1. Important Information

1.1. Local Standards

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

1.2. Qualified Installer

Installation must be completed by qualified plumbing professionals

1.3. Pressure and Temperature Control and Relief

Solar loop should be designed for normal operation at <500kpa vie use of a pressure limiting (pressure reduction) valve on the mains cold supply line. System design must provide mean for allowing pressure release at no more than 800kpa (113psi) and hot water dumping form the solar loop or storage tank once the temperature reaches 99°C (120°F). It is recommended that the lever on the pressure and temperature relief valve (PTRV) be operated once every 6 months to ensure reliable operation. It is important to raise and lower the lever gently.

1.4. Water quality

Water in direct flow through the manifold header must firstly meet potable water requirements and the following in addition:

Total dissolved solids	< 600mg/litre or p.p.m.
Total hardness	< 200mg/litre or p.p.m.
Chloride	< 250 mg/litre or p.p.m.
Magnesium	< 10 mg/litre or p.p.m.

In areas with ñhardò water (>200ppm), lime scale may form inside the header pipe. In such regions, it is advisable to install a water softening device to ensure long term efficient operation of the collector, or use a closed loop for the solar circulation loop. Using glycol/water, must meet the above requirements, and the glycol must be changed periodically to prevent it from becoming acidic.

1.5. Metallic corrosion

Both copper and stainless steel are susceptible to corrosion when high concentrations of chloride are present. The solar collector may be used for heating of spa or pool water, but levels of free chlorine must not exceed 2ppm. In addition the standard warranty provided on the header when used for spa or pool heating is 2 years. The chloride level present in most reticulated public potable water suppliers are safe for use in the collector provided there is no use of bore waters in the reticulated supply.

1.6. Freeze protection

Freeze protection (anti-freeze) should be incorporated into the system by use of a ñlow manifold temperatureò setting on the solar controller, which turns on the pump if the manifold drops below a present level (e.g. 5°C/41°F). Alternatively a closed loop filled with glycol-water (anti-freeze) mix may be used to provide freeze protection. Evacuated tubes are not susceptible to cold weather damage, and heat pipes are protected from damage caused by the freezing of the water inside.

1.7. Hail resistance

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

their impact resistance. However, even when lying flat, impact by hail up to 20mm/3/4ò in size should not cause breakages.
It is recommended that in areas prone to large hail stones (20mm/3/4ò) the solar collector should be installed at an angle of 40° or greater to provide optimum protection. As many populated areas in the world fall within the latitude of ±30-70° this angle is common for installations anyway.
If in the unlikely circumstance that a tube is broken, it can easily be replaced in a matter of minutes. The solar collector can still function properly with one or more broken tubes, however there will be a varying reduction in heat output (depending on the number of tubes broken).

1.8. System design and installation

Please read all installation instructions carefully before beginning. The system configuration many need to be customised to suit the specific requirements of an installation. Please ensure that any system design meets local building and water quality regulations. These instructions are meant to provide an overview of how to assemble a solar panel and highlight some of the necessary procedures that must be undertaken before an installation.

2. Unpack and inspect

2.1. Tube inspection

Open the tube box(es), which contain both evacuated tubes and heat pipes. Check to make sure the evacuated tubes are all intact and the bottom of each tube is silver. If a tube has a cloudy white or clear bottom, it is damaged and no longer vacuum sealed and should be replaced. Each evacuated tube contains a pair of metal heat transfer fins. Do not remove the and/or expose the tubes to sunlight until you install them, otherwise the inner tube and heat pipe will become very hot. The outer glass will not heat up.

2.2. Heat pipes

If heat pipes are bent during handling, do not worry, as they are not easily damaged. Just ensure they are relatively straight before insertion into the evacuated tube and manifold.

2.3. Frame

Unpack the standard frame kit, included with the manifold. (If using a flat roof frame, low pitched roof frame or roof mounting straps, these will be packaged separately) The attachment bolts required to attach the side rails to the manifold should already be in place at the top of the manifold. Other nuts and bolts for attaching the bottom rail should be in place. For detailed instructions on assembling your manifold and frame, see the diagram below.

3. Plumbing

3.1. Plumbing Connection

Once the frame has been mounted and the manifold attached, the manifold header may be connected to the system plumbing.

3.2. Choice of Piping material

10mm, 15mm and 22mm copper piping are the typical sizes used for most solar installations. The entry/exit piping on the manifold is 22mm but is generally reduced in size for the majority of the installations plumbing. As the flow rate is slow, a large diameter pipe is unnecessary and will only increase system costs and heat loss.

3.3. Pressure Levels

Regardless of the installation configuration, pressure release valves and/or other pressure control devices must be installed. The solar loop should be designed to operate at no more than 800kPa (PRV may be 850kPa). (800kPa = 8bar = 116psi) For installations where mains pressure water is used, the system should ideally be designed to operate at a pressure of <500kPa, achieved by use of a pressure limiting/reduction valve.

3.4. Tempering value.

It is recommended, and may be required by regulations, that a temperature control device (tempering value) be fitted into the hot water pipe between the water heater and bathrooms and en-suites to reduce the risk of a scalding. This is achieved by controlling the water temperature to below 50°C/122°F (temperature may be adjustable).

3.4. Temperature Sensor Insertion

The solar controllerôs temperature sensor should be coated with a thick layer of thermal paste and inserted into the sensor port to the full depth. If the fit is too loose, slide a piece of copper plate or wire in beside the sensor, seal the sensor port opening with silicone sealant to prevent water ingress or the sensor being blown out or removed by a hungry bird. Ensure that sensors used on the collector are high temperature rated (up to 250°C/486°F), in particular the cable.

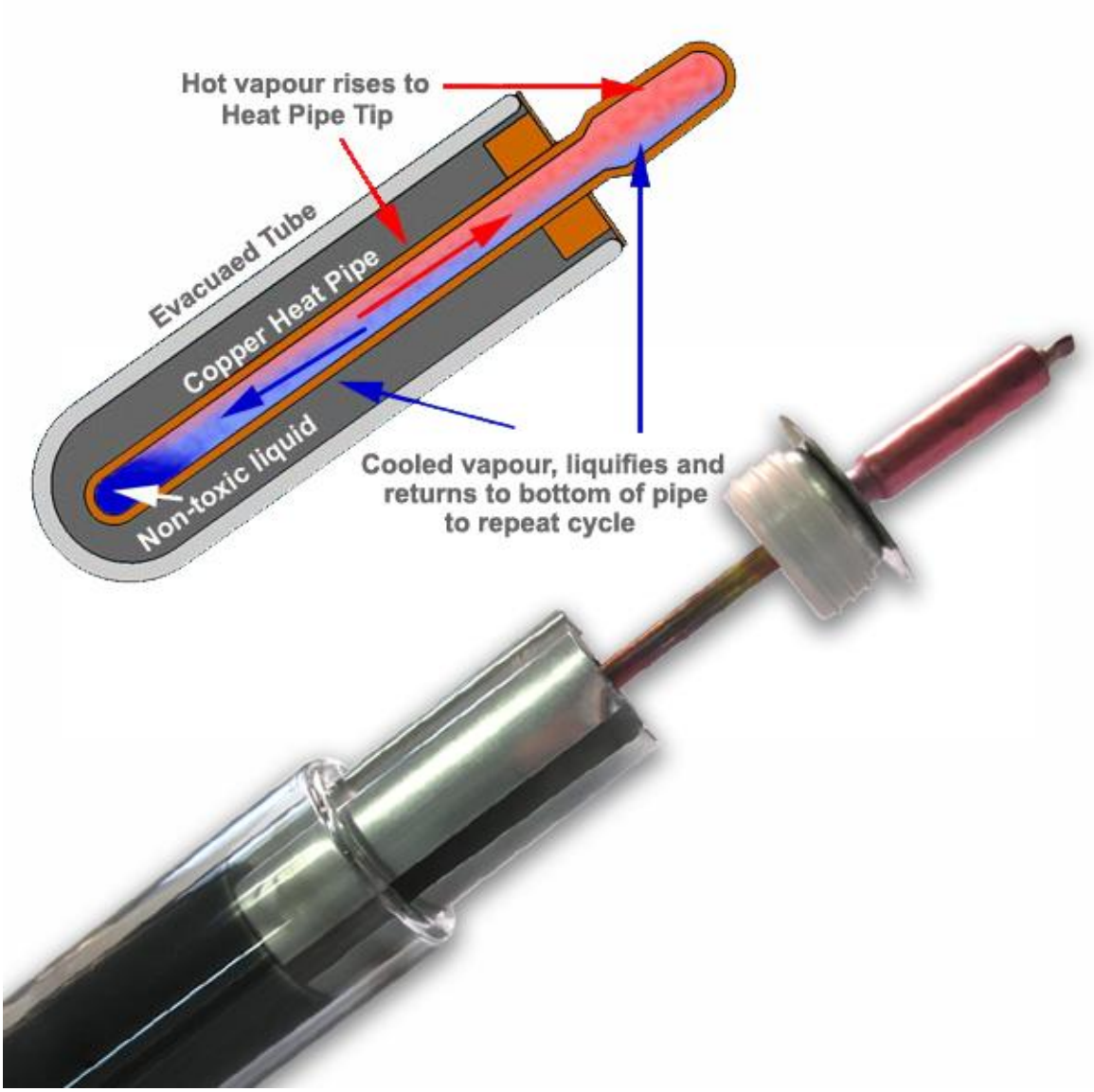
4. Stagnation and Overheating

Stagnation refers to the condition that occurs when the pump stops running, due to pump failure, power blackout, or as a result of a high tank temperature protection feature built into the controller, which turns the pump off. If a PTRV is installed on the collector inlet or outlet the collector will continue to increase in temperature until the limit of the temperature relief valve is reached, at which point the hot water will be dumped from the system. If a PTRV is not installed on the collector, steam will form in the header. Eventually some steam may feed back to the storage tank via the return line. The PTRV on the tank will open to release pressure or heat as required. Under such conditions the manifold will normally reach a maximum temperature of around 160°C/320°F. Generally the heat returning from the collector in the form of steam is not enough to affect a continued increase in tank temperature (i.e. Heat input<tank heat losses)

Under normal use stagnation rarely occurs as a result of pump stoppage, since power blackouts normally happen during storms and not clear sunny weather. High tank temperature protection should only occur when hot water is not used for several days (when on holiday), and only during strong periods of sunlight (summer). If leaving the house for an extended period of time (2-3 days +), it is advisable to cover the collector panel or design the system with a heat dissipation device or alternative use for the heat, thus preventing overheating of the system and collector stagnation.

Stagnation of the solar collector will NOT damage the collector itself, however insulation used on the piping close to the manifold inlet and outlet should be able to withstand temperatures of up to 200°C/395°F (E.g. Glass wool or mineral wool ï with an exterior wrap of aluminium foil, thus protecting against the elements)

5. Structure of heat pipe with glass tube



The heat pipe series solar collectors are always connected with an existing heating supply device. The selective coating on the inner cover of the evacuated tubes converts solar energy into heat energy and transfers heat to the heat pipe by aluminium fins. The liquid in the heat pipe changes into vapour which rises to the condenser. The heat then passes through the heat exchanger and the vapour becomes liquid, returning to the base of the heat pipe. The heat conducts to the heat transfer liquid (anti-freezing liquid or water) via copper pipe. This transference of heat into the liquid creates a continuous circulation as long as the collector is heated by the sun.

For a step by step guide to the assembly of a solar panel, see panel assembly instructions part 2é