a qualified technician according to the manufacturer's maintenance guidelines.

Precautions and Warnings

VITREOUS ENAMEL TANKS: For solar collector systems using a vitreous enamel/glass lined storage tank the following precaution applies:

IF THE HOT WATER SYSTEM IS NOT USED FOR TWO WEEKS OR MORE, A QUANTITY OF HIGHLY FLAMMABLE HYDROGEN GAS MAY ACCUMULATE IN THE WATER HEATER

TO DISSIPATE THIS GAS SAFELY, IT IS RECOMMENDED THAT A HOT TAP BE TURNED ON FOR SEVERAL MINUTES OR UNTIL DISCHARGE OF GAS CEASES. USE A SINK, BASIN, OR BATH OUTLET, BUT NOT A DISHWASHER, CLOTHES WASHER, OR OTHER APPLIANCE

DURING THIS PROCEDURE, THERE MUST BE NO SMOKING, OPEN FLAME, OR ANY ELECTRICAL APPLIANCE OPERATING NEARBY. IF HYDROGEN IS DISCHARGED THROUGH THE TAP, IT WILL PROBABLY MAKE AN UNUSUAL SOUND AS WITH AIR ESCAPING

THE TPRV MUST BE OPERATED BY LIFTING AND LOWERING THE LEVER VERY SLOWLY TO AVOID DAMAGE TO TPRV

Warranty

Warranty Conditions

- i. The solar water heating system must be installed in accordance with the manufacturer's installation instructions, the local, State and National authorities and all relevant statutory requirements - AS3500.4 & 5, AS5601, AS3000, AS2712 etc.
- ii. This warranty applies only to those components provided as part of the SolarArk solar water heating product and does not apply to any electrical or plumbing parts provided by the installer.
- iii. The coverage period is valid for the indicated time from the date of purchase. Should any part of the complete solar system/water heater product be replaced during this warranty period, only the balance of the original warranty will continue to remain effective.
- iv. The electrical system components must be installed in a domestic application and connected to a 240V power supply by a qualified electrician in accordance with AS3000.
- v. The drain cock for flushing must be fitted at the time of installation should this system be installed in a regional location where regular flushing is required due to sediment build-up.
- vi. Component manufacturers are at liberty to alter the design or construction for the products notwithstanding that the product may have been sold by description or sample, even though alterations made have been introduced from the date of Contract and the date of delivery provided that the products are of the same or similar quality and are fit for the purposes for which they are purchased. Such alterations shall not constitute a defect in design or construction under this warranty.
- vii. Dated proof of purchase is required prior to commencement of warranty work.
- viii. The Warranty shall be limited to the replacement or repair, at the option of SolarArk Pty Ltd of any defective products and of such parts as have been damaged in consequence of the defect. SolarArk Pty Ltd is excluded to the extent allowable by Law from responsibility for any consequential loss including injury to persons; damage to property; economic loss; pain and suffering and any legal or other damages flowing from any manufacturing during fault or defect.
- ix. SolarArk Pty Ltd shall be under no obligation to return parts replaced at its option pursuant to this warranty.
- x. All independent work carried out must be authorised and prearranged by SolarArk Pty Ltd before any work commences.
- xi. Labour credit claims must be logged to SolarArk Pty Ltd within 7 days of the service call.
- xii. By law you must observe certain minimum safety precautions when working on high work sites. These safety precautions are outlined in work cover code of practice "safe work on roofs" part one and two in the occupation health and safety act 1983.

Warranty Exclusions

The following exclusions shall cause the warranty to become void, and may incur a service charge and cost of parts that may be required.

- i. Accidental damage, acts of God, failure due to misuse, incorrect installation including but not limited to, as per owner's manual, installation guide, installation instruction and any other requirements set by SolarArk and or lack of maintenance.
- ii. If the system is sold or attempts to repair or alter the system without the consent of or other than by an authorised SolarArk Pty Ltd representative.
- iii. Where the solar collector leaks or fails to operate normally due to freezing in regions above the snow line and/or with minimum temperatures below -15°C (in accordance with AS/NZS 2712:2007 freeze level 1), or when power supply to the controller and pump is cut.
- iv. Power surges and/ or voltage fluctuation.
- v. Claims for damage to wall foundations, furnishings, roofs or other losses directly or indirectly due to leakage from the water heater.
- vi. Damage to the collector due to excessive winds.
- vii. Damage to the evacuated tubes due to impact by any object.
- viii. This warranty does not cover for any damages incurred to the solar collector, valves/fittings and or storage tank due to incorrect sizing, selection of the solar collector or system water supply pressure under 400 KPa.
- ix. The use of this solar hot water system to heat chlorinated pools or spa water. Chloride levels present in most reticulated public potable water supply are safe for use in the solar collector provided there is no use of bore waters in the reticulated supply.
- x. Damage to Collector as a result of excessive oxygen (Dissolved Oxygen) common in low pressure systems (Supplied from Rain Water Tank/Gravity supplied).
- xi. The solar collector is left dry (no liquid circulation) and exposed to daily sunlight (i.e. not covered) for a period exceeding 10 consecutive days.
- xii. Where the solar water heating system component has failed directly or indirectly as a result of excessive water pressure, negative pressure (partial vacuum), excessive temperature, corrosive atmosphere, faulty plumbing, electrical wiring, major variations in gas/electrical energy supply.
- xiii. This warranty does not cover the effects of sludge/sediment or corrosion as a result of connection to a water supply from unfiltered or treated sources i.e. spring, dam, bore, rain water tanks, river or other. Town supply from a bore or highly mineralized water.

Water Acceptability Composition Range for Solar Collector

Total Dissolved Solids	<600 mg/litre or ppm
Total Hardness	<200 mg/litre or ppm
Chloride	<250 mg/litre or ppm
Sodium	<150 mg/litre or ppm
Magnesium	<10 mg/litre or ppm
PH Levels	Min 7.0 to Max 8.5
Electrical Conductivity	850 /cm

- i. The changing or alternating from one water supply to another can have a detrimental effect on the operation and/or life expectation of water heaters storage cylinder, pressure temperature relief valve, heating unit and solar collector.
- ii. SolarArk will not cover resulting faults to the storage cylinder and solar collector if this system is connected at any time to a water supply where the TDS contents of the water exceeds 600 mg/l.
- iii. Warranty form must be filled out and a copy returned to SolarArk within 10 working days of system installation date.
- iv. Where the water stored in the cylinder exceeds at any time the following levels:

Water Acceptability Composition Range for Stainless Steel Tanks

Water Quality	
Total Dissolved Solids	<600 mg/litre or ppm
Total Hardness	<200 mg/litre or ppm
Chloride	<250 mg/litre or ppm
Sodium	<150 mg/litre or ppm
Magnesium	<10 mg/litre or ppm
PH Levels	6.5 – 8.5
Electrical Conductivity	851 /cm

Water Acceptability Composition Range for Vitreous Enamel Tanks

Water Quality	
Total Dissolved Solids	<600 mg/litre or ppm
Total Hardness	<200 mg/litre or ppm
Chloride	<300 mg/litre or ppm
Sodium	<150 mg/litre or ppm
Magnesium	<10 mg/litre or ppm
PH Levels	6.5 – 9.5
Electrical Conductivity	850 µS/cm
Iron	1 mg/litre

- v. Damage caused by animals, birds and rodents.
- vi. Any serial tags/stickers on any of the components are removed or defaced
- vii. The product is relocated from its original point of installation
- viii. Subject to statutory provisions to the contrary, SolarArk Australia shall not be liable for consequential damage or any incidental expenses resulting from any breach of this warranty.
- ix. The benefits conferred by this warranty are in addition to all other rights and remedies in respect of the product, which the purchaser has under the Trade Practices Act (Commonwealth) 1975, and similar State or Territory laws.

Component Warranty

Replacement of major components, including gas heater, evacuated tube solar collector, storage tanks, solar circulating pump, electric tank heating element, electric tank thermostat that fail due to faulty manufacturing or workmanship will be provided at no charge to the customer for replacement.

SolarArk reserves the rights to reject or void warranty if the customer has not paid in full for the SolarArk hot water system.

Warranty will be covered within Metropolitan areas. Where the system is installed outside the boundaries of a Capital Cities Metropolitan area (areas on STD), or where the Solar Hot Water System is installed outside of a 20km radius of an accredited SolarArk Service Agent's premises, the costs of transport, insurance and travelling will be charged to the consumer.

The period for which free replacement applies varies for different components and the details appear below.

Replacement or repair excludes all travel, insurance and/or transport costs. This cost will be passed on to the consumer.

Faulty parts will only be replaced under warranty after the faulty part has been returned to SolarArk for inspection to validate the cause of the failure.

Any parts returned for repair may be replaced by refurbished parts of same type rather than repairing same parts. Refurbished parts may be used to repair or replace the returned parts.

It is a warranty requirement to replace the anode on the SolarArk vitreous enamel tank (glass lined tank) every three years. Failure to replace anode will void warranty.

The SolarArk warranty is valid from the date of purchase in the event that the date of purchase is not known the date of manufacture will be used to determine warranty period.

Major Component	Part	Domestic Use		Commercial Use	
		Parts Warranty	Labour Warranty	Parts Warranty	Labour Warranty
Evacuated Tube Solar Collector	Evacuated Tubes	15 Years	1 Year	5 Years	1 Year
	Manifold	15 Years	1 Year	5 Years	1 Year
	Mounting Frame	15 Years	1 Year	7 Years	1 Year
S20 and S26 Solar Compatible Gas Booster	Heat Exchanger	10 Years	3 Years	5 Years	1 Year
	Other Components	3 Years	3 Years	1 Year	1 Year
Solar Storage Tanks	SolarArk Vitreous Enamel	5 Year	1 Year	1 Year	1 Year
	Stainless Steel	15 Years	1 Year	5 Years	1 Year
Components	Solar Controller	1 Year	1 Year	1 Year	1 Year
	Sensor Cable	1 Year	1 Year	1 Year	1 Year
	Circulating Pump	2 Year	1 Year	2 Year	1 Year
	Tempering Valve and Fittings(If supplied by SolarArk)	1 Year	N/A	1 Year	N/A
	Electric Heating Element	1 Year	1 Year	1 Year	1 Year
	Anode (where applicable)	1 Year	1 Year	1 Year	1 Year

- In order to comply with Queensland State legislation, in Queensland domestic installations only, a 2 year warranty on the solar circulating pump 1 year labour warranty applies.
- In order to comply with Victorian State legislation, in Victoria domestic installations only, a 5 year warranty on the solar circulation pump, solar controller and components within the gas booster with 1 year labour warranty applies.
- For Everlast stainless steel tanks the 15 years warranty applies for installation in Eastern sea boarder from Sunshine Cost to Tasmania out to Darling Range and Tamworth all other States 10 years' warranty.

SolarArk Warranty Claim Procedure

For all warranty claims on SolarArk Solar Hot Water Systems, please contact your SolarArk Representative.

Have all information regarding the warranty claim available including:

- Copy of Warranty Card
- Installer & Customer Details
- Installation Compliance Certificate
- System Details
- Information on Faulty Components

An authorised agent will be allocated to your warranty claim.

In the case that the warranty is not valid, the labour and parts will be charged to the agent or consumer based on the warranty coverage.

Labour claims will only be honoured based on the SolarArk Schedule of Rates and once the faulty parts have been received.

For further details on warranty please read the SolarArk Warranty Procedures Guide.

Please find a contact list below outlining the relative suppliers

Component	Contact
Rinnai Gas Booster	Contact: Rinnai 1300 555 545
Everlast Stainless Steel Tank	Contact: Everlast 03 9768 2404
SolarArk Solar Collector	Contact: SolarArk 1300 670 966
SolarArk Solar V.E Tanks	Contact: SolarArk 1300 670 966

Disclaimer

This manual contains an overview of the SolarArk Solar Hot Water System, all instructions/recommendations must be followed exactly as stated herein. SolarArk Pty Ltd is not responsible for any loss of damage to any person or property of any type, whether direct or consequential, arising from the operation of the solar hot water system or any of its components.

OH&S Disclaimer – SolarArk Pty Ltd and its Authorised Dealers work with and recommend various installation and plumbing companies to install, test and certify correct operation of solar hot water systems. Each installation must be covered by the installer's insurances, commercial terms and conditions and by the applicable OH&S legislation. Each person that installs assembles or services must comply with all OH&S requirements relevant to the type of work being conducted including, but not limited to, plumbing work, work on roofs and electrical work. SolarArk Pty Ltd and its Authorised Dealers do not accept any responsibility for any loss or damages to any person or property of any type, whether direct or consequential, arising from the installation, maintenance or operation of the solar hot water system or any of its components.

SolarArk Frequently Asked Questions

Why Choose a SolarArk Hot Water System?

SolarArk is the only system in the Australian market that is backed by a 15 year manufacturing warranty for all major components. As SolarArk is an Australian owned company with its own manufacturing facility, you can be assured of the highest quality, ongoing support and service. We offer the most efficient Solar Collector for both cost efficiency and performance.

How does the SolarArk Evacuated Tube Hot Water System Work?

Sunlight passes through two outer glass layers to an internal tri-layer (comprising an infrared-reflection layer, an absorbance layer and an anti-reflection layer). The heat collecting absorbance layer converts the sunlight into usable heat. The heat generated by the evacuated tube's absorbance layer is transferred to the manifold at the top of the tubes, where the cold water is converted to hot water as it passes through the header pipe to be stored in the hot water tank.

Is Solar Water heating a viable alternative to gas or electricity?

Due to varying weather conditions, solar water heating plays a complementary role to gas and electricity. Solar water heating cannot completely replace the need for gas or electric heating as there are some days when solar contributions are low. On average, over a period of a year, a correctly sized solar system can provide up to 90% of a household's hot water needs. The hot water system can be automated so that hot water is guaranteed regardless of sunlight levels.

What is gas or electric boosting?

When solar contribution is low, the gas or electric booster will automatically boost the water temperature to the required level of 60°C.

What are Small- Scale Technology Certificates (STC's) or formerly known as (REC's)?

A Small-Scale Technology Certificate is a new form of currency created by the Federal Government and is used to demonstrate compliance with the requirements of the Governments Mandatory Renewable Energy Target (MRET) scheme. Each STC's represents the equivalent of one megawatt hour of electricity generation from an accredited renewable energy source. Each SolarArk system has been assigned a STC's value based on independent testing authority to establish the performance and efficiency of each system. The STC's values assigned to SolarArk systems represent the amount of energy savings over 10 years. STC's have a monetary value which changes weekly based on the renewable energy industry.

Are any structural roof modifications needed to support the hot water system?

There are *NO* roof modifications required to accommodate SolarArk hot water systems. The manifold, frame and tubes are lightweight and easily installed by a qualified person.

What is the optimum angle to install the Solar Collector?

The solar collector should be installed for optimum winter performance. The tubes perform best when installed at an angle of between 20° and 60° from the horizontal. If a roof has an angle less than 20°, it is advisable to use an adjustable pitched roof frame to ensure optimal heat pipe operation.

Are the Evacuated Tubes affected by frost?

Frost protection is incorporated into the solar controller. SolarArk evacuated tubes operate at high efficiency levels in freezing conditions without the use of chemicals such as glycol.

Are the glass tubes hail resistant?

Yes. The evacuated tubes are extremely strong. The SolarArk evacuated tubes are able to handle significant impact from hail of up to 25mm/1" in diameter.