Thermosiphon Solar Water Installation Manual

TS-40G and TS-80G

Distributed by: Eco-$mart, Inc. 941.376.8484 ph / info@eco-smart.org

Important points before you begin:

1. The evacuated tubes must be installed last.

The tubes quickly generate heat and need water in the tank to act as a load for the heat generated. Keep the tubes in the box and covered until final step of installation. Do not touch heat pipe without protective gloves as they get very hot.

2. Make sure that the heat pipes are fully inserted into the tank (about 6 inches).

First insert the condenser bulb of the heat pipe into the manifold until you feel the condenser bulb hit against the end. Once fully inserted slide tube up to meet tank. Full instructions can be found in section 13.

3. Use proper freeze protection

For installations in freeze prone areas, proper freeze protection is required.

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According to the SRCC, the freeze tolerance for this system is 23° F or -5° C. Freeze tolerance limits are based upon an assumed set of environmental conditions. Extended periods of cold weather, including ambient air temperatures above the specified limit, might cause freezing in exposed parts of the system. It is the owner's responsibility to protect the system in accordance with the supplier's instructions if the air temperature is anticipated to approach the specified freeze tolerance limit.

4. Put pipe dope on female and male threading then wrap with Teflon tape.

The threads on the openings to the Unit are such that they require at least 4 wraps of high quality Teflon tape. *To prevent leaks you should put pipe dope on the female threads and on the male threads, then wrap Teflon tape over the male threads.* This is a plumber's trick and the best way to avoid leaks.

For the inlet and outlet on the bottom of the tank, remove the male threaded nipples and re-teflon and thread seal them before filling tank.

5. Make sure to insert the temperature sensor the full 6 inches into the thermowell.

This is only applicable to installations that are installing the optional controller and heating element. When inserting the temperature sensor into the black plastic cord grip make sure it goes all the way up (about 6 inches) into the tank. Otherwise, you will get a bad reading which can cause your system to overheat if using the optional contr

Table of Contents

Notice:

The solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the SRCC. This certification does not imply endorsement or warranty of this product by SRCC.

All installations should comply with building, plumbing, mechanical and fire code adopted by the authority having jurisdiction or, in the absence of such codes, with the *International Building Code*, *International Plumbing Code*, *International Mechanical Code*, and *International Fire Code*.

Mfr. accepts no responsibility for the misuse or improper installation of this product. This manual is illustrative, not comprehensive. It does not cover personal safety when working on a roof or go into depth regarding structural, plumbing, or electrical code. The installer should heed local building code and industry best practices. The installer should have the proper training and knowledge in these areas. If you do not have the proper training and knowledge then you should not attempt to install the unit.

1. Included Parts

The basic system includes:

1 – 40 or 80 Gallon Tank

1 - Bracket (assembly required)

15 (40G) or 30 (80G) - Evacuated tube solar collectors (including aluminum fin, stainless heat pipe, and cap assembly)

15 or 30 - Plastic tailstocks

15 or 30 - Dust rings

1 - Magnesium Anode (pre-installed under white plastic disc)

1 – ½" Temperature and Pressure (T/P) Valve

1 – ½" Hy-Vent Air Eliminator

1 – 240V, 2400W heating element (pre-installed, optional to use)

Here are photos of some of the components that we talk about in the manual. The thermowell and controller are optional and not included with every unit.

T/P Valve

Plastic Tailstock

Controller

Hy-Vent

Dust Rings (Black or White)

Thermowell

2. Not Included Parts

The specific hardware necessary is installation and climate specific. This list is illustrative, not comprehensive.

Contact us for a Shopping Cart link to help speed up your purchase of these items.

The unit can be installed as a pre-heater with a bypass or as a standalone system.
The following parts list is for the basic pre-heater setup:

1 – copper or PEX pipe (length and diameter dependent upon installation)

1 – roll of Teflon plumbing tape

1 – bottle of thread sealant

1- 4.5 gallon potable water expansion tank

2 – ¾" FNPT adapters to interface with tank inlet and outlet

2 – ¾" FNPT caps (if not using side ports – most installations)

1 – ½" brass plug (if not using thermowell)

2 – ¾" MNPT drain valves

6 – T's (diameter depends on pipe size chosen)

6 – Ball valves (see plumbing configuration diagram in Part 4 for explanation)

1 – Flashing to interface with the roof/building penetration point

1 – lead free mixing valve (also known as a tempering valve)

Roof attachments (type depends on roof surface – contact us for suggestions)

Installation specific plumbing fittings to interface with existing plumbing

Pipe insulation and aluminum jacketing for outdoor pipe

Optional:

1 – freeze protection valve. -

3. Project Overview

1. Before starting an installation, it is necessary to know where you plan to mount the unit and where you plan to interface with the existing plumbing system. Once this is clearly defined, you can purchase the necessary plumbing supplies.

2. If a permit is required in your jurisdiction contact us for more resources. We will provide you with documents that you will need for a permit and can connect you with a structural engineer, if necessary.

3. Assemble the bracket and find the rafters/trusses over which you plan to mount it. Lag flashed attachments to roof and mount bracket so that you can find the correct roof/building penetration.

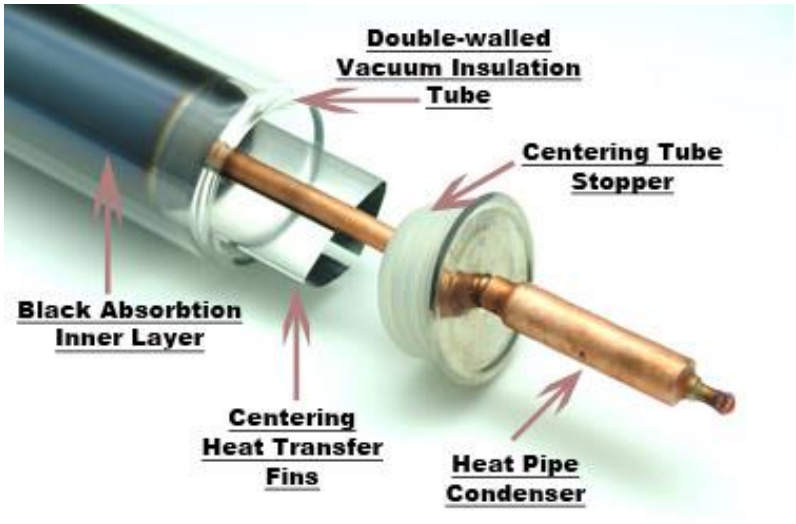
4. The next step is to run the plumbing to where you will interface with the existing plumbing. Make the plumbing connections according to the unit plumbing .

5. Tighten nuts to secure tank bolts to the bracket. Connect plumbing and fill with water and check for leaks. Do not seal up insulation until you have checked for leaks.

6. Install tubes. This is always the last step and they are kept in the box until now to prevent overheating.

7. Enjoy solar heated water.

We will discuss the various parts of the vacuum tube assembly in this manual:



4. Plumbing Diagram

We are including three plumbing diagrams to help explain how to plumb the system

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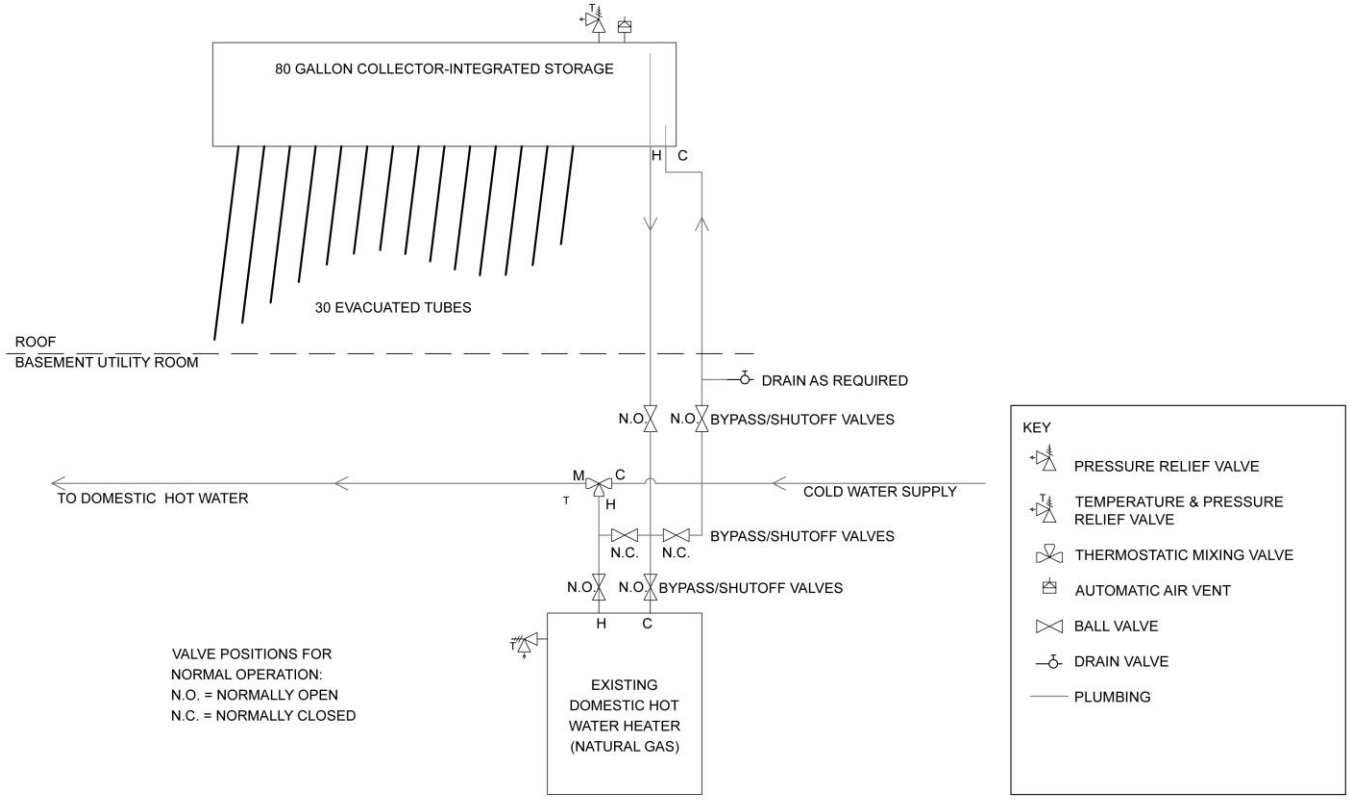
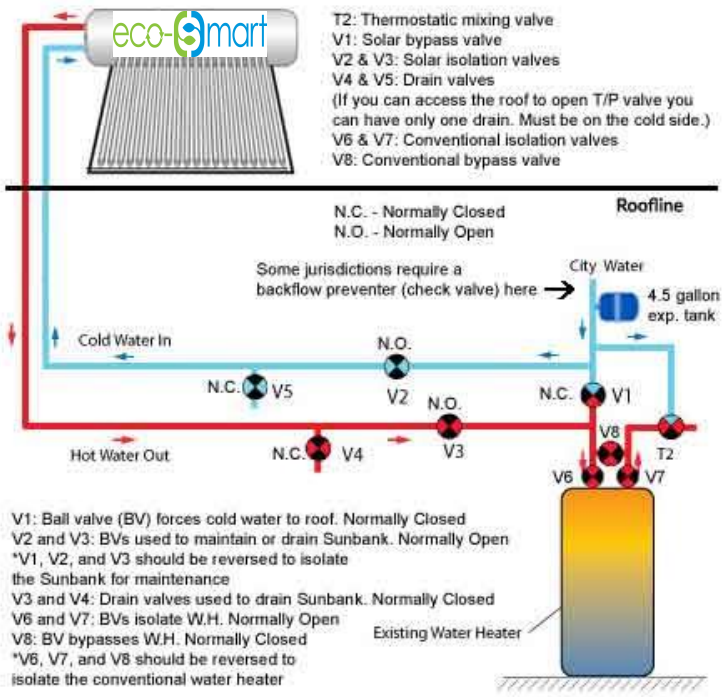
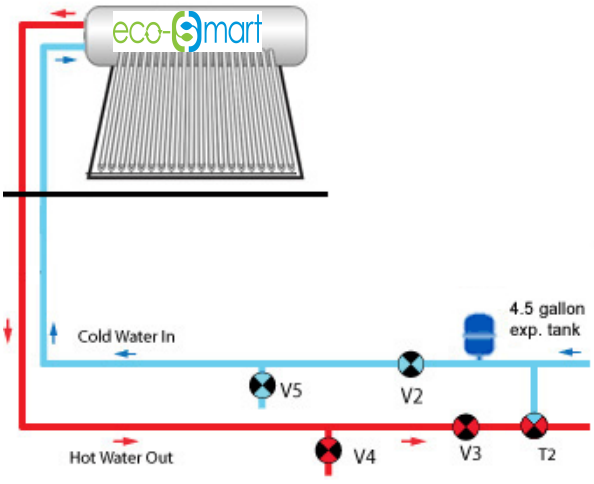
Pre-Heat Diagrams



Note: Drain the T/P valve to the gutter to avoid hot water on the roofing material



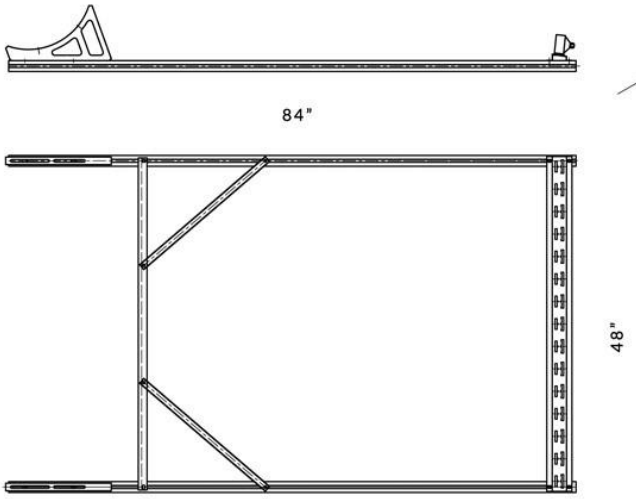
Stand-alone with Electric Backup Plumbing Diagram

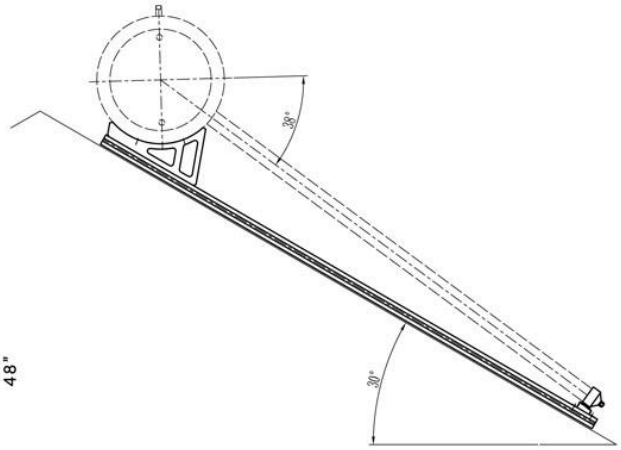


▲ T2: Thermostatic Mixing Valve
▲ V1: Solar bypass
▲ V2 & V3: Solar isolation
▲ V4 & V5: Drain
(In certain installations you can use the faucet to drain)

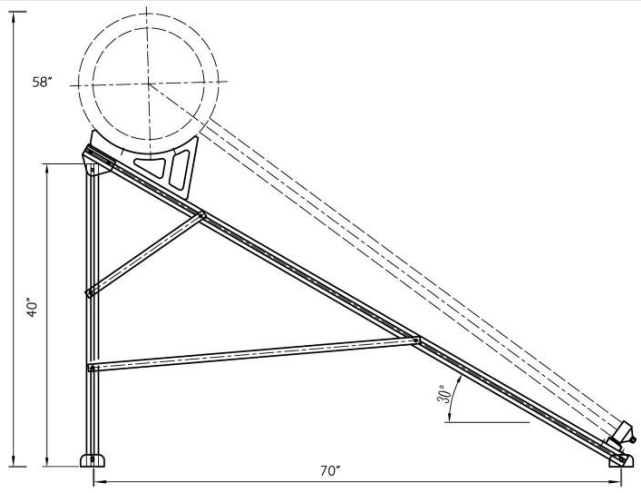
5. Bracket Diagrams

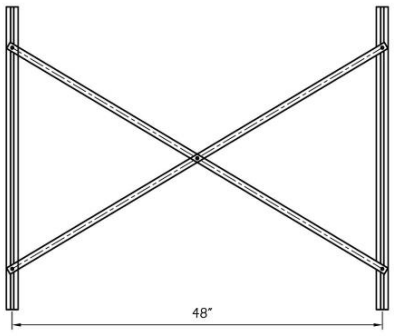
1) 40G Flush mount for pitched roof



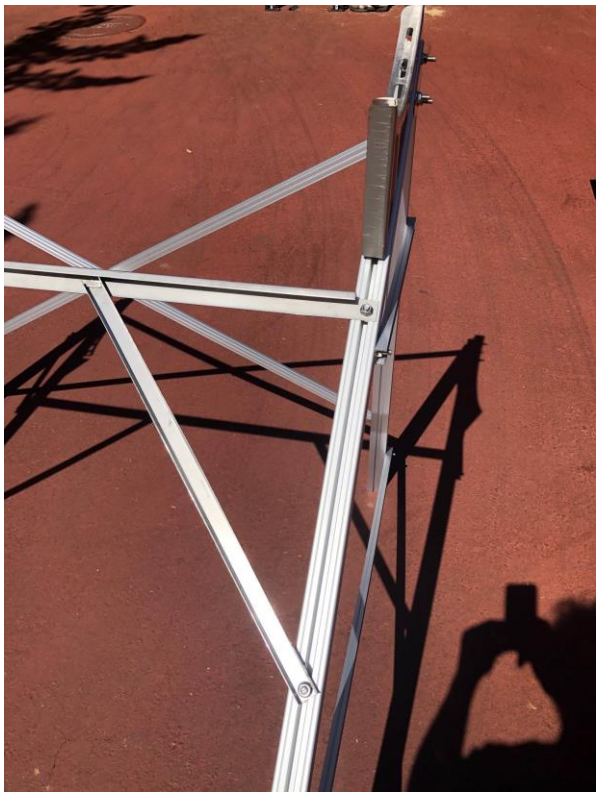


2) 40G Flat roof and ground mount

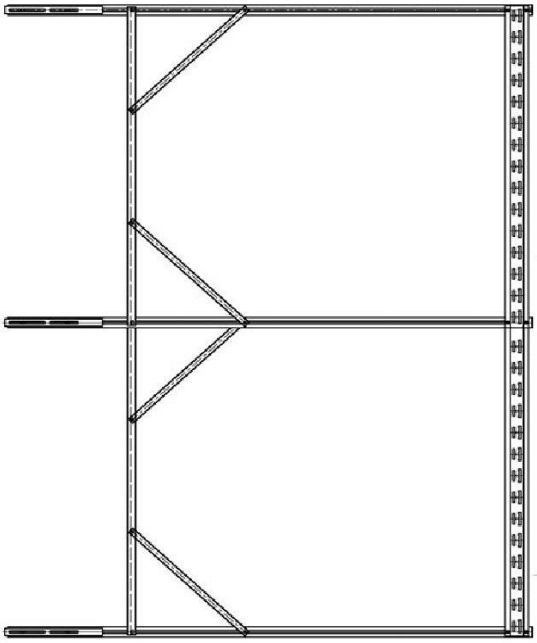


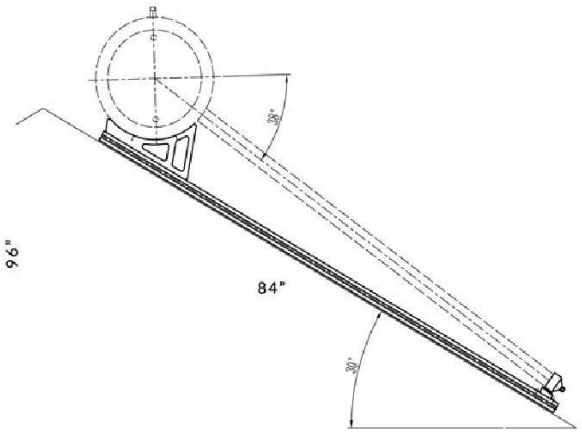




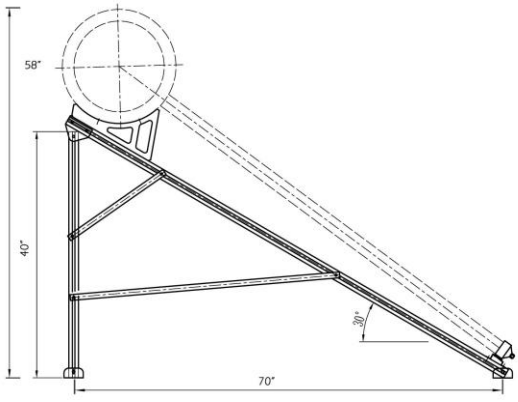


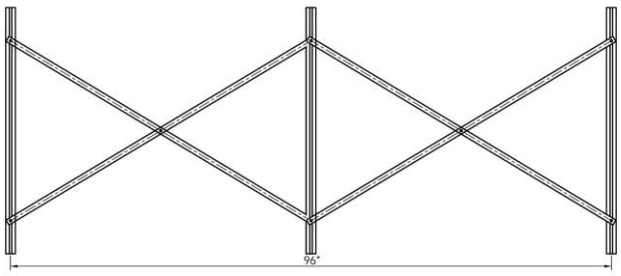

3) 80G Flush mount for pitched roof





4. 80G Flat roof and ground mount



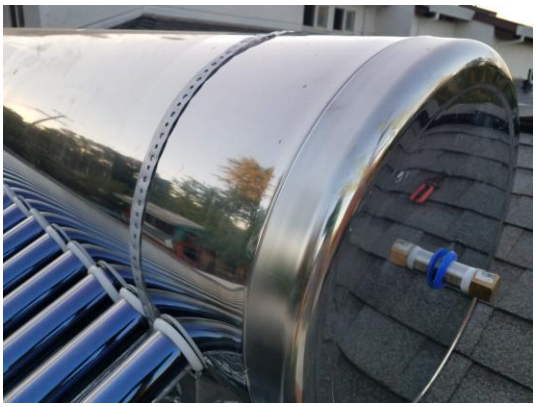


6. Reinforce Roof

Whether or not it is necessary to reinforce the roof depends on the existing roof structure. A structural engineer is qualified to assess a roof and to prescribe reinforcement measures that must be performed before installation. We recommend structural engineering for all roof mounted projects and it is often required for a permit. Send us an email for a structural engineering referral.

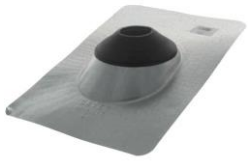
7. Strapping the Tank

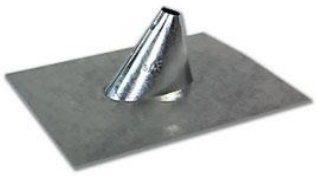
For all installations, but especially those in areas prone to earthquakes or hurricanes, we recommend the installation of 304 stainless steel strapping. The purpose of this is backup protection to keep the tank on the roof in the case of a catastrophic event. It should be directly connected to the steel strut or a lagged roof attachment using stainless steel hardware. Shown below with silicone "plumber's tape" underneath the strap.



8. Roof Penetration

If your installation involves penetrating a roof, you will want to make sure that you have the right hardware to get your roof sealed up correctly. "Oatey Solar Flashings" (leftmost) are available at local hardware stores, the flexible part of this flashing can break down over time with UV exposure. A ¾" cone flashing (middle) is a more robust option. Other options include the Quickflash A/C U-C (right), Quickmount Q-Box, and Soladeck. Flash correctly with M-1, Vulkem, or equivalent structural adhesive.





9. Roof Attachments

There are many companies that make robust solar roof attachments. Roof attachments are specific to the type of roofing to which you are attaching the Sunbank and all roof attachments should be approved by a structural engineer for the specific installation. For mounting to most composition shingle roofs, we recommend a flashed L foot design like the Quickmount QSME-Lag. Snap-n-Rack and S-5! make metal roof attachments, Pegasus for tile roofs, and Chem-Link and Eco-Fasten have products for flat or membrane roofs.

Spec sheets, distributor information, and installation diagrams can be found on their websites.

It is recommended to attach the roof attachments to strut rail (second set of photos) and then mount the Sunbank bracket to the rail. Especially underneath the tank, where most of the weight lies. This has the advantage of allowing the installer to put in more lagged roof attachment points, to spread out the weight between more rafters, and to have the final mounting position not be constrained by rafter position.

Bracket mounted directly to roof attachments:

Bracket mounted to strut which then mount to roof attachments **(recommended)**:

10. Insulation and Jacketing

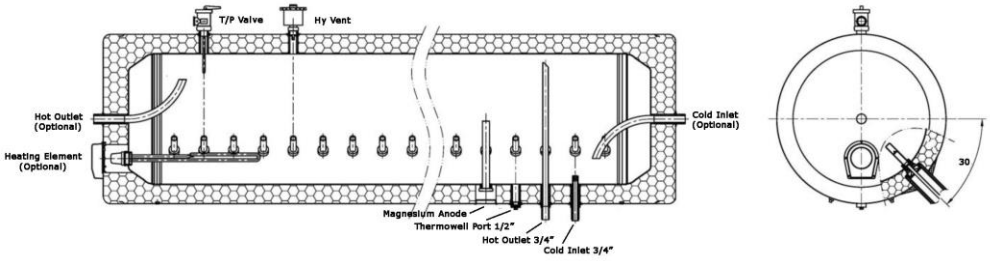
All plumbing that is exposed to the elements should be adequately insulated and jacketed; how best to do this will depend on the specifics of your installation and your climate. Below are examples of insulation and jacketing systems. Aluminum jacketing for solar thermal projects can be found at a local distributor or here: http://www.buyinsulationproductstore.com. We have found that 6" aluminum flex duct and aluminum stack vent are the products most commonly available at hardware stores and serve a similar function. You must install the aluminum version of these products, not the Mylar/plastic version as they are not robust enough to be installed outdoor and can be destroyed by birds.

A register boot will interface with the tank. You can use rivets or tek screws to connect the boot to the tank and butyl tape to flash. Remember, don't do this until you have filled the tank with water and checked for leaks.

11. Filling the tank

Make certain the drain valve is closed. Open the solar isolation valves (V2 and V3) to allow water to fill the Sunbank tank. Close the solar bypass valve (V1) to force cold water into the unit. The Air Vent (or Hy Vent) will allow air to escape and the tank to fill with water. Check the connections and fittings for leaks and repair any if found.

12. Tank Diagram



13. Tube Installation

The last step is to install the tubes.

1. Note tailstock comes apart. Unscrew the black plastic at the bottom of the bracket. Put the dust ring around the top end of the evacuated tube about 2 inches from the top. Use mild soap and water to ease on the dust ring.

2. Put the bottom of the evacuated tube through the end of the unscrewed plastic tailstock and pull the heat pipe out of the tube about six inches.

3. Guide the condenser bulb of the heat pipe into the tank socket until you hear it bottom out in the tank (~4 inches). Rotate the tube if there is resistance.

4. Slide the tube so that it fits up against the tank. Maintaining upward pressure on the tube, screw the cap of the tailstock on to hold the tube in place. It should screw easily—be sure that you have the threading lined up. You can twist the tube to help twist the tail stock. Do not overtighten.

5. Adjust the dust ring so that it fits snugly between the tank and the tube.

6. Repeat.

14. Controller

We offer a WiFi Smart Home Controller, as well as a hard wired controller option. Their primary function is to control the backup heating element (if used) as a thermostat, but they do have several other useful features. In order to use the backup heating element, you MUST use a thermostat (controller). In addition to turning on and off the heating element based on temperature, they also give you a digital readout of the temperature in the unit. Knowing the temperature in the unit is important to understand that the system is functioning correctly. In addition to these functions, it can also provide both overheat and freeze protection when coupled with a recirculation valve and pump kitl.

15. Temperature Sensor

While you are putting teflon tape on the temperature sensor thermowell you will notice that it extends 6 inches or so up into the tank. When you are installing the actual temperature sensor wire it is important that it goes all the way to the end of this well. This ensures an accurate reading.

The TS-40G and the TS-80G comes with a pre-installed 240V/2400W/10A element. We also have a 120V/1500W/13A element that you can purchase. The lower voltage element can be used for off-grid battery backup applications or if there is not enough space on the breaker panel. They both have 1" BSP threads, and either element can be used with either system. We have a special socket to remove the element and it comes with the purchase of the replacement element.

16. Project Completion

Once the tubes are installed the system should be ready for use. Again, make sure that there are no leaks at the fittings and that the insulation is sufficient and sealed appropriately.

The next time you should need to think about your unit is to check and change the magnesium anode. Like any water heater, this anode should be changed in order to keep the inner tank from corroding. The frequency with which you should change this anode depends on the total dissolved solids (TDS) of your local water supply. If you don't have a good idea of your local TDS, The Mfr. recommends that you check the anode one year after installation and base future checks on the amount of the existing magnesium anode that is left at this point.

Addendum:

Watts (Grundfos) Instant Hot Water Recirculation System

We recommend this system, now available on our website and elsewhere online, to prevent overheating and freezing.

http://www.watts.com/InstantHotWater

This valve installs under the sink furthest from the unit and uses the cold water line to circulate hot water back to the solar tank. The pump is controlled by the solar unit controller and can be programmed to turn on when the tank is getting too hot. Using the "AH function" we recommend turning on the pump at 165F and turning it off at 160F. When the system comes on hot water is circulated through the home's plumbing lowering the temperature in the tank. Likewise, the controller can be set on a timer during the winter to come on periodically throughout the night to prevent any of the plumbing lines from freezing.

18. Operation & Maintenance

Once the unit is installed, the tank filled, and the valves turned according to the diagrams above, your unit is operational. Because your system is now pressurized via municipal or well water pressure, the unit delivers hot water by simply opening your hot water faucets.

Safety

Turn off power to water heater if it has been subjected to overheating, fire, flood, physical damage, etc. Do not turn on heating element unless it is filled with water. Do not turn on heating element if cold water supply shut-off valve is closed. If there is any difficulty in understanding or following these instructions, it is recommended that a qualified person perform the work.

Draining the Tank

In order to drain the water heater, close V2 and V3. Attach a garden hose to the drain valve and direct the hose to a drain. Open V4 and V5.

Painting the Tubes

A good idea of any installation, but especially if you go away from home for a week or more, or live in a climate with too much sun, you can paint half of the tubes and rotate (all of some of the tubes) so that the opaque side faces the sun. It is best to do this before installing the tubes. Simply mask half of the tube with painter's tape and spray paint the other side with silver spray paint. If already installed, clean the tubes before painting. If you plan to be away for long periods with freezing temperatures, it is best to either run a recirculation pump for freeze protection or cover the collectors and drain the system so that the pipes don't freeze.

Painted tubes:

Maintenance

There is relatively little required maintenance for the unit. Properly maintained, your solar water heater system will provid e years of dependable, trouble-free service.

Annually:

1. Trim trees near collectors.

2. Lift and release the lever handle on the temperature and pressure relief valve to make certain the valve operates freely.

At least every three to five years:

1. Check all valves and electrical equipment.

2. Change magnesium anode and flush tank

The evacuated tube collectors should last for 15 years without significant degradation.

The tank life depends on the local water quality, pressure, and how frequently the magnesium anode is changed. Reducing the pressure fluctuations in the tank will increase its life. You can reduce the pressure by:

a) installing a whole house pressure reducing valve if your incoming water pressure is above 60 PSI,
b) installing an appropriately sized expansion tank in the mechanical room on the cold side

Stainless steel tanks are the most durable and expensive tanks to produce, but if not properly maintained in areas with hard water they can corrode which will shorten their working life.

Magnesium anode

Every unit comes with a magnesium anode meant to protect the inner tank from corrosion. How fast this sacrificial anode will corrode depends on your local water quality. We recommend that you check the anode one year after installation and base future replacements on how much of the anode remains. You can buy replacement anodes from your distributor or your local hardware store.

IMPORTANT: Change your anode frequently to protect your tank from corrosion. This is especially important for systems installed with high mineral content water, like well water systems. Our recommendation for well water systems is to install a whole house reverse osmosis system to remove the minerals as high mineral content will shorten the life of the tank.

19. Warranty

The Mfr. offers a 10 Year Warranty for manufacturer's defects on our evacuated tube collectors and 1 year warranty on all other components of the system. This does not include damage that occurs due to improper installation or maintenance. Nor does it include damage from anything outside of Sunbank's control, such as an act of nature or Force Majeure. The Mfr. will replace defective parts at no charge but will not pay for or provide the labor to replace those parts.

Proof of purchase, such as an invoice marked 'PAID', is required as we do not warranty products that were not sold by us.

20. SRCC Information

Please circle your system configuration on the chart below and leave a printed copy in an accessible place like the water heater closet. The system model refers to which type of conventional water heater the Sunbank preheats: E – Electric, G- Gas, TE – Tankless Electric, TG – Tankless Gas.

The SRCC certification qualifies you for certain rebates and incentives, such as the Federal Tax Credit.