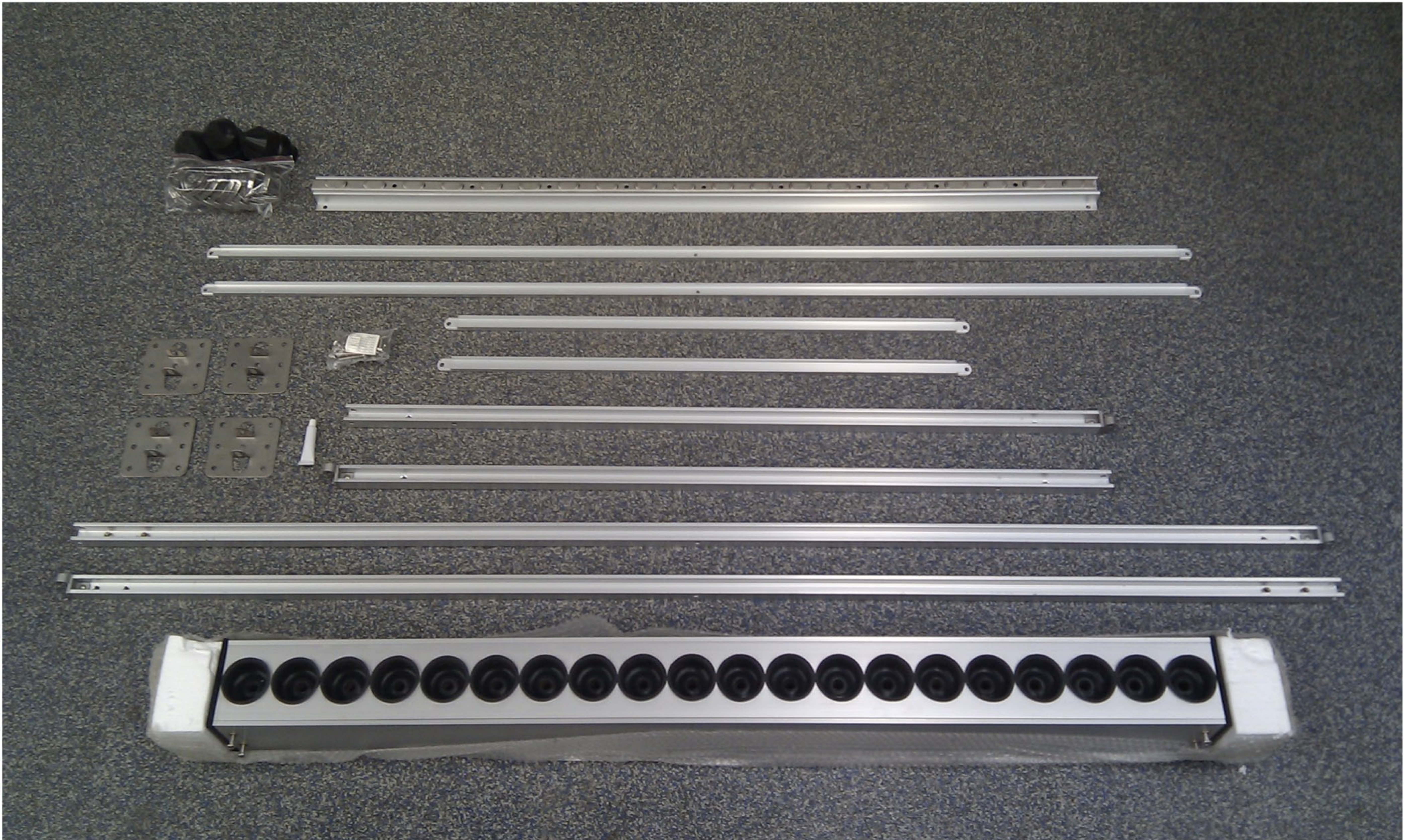




WaterTechSolar.com

Instruction Manual

Parts List



From Left to Right / Top to Bottom

Solar Tube Stand	2 Side Angle Braces
Rubber Caps for Solar Tubes	4 Mounting Feet
Clamps for Solar tubes	Plumbers Thread Seal tube
Bottom Solar Tube Rail	2 Rear Uprights
2 Rear Cross Braces	2 Front Uprights
Hardware Bag	Solar Tube Manifold

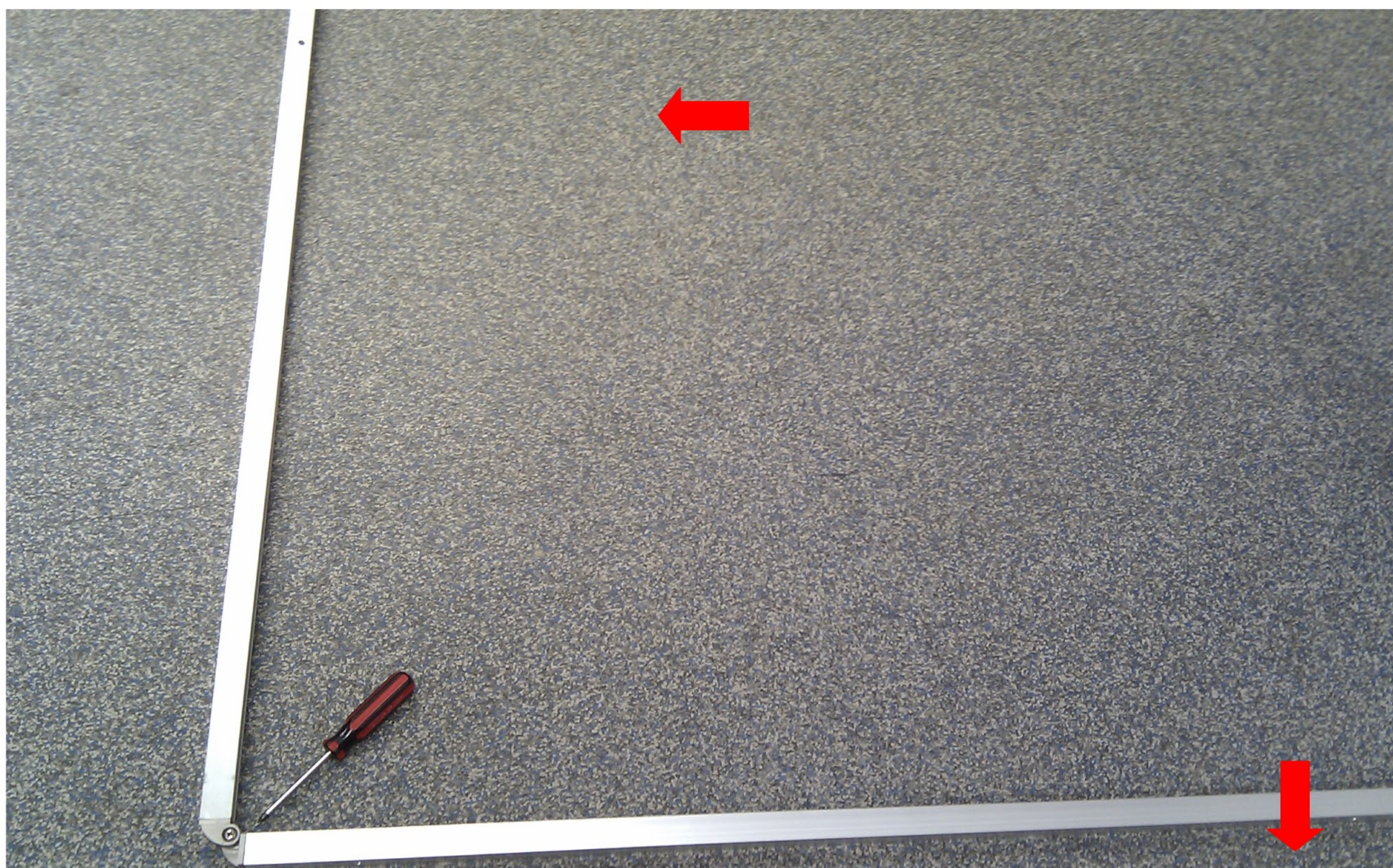
Instructions



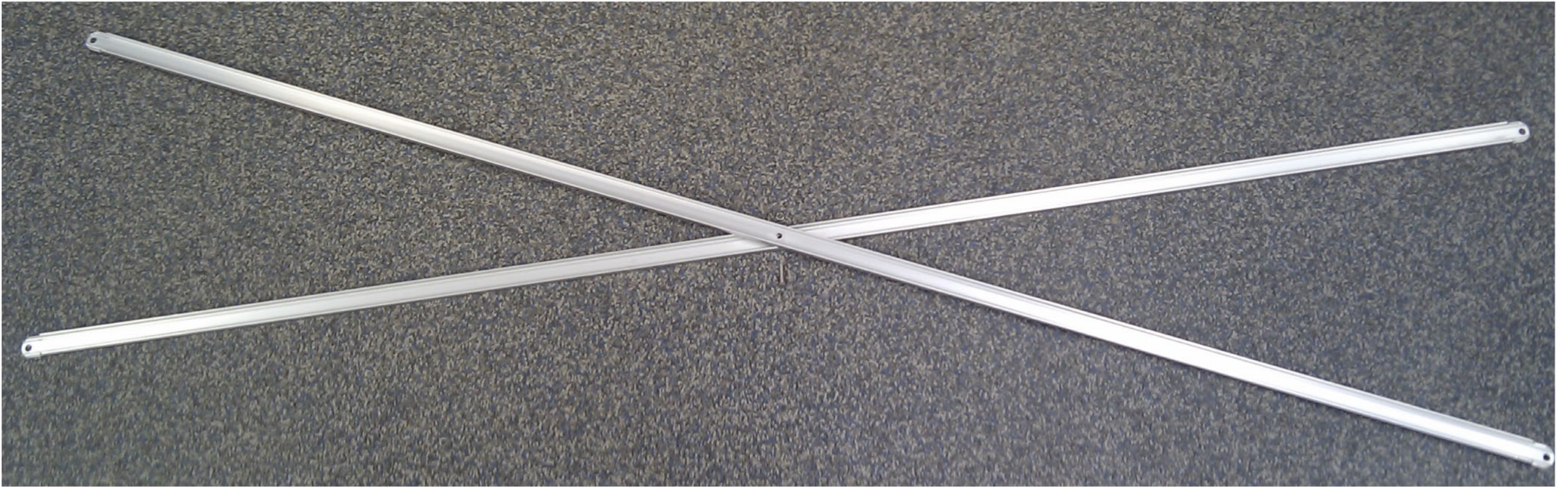
Step 1:

Join the Front and Rear Uprights Using the Round Head M8x20 Bolts.

Note the uprights are sided. They have holes predrilled on one face of them. This will be the outside face on each side. See below.



Instructions



Step 2:

Lay the 2 rear cross braces on top of each other to form an X. Line up the center holes. Insert the Hexagon Screw M6 x 25 and join the two using the M6 Hex Nut.

Note the picture below, the cross braces have a flat side and a channel side. The channel should be facing the same direction and the flat sides should be facing the same direction. The like side should not be facing each other.



Instructions



Step 3:

Join the assembled uprights to the assembled rear cross brace. The flat sides of the cross brace go against the rear of the uprights. Attached the cross brace to the uprights using 4 of the M8x16 Hexagon screws and nuts. The head of the hexagon screw should grab in the grooves of the cross braces when the nuts are tightened down - see upper right picture.



Instructions

Step 4:

Attached the bottom solar tube rail to the uprights. Use 4 M8x16 Hexagon bolts into the threaded holes.



Instructions

Step 5:

Attach the mounting feet on all 4 corners of the uprights using M8x45 Hexagon Screws and M8 Hex Nuts.

Tighten so tabs create outward pressure on the nut and bolts head but not to tightness that the stand can no longer pivot.



Instructions

Step 6:

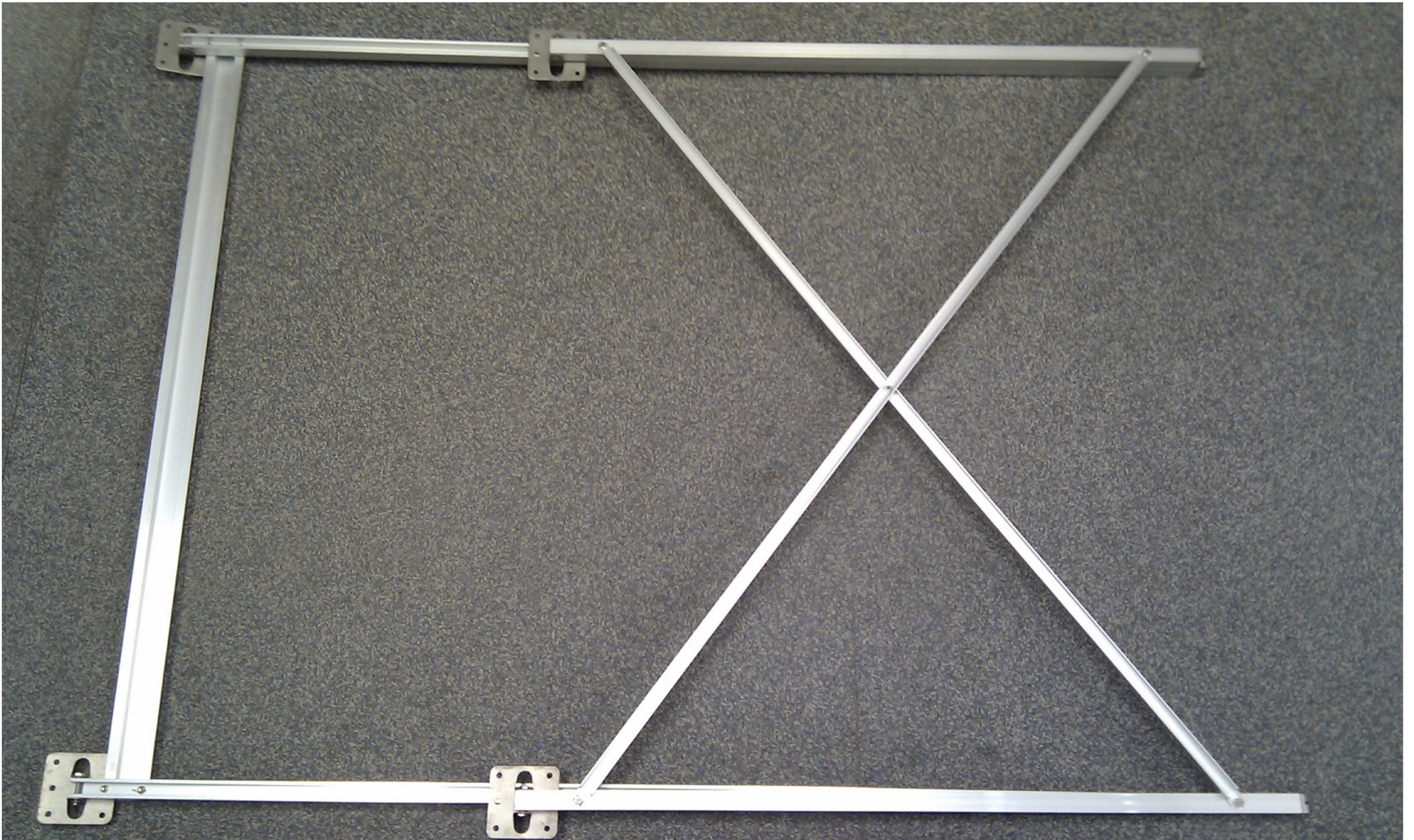
Collapse stand and transport the stand to the roof or mounting location. When doing any work on a roof or raised area that poses a falling hazard; please take all necessary safety precautions including but not limited to:

Wear correct footwear.

Use safety ropes and harnesses incase of slipping.

Wear protective clothing for crawling and climbing.

Always work with enough people that you are not putting yourself or others in danger trying to over exert yourself lifting or climbing.



Instructions



Step 7:

Move the frame to the location on the roof you wish to mount it. Please note the stand should be facing South in the Northern Hemisphere and not have any tree coverage at any point of the day.

Using the following formula find the angle at which your front uprights should be angled:
 $(\text{Your Latitude} \times 0.9) + 29 \text{ Degrees} = \# \text{ of degrees}$
your panel should be angled towards true South from the horizontal position (laying flat pointing directly up)

You can find your Latitude by visiting
<http://www.findlatitudeandlongitude.com>

Using an angle locator as seen in the picture above, spread the uprights away from each other so the front upright is at an angle matching your calculation from above.

Instructions



Step 8:

On the side of the rails you will find two pre-drilled holes that fit M8x16 hex bolts. These holes are the MAX steepness reference holes (see above). If the side braces are used in conjunction with the holes it will position the stand at a 45 degree angle sitting on a flat surface. The rear and front uprights should NEVER be any closer to each other than this point for stability purposes.

Most people will have to angle the rear uprights away from the front uprights at a wider degree than this to achieve a different angle (especially when being mounted on a pitched roof).

Once the correct degree of pitch for the front uprights is achieved while sitting in its final mounting location; locate a position on the side of the rear and front upright that the side braces will reach from hole to hole on the uprights and is level - see pictures below.

Using a 5/16" drill bit drill a hole through the outside face of the frame where the side brace will attach. Secure the angle position using 4 M8 x 16 Hex bolts and nuts.



Instructions



Step 9

Transport the Solar Tube Manifold to the roof or mounting location. Use caution as this component is smooth and heavy.

The mounting bolts come factory located in the mounting holes on the underside of the manifold.

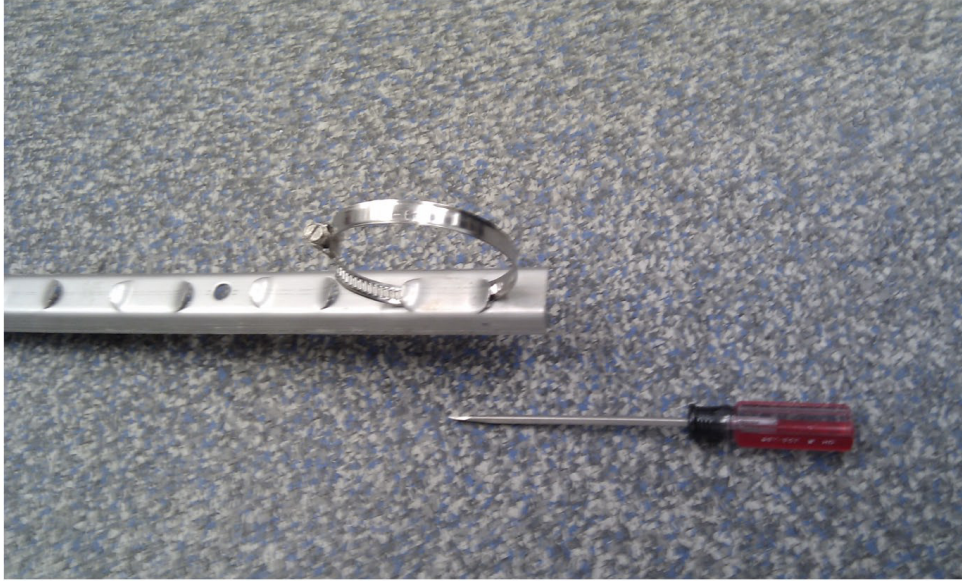
Remove the screws and use them to mount the manifold to the uprights.

Note: At this time you will need to have helpers securing the stand on the roof . It is not bolted down yet and the weight of the manifold could cause the stand to fall.





Instructions



Step 10:

Remove the clamp holder from the bottom solar tube rail by sliding it out one side. Undo the clamps fully so they can be fed down in and back out of the clamp holders - see above.

Once all the clamps are in place slide the holder back into the bottom solar tube rail.

Do not insert tubes at this point, inserting the tubes will cause the pipe to heat rapidly during installation of plumbing.



Instructions

Step 11:

PLEASE NOTE: *There are different style roofs and the directions below are only pertaining to an asphalt shingle roof. On tile roofs and other type of roofs the tiles or other material may need to be removed in the area the feet will be positioned and then place on top of the feet after mounting and sealing. A professional roofer with experience in your type of roof material should be hired or consulted prior to installation.*

Disclaimer: Different areas have different weather conditions building codes, or other factors to take into consideration when working with roofs. Please consult a local roofer prior to following the below instructions.

Through the feet on the roof drill 2 holes on opposite corners of the feet through the shingles and roof using a 15/64 inch drill bit for location purposes.

Drop a piece of string into the attic or crawl space on the interior of the house in the location of each hole.



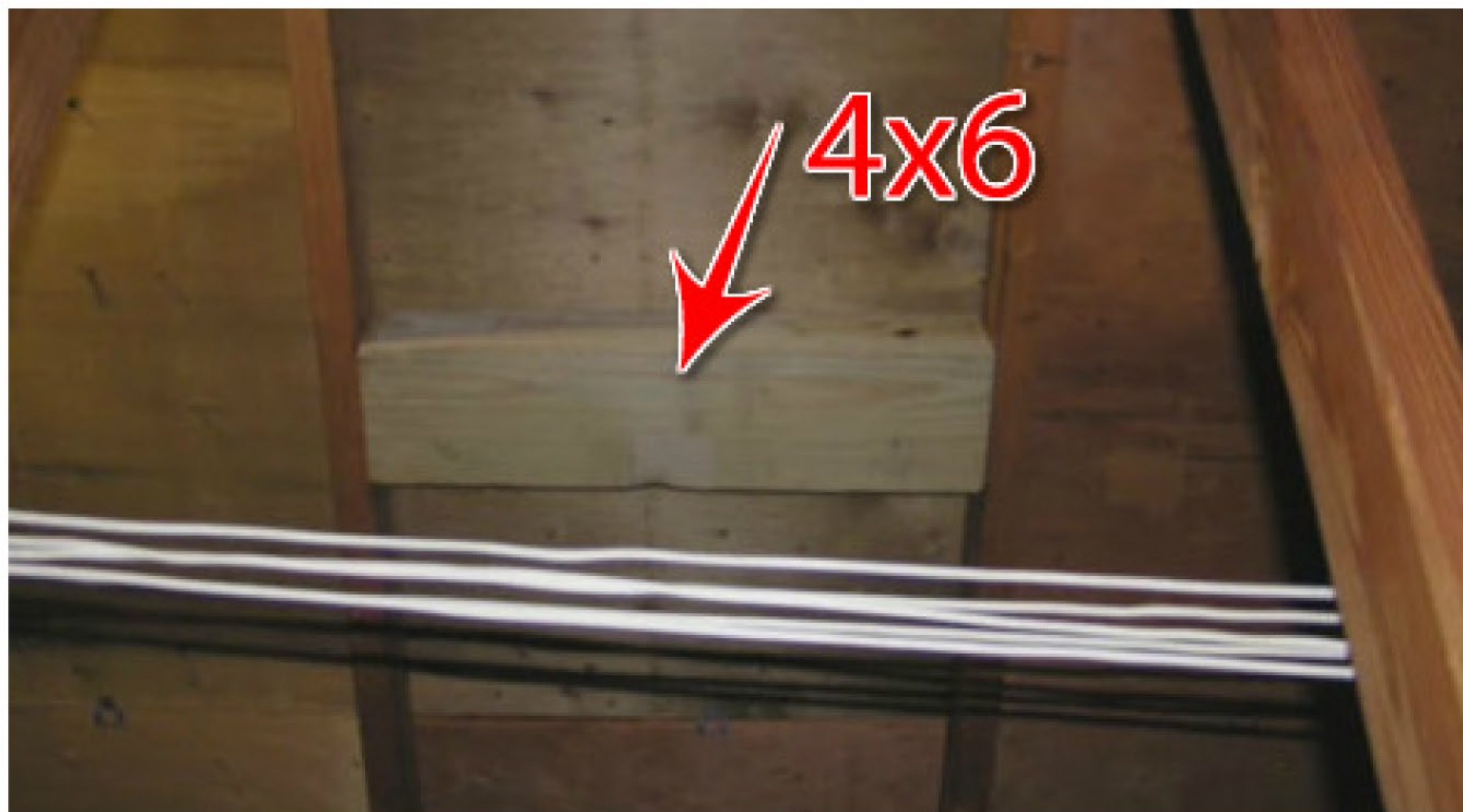
Instructions

Step 12:

For each footing; where the strings are located, measure the distance between roof trusses.

Cut a block of wood that measured length from a 4x6.

The wood block should be snug between the two trusses. Hammer the wood block into place so the strings are centered on the wood and secure on each end to the trusses. Do this by drilling 2) 15/64 inch holes through the trusses and into the block's ends. Then use 2) 3/8 inch x 4 inch lag bolts in those holes for securing the blocks to the trusses.



Step 13:

Using a 15/64 bit drill, re-drill the two spotter holes so you reach 4 inches into the roof and wood blocks. Also drill the remaining holes on the footer.

Before securing the footer use a high quality construction grade roofing silicone to liberally fill the holes that were just drilled and between the footing and the roof.

Immediately after applying the sealant secure the footers into the blocks below the roof using 3/8 inch x 4 inch lag bolts. Do this before the sealant has an opportunity to dry.

Plumbing Components

Step 1:

Starting from the solar collector plan where you are going access the inside of the house through the roof.

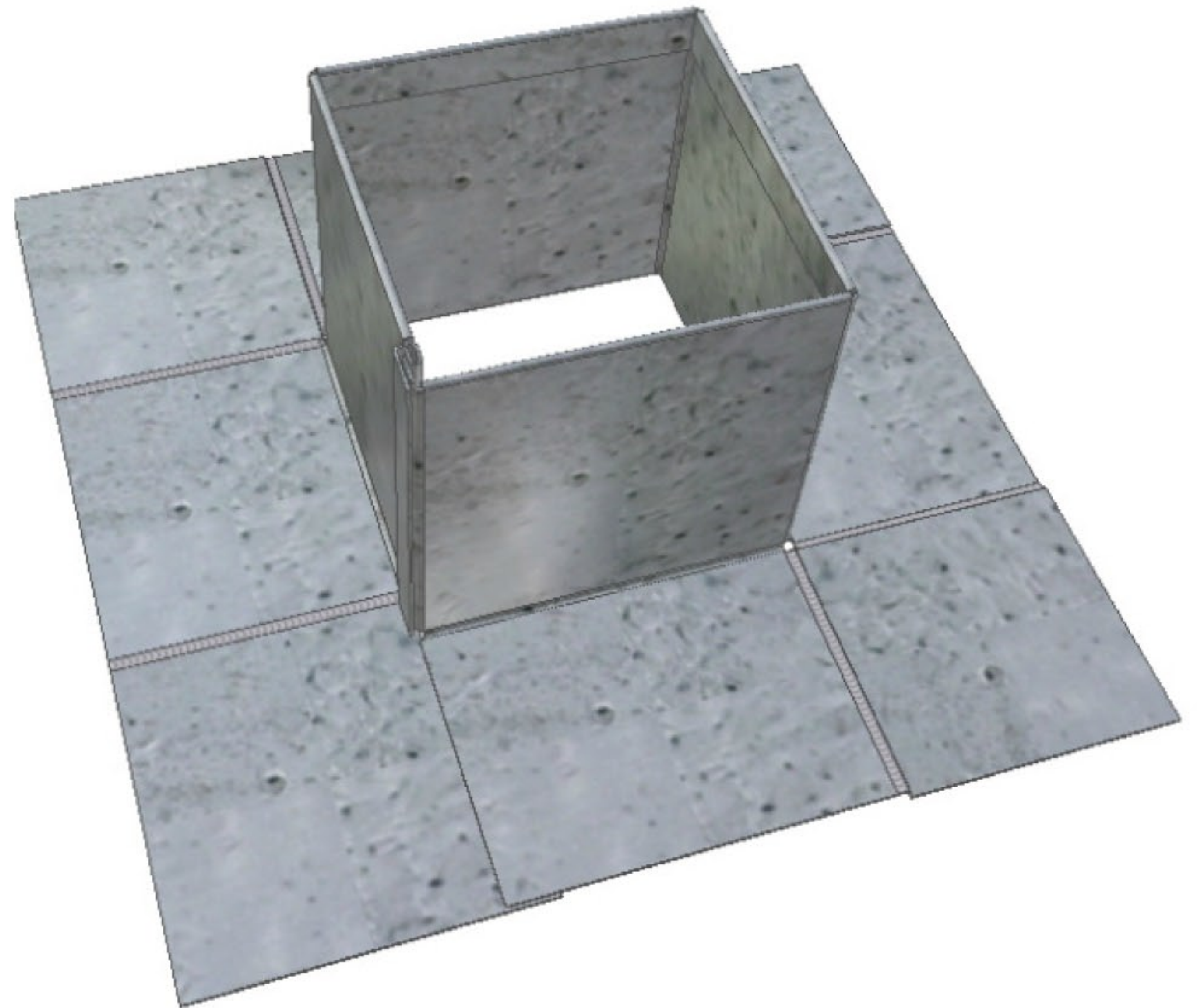
Step 2: Purchase a pitch pocket that will fit the two pipes you are running through.

Step 3: Pull up enough of the asphalt tiles to fit the flashing of the pitch pocket against the wood of the roof.

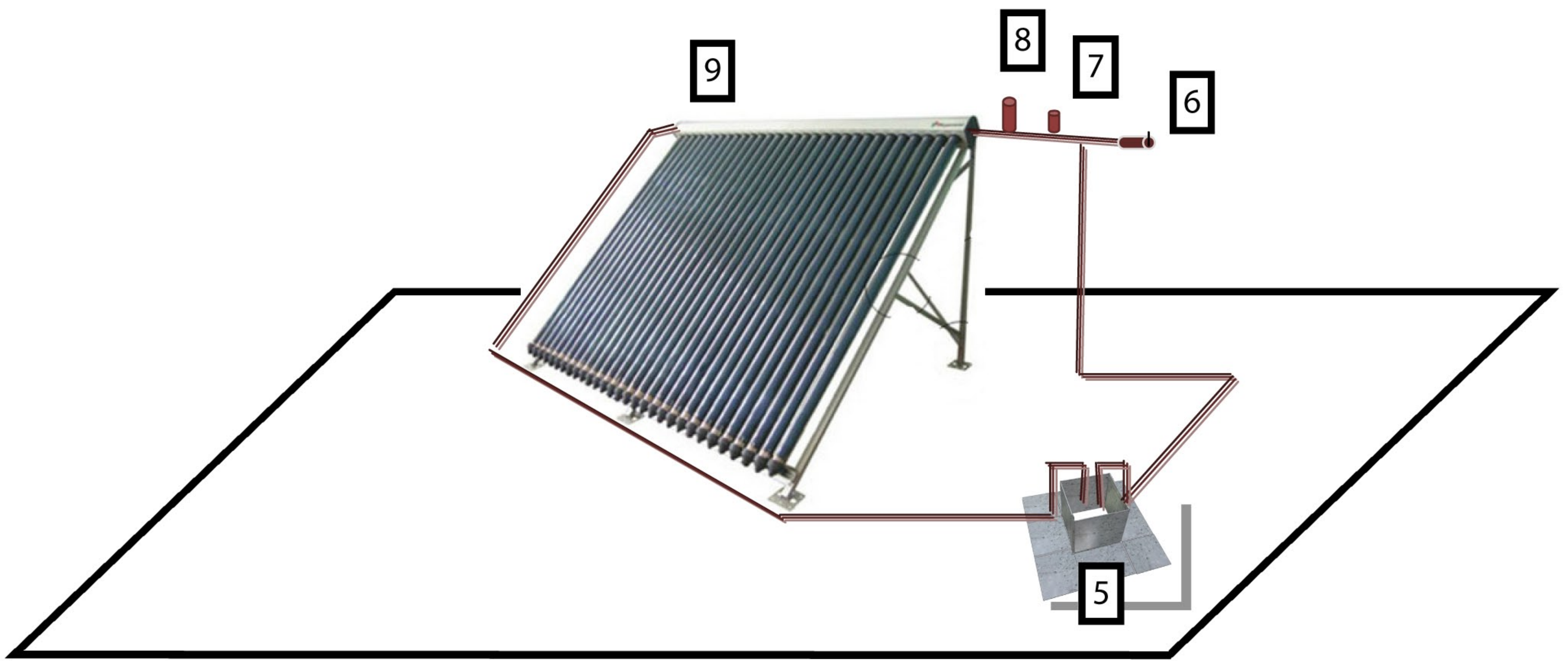
Step 4: Drill a hole in the roof lined up with the stack of the pitch pocket. Drill the hole large enough to fit the 3/4 inch pipes and sensor wire through.

Step 5: Center the pitch pocket over the holes in the roof. Very liberally use roofing cement between the flashing of the pitch pocket and the roof. Nail down the corners of the flashing with roofing nails.

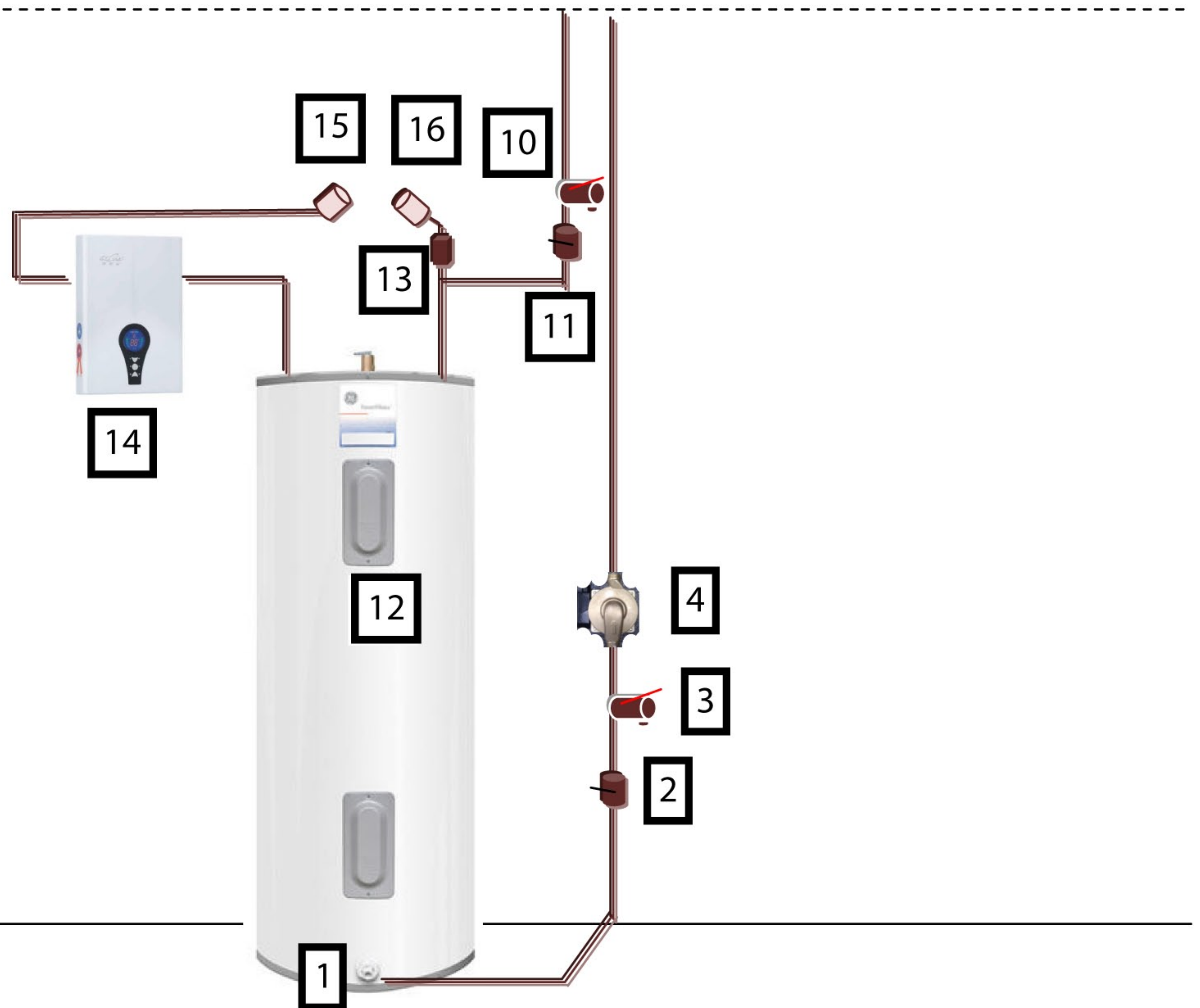
Step 6: Re-install the shingles on top of the flashing.



System Overview



1. Dual head drain
2. Ball Valve
3. Drain
4. Pump
5. Pitch Pocket
6. Heat / Pressure Release
7. Vacuum Breaker
8. Air Vent
9. Solar Collector
10. Drain
11. Ball Valve
12. Water Tank
13. Check Valve
14. Back up instant heater
15. Hot Water Into House with Ball Valve (can use existing shutoff)
16. Input Water from City/ Well with Ball Valve (can use existing shutoff)



Plumbing Components (Cont.)

Step 7: Turn off the water inlet to your water tank and for electric tanks flip the breaker to OFF that is leading to your tank. After confirming power is not longer going to the tank the wires can be removed leading to power the tank as they will no longer be needed. For Gas tanks turn off the gas leading to the tank. There is usually an on, pilot and off setting. Choose full off and allow a few minutes for residual gas to burn off.

Step 8: Attach a hose to the drain valve of your water tank and run it out to a safe place to drain your tank. Open the valve and drain your hot water tank.

PLUMBING NOTE: Plumbing should only be done by the experienced. Poor plumbing connections can lead to water leakage, scalding, major water damage issues and system failure. Only use copper piping or piping approved for extremely hot temperatures up to 350 degree F. All threaded joints should be used in conjunction with Teflon tape or plumbers tape. All copper pipe connections should be joined using 95/5 solder.

Step 9: Unscrew the old drain valve and replace with a dual head drain valve. This will allow for the drain to still be used and also feed water into the solar system. If you cannot find the dual head you can make one with a male and female threaded union, a drain, a tee and rigid pipe to connect it all (see below).

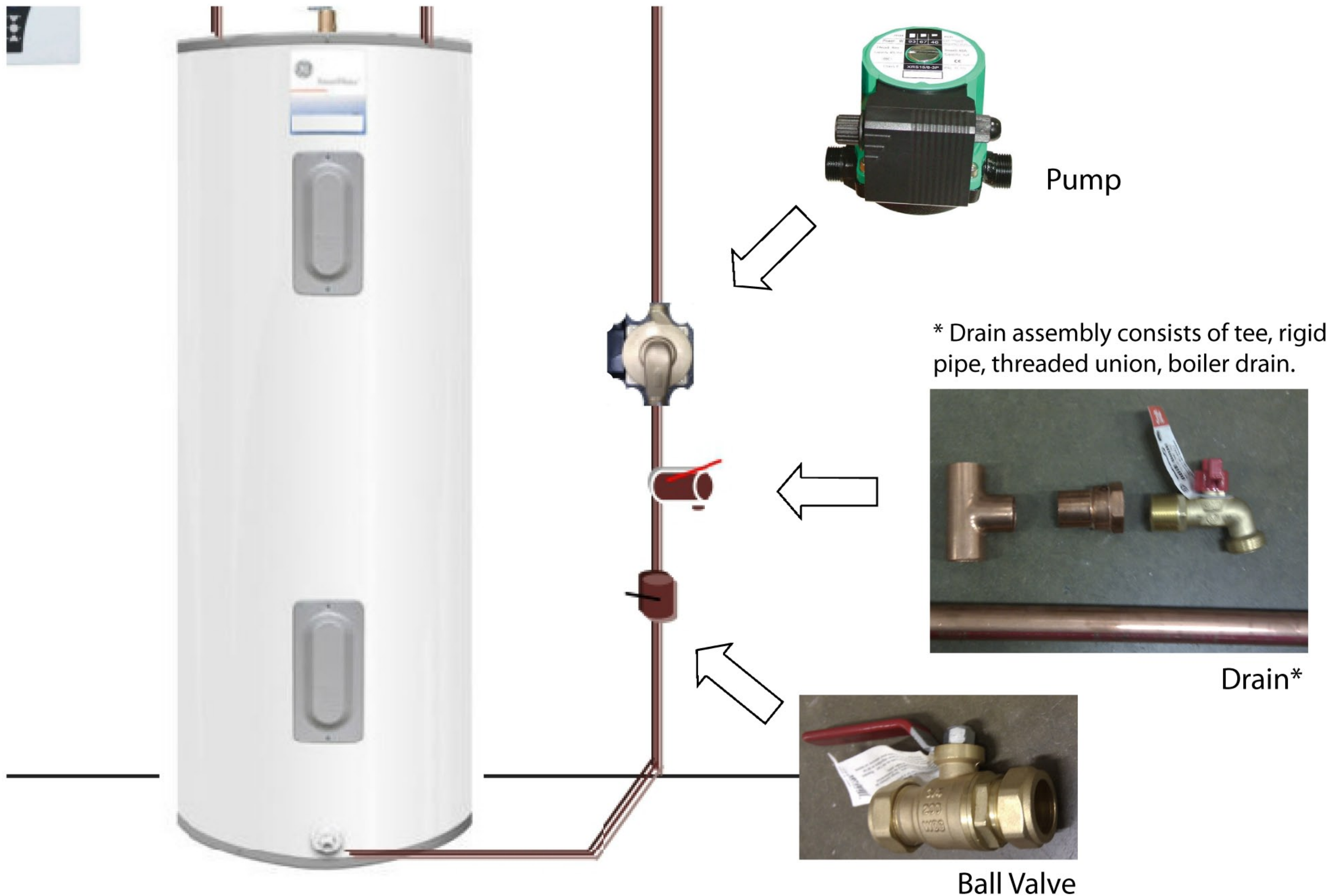


Step 10: Using a threaded union and copper elbows; run one of the valves in an upward direction along the wall. Number of elbows and exact plumbing configuration will depend on the placement of the water tank.



Plumbing Components (Cont.)

Step 11: Once the upward turn is made run the pipe into a ball valve. The valve is intended to isolate the pump and pipes above that point for maintenance and / or repair. Once the ball valve is closed no water from the tank will be able to flow into the pipes past that point.



Step 12: Above the ball valve install a drain to allow the pipes above the ball valve to be emptied for maintenance or repair purposes. With the ball valves closed you can then open the drain and allow the water to evacuate the pipes without emptying the tank.

Step 13: Place the pump on the wall about half way up the tank (electrical, triggering and startup of the pump will be discussed later). The outlets of the pump should be facing up and down. Run the out pipe from the bottom of the tank into the pump.

IMPORTANT: The pump is sole directional. The pumping direction is indicated with arrows on the unit. The arrow should be pointing away from the water tank and toward the roof.



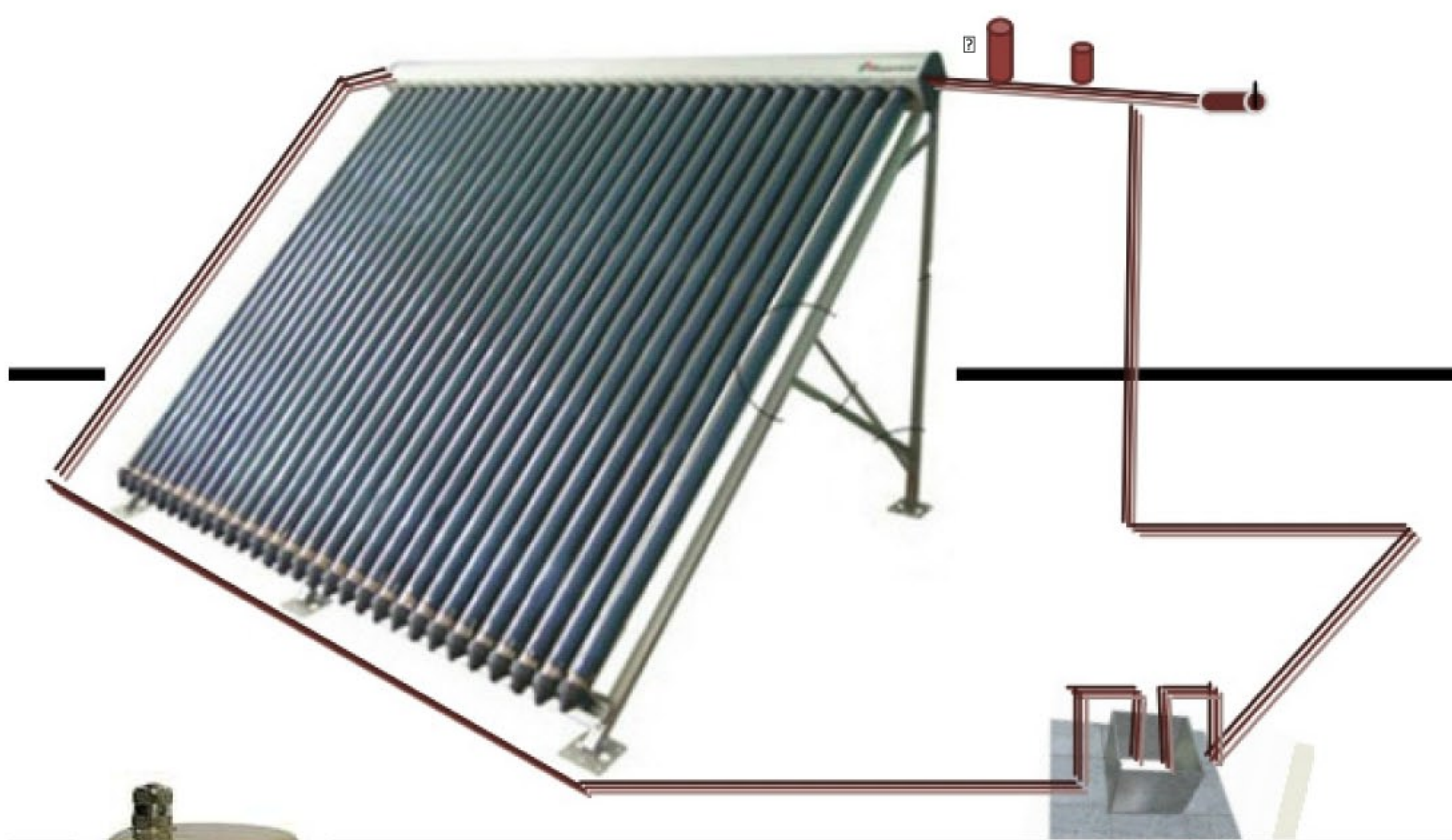
Plumbing Components (Cont.)

Step 14: Run the pipe out the top side of the pump; up through the hole in the roof that runs through the pitch pipe and to the side of the solar water heater manifold that DOES NOT have the sensor input hole. Attach to the manifold using a 3/4 inch threaded union and plumbers thread seal. To do long plumbing runs copper tubing (see to the right) is the easiest material due to its flexibility on gradual turns without the need for elbows.



Step 15: Create your system maintenance configuration off the out-pipe of the manifold. Some people choose not to use some or any of these devices however it is recommended that they are used in these instructions and the function and safety of the system is the sole responsibility of the installer.

- Run threaded union with attached rigid pipe out the other side of the manifold to a tee approximately 3 inches away from the manifold.
- The top of the tee should lead to an air vent.
- The other end of the tee should continue with rigid pipe a few inches to another tee.
- The top of that tee should have a vacuum breaker.
- The other end of the tee should lead with rigid pipe to a last tee. This tee should face down to head back to the roof inlet. On the bottom of the tee attach pipe for water to flow back down into the house.
- On the end of the tee install a few inches of rigid pipe and a pressure release valve.



Threaded Union



Rigid Pipe



Tee



Air Vent



Vacuum Breaker



Pressure / Heat Release

See next page for details on purpose of air vent, vacuum breaker, release.

Plumbing Components Explained

Automatic Air Vent:

An automatic air vent purges air from your system. This helps your system to run more efficiently. Air in the pipes causes the pump to work harder and use more electricity. It will also lead to a slower flow of water through the pipes. Air can enter the system in a few different ways; one of the most common ways is a shut off from a city water line or maintenance on the system. The one seen on the previous page is not the only look to these; they come in many shapes.

Vacuum Breaker:

A vacuum breaker allows air into the system to disrupt a vacuum effect. If a vacuum effect occurs in the pipe it can pull water back from the incoming city water that is entering the tank and cooling the system. Water could also get trapped on the roof instead of flowing back down and become overheated. The one seen on the previous page is not the only look to these; they come in many shapes.

Heat / Pressure Release:

This is the same as what is on top of the water tank. As pressure builds the release lever allows water or steam to come out. Normally this is attached to a pipe to direct the release but since this is hanging out over the roof the release can be allowed to just come out the end.

Combo units:

All of the above devices can be found at plumbing supply houses or online. The pressure release is the only item of the 3 that you could probably find at your local hardware store so please plan ahead for these components. Once you begin your search for these items you may find some that are combinations which are fine to use. Like an air vent and pressure release in one. The order of the devices on the pipe are not important so configure them in a way that makes sense for the devices purchased.

Plumbing Components (Cont.)

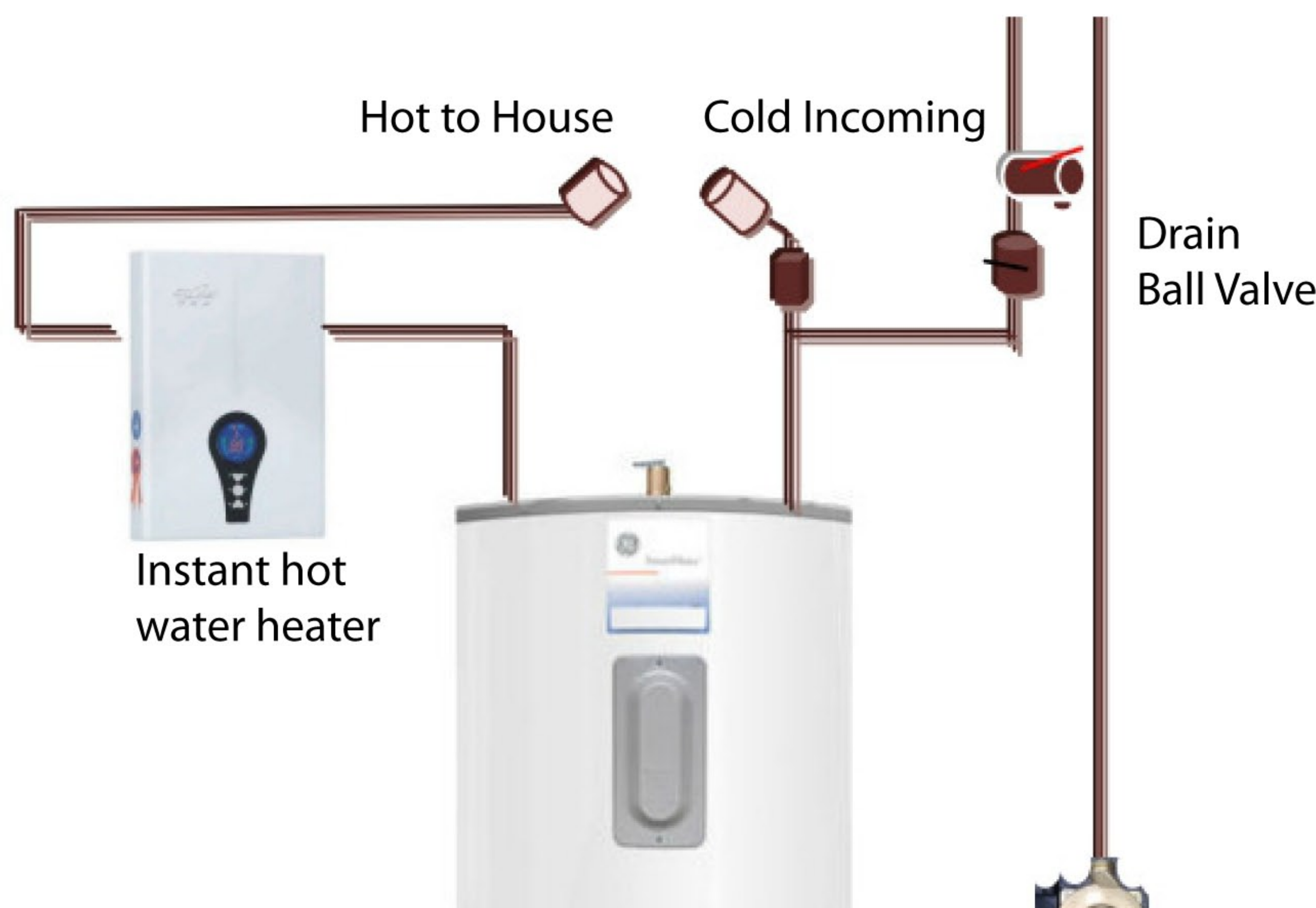
Step 16: Run the pipe in through the pitch pipe down to approximately 24 inches above the top of the tank. Install a drain and then a ball valve. This again is for draining the pipes from the roof without emptying the tank. When draining close both ball valves (on the up and back down) and release both drains.

Step 17: Using elbow bring the pipe from the roof to a point downstream of the incoming water inlet valve. This means the incoming pipe from the roof should meet an area of the pipe that is the incoming cold water from well or city but after the valve that turns water on and off from the water source and also after a check valve (see next step).

Step 18: Split the incoming cold water inlet pipe from the city/well after the existing on/off and install a check valve. The check valve is a directions valve (seen to the right) that will be positioned to only allow water to come in from the city or well but not to flow back out. Note the arrow on check valves to indicate flow direction.



Both with existing on/off valves



Step 19: Install a tee that connects the hot water from the solar to the incoming line from the city/well after the check valve to the top of the tank.

Step 20: Locate a position in between the hot water output of the tank and the point the water pipe enters the house. This will be your mounting position for the instant water heater. Split the pipe, install the instant water heater and have the pipe from the tank enter the instant heater and exit the heater to go into the house (electrical and programming of the instant water heater will be addressed later).

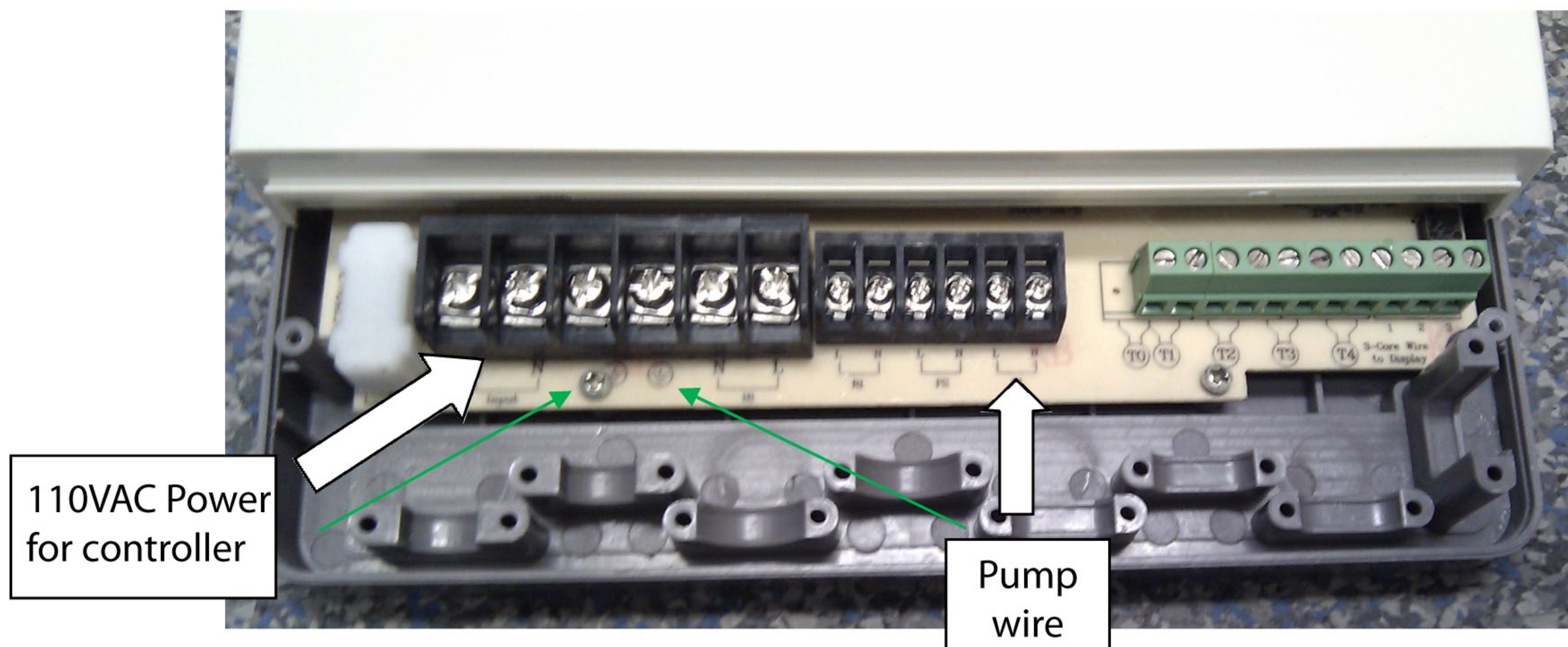
Electrical / Sensors / Insulation

Step 1: Locate the Solar Controller near the water pump as both devices are connected and this will add convenience. The controller should be easily accessible from the ground.

Warning: All electrical should only be conducted by a qualified individual.

Step 2: Add a 15 amp 110 Volt breaker. Using proper electrical conduit, wire and 110V outlet - install an outlet near the pump and solar controller. Do not turn on the breaker.

Step3: Use the grounded 110V plug to power the solar controller. Run the Black and White wires of the plug to the L and N Input Ports on the solar controller. Run the ground wire of the plug to the GDN earth terminal of the solar controller. (diagram can be found on page 7 of solar controller instructions)

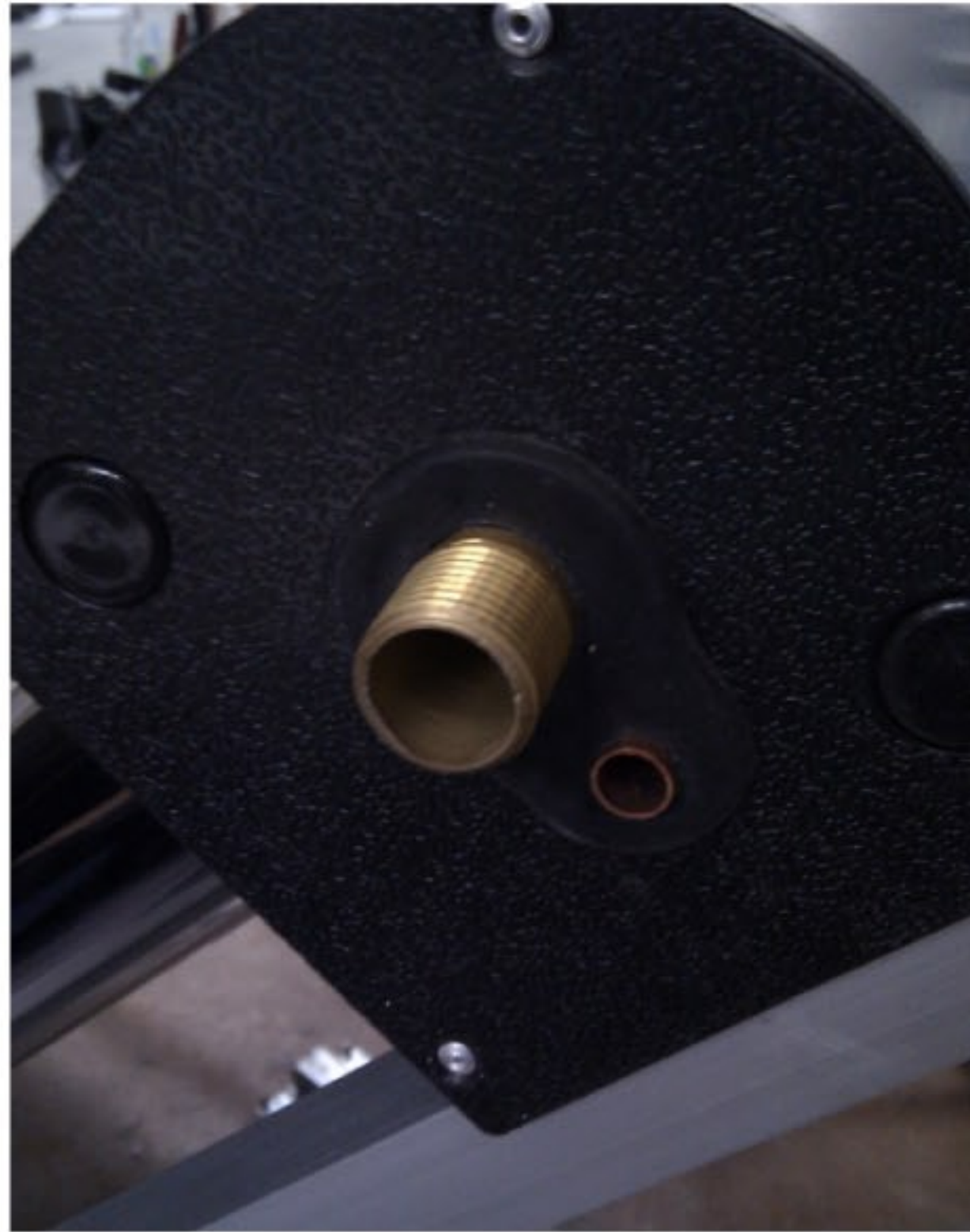


Step 4: Cut the plug off the end of the pump and strip the 3 wires. Using those wires connect Output P1 (L to White and N to Black) to the water pump. The Green wire of the water pump goes to one of the two earth terminals of the solar controller. Secure the wire through conduit.



Electrical / Sensors / Insulation

Step 5: Connect the T1 Input ports to the Pt1000 sensor (found printed on the sensor probe). The sensor wire can be extended using 16 gauge wire. Run this wire along the same path as the incoming pipe from the solar collector, through the pitch pipe and into the temperature gauge input hole on the solar manifold.



Step 6: Connect the T2 Input ports to one of the NTC10K sensors (found printed on the sensor probe). The sensor wire can be extended using 16 gauge wire. Mount this sensor to the output pipe from the bottom of the tank immediately after the valve exiting the tank. Lay the stainless probe against the metal pipe and strap it to the pipe using a stainless steel clamp. Note: If using pipe that will not accurately reflect internal heat (i.e. insulated solar flex tube) the sensor must be located inside the wall of the tank so the probe is behind the tank insulation and touching the tank.

Step 7: Connect the T3 Input ports to the other of the NTC10K sensors (found printed on the sensor probe). The sensor wire can be extended using 16 gauge wire. Mount this sensor to the hot water output pipe from the top of the tank immediately after the pipe exits the tank. Lay the stainless probe against the metal pipe and strap it to the pipe using a stainless steel clamp. Note: If using pipe that will not accurately reflect internal heat (i.e. insulated solar flex tube) the sensor must be located inside the wall of the tank so the probe is behind the tank insulation and touching the tank.

Step 8: Install the Display of the solar controller to the 1, 2, and 3 terminals as seen on page 7 of the solar controller manual.

Electrical / Sensors / Insulation

Step 9: Install a 240V breaker of the appropriate amperage for the size KW heater being used. Use the correct gauge of wire and conduit run to the instant water heater. Amperage and wire gauge can be found on page 4 of the instant water heater manual. An earth ground must also be used.

Step 10: Electrical is now down but leave both the breakers in the off position.



Step 11: Using pipe insulation insulate all pipes in the system. This is very important as this will retain the heat and also prevent burns from touching hot pipes.

NOTES ON INSULATION:

Sensor wire should be attached to the outside of the pipe insulation for neatness using tape, not the inside. However the sensors themselves must be inside the insulation.

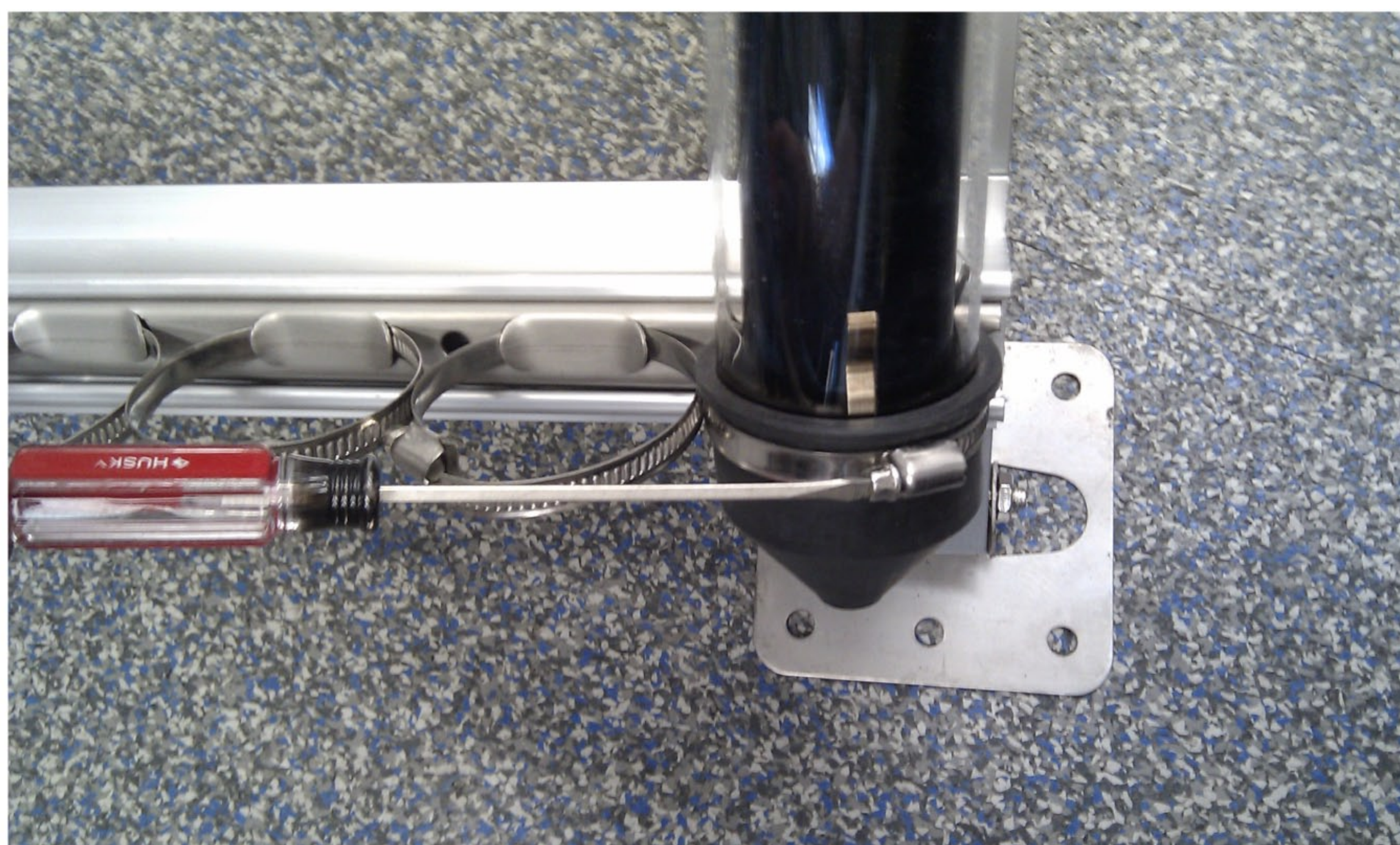
The pipe and wire going through the pitch pipe should not have insulation when inside the pitch pipe. The insulation should lead up to and after the pitch pipe.

After insulation use pipe straps to secure the pipes to trusses or studs to make the installation neat and safe.

Step 12: Fill the pitch pipe with a roofing sealant or roofing epoxy. The filler should be approved for roofing, weather proof, water proof, non-shrinking, UV resistant and extreme heat resistant from hot pipe contact. The correct sealant may change depending on the area of the country installation is in, please seek local advice.

Electrical / Sensors / Insulation

Step 13: Install solar tubes on manifold. Put rubber caps on the bottom of each solar tube. The top of the solar tube slide into the manifold. The bottom of the tube is secured using the provided stainless steel clamps.



System Start Up

Step 1: Confirm that the following valves are open or closed:

Drain valve at bottom of tank closed

Valve leading to pipe on bottom to tank is open

Drain below pump is closed

Drain on return pipe from solar collector is closed

Stop-check valve below the return drain is open

Step 2: Open the cold water input from city/well water supply.

Step 3: Allow the tank to fill, you should be able to hear the water flow during filling and cease after filling.

Step 4: Turn on 110V 15amp breaker. Solar controller comes preset to recommended temperature differentials and setting. You can change these if desired after reviewing the solar controllers manual. You will however have to set the time and day of week (page 9 of solar controller manual). You will also have to set a 4 digit passcode (page 13 of solar controller manual).

Step 5: Pump is ready to go after power is applied. There are speed setting changes available; please read pump manual for possible reasons to use speed changes. The pump does not need to be primed and it will vent itself after running.

Step 6: While pump is running water to roof and the tank is heating; turn on the 220V breaker. The instant water heater also comes preset to preferred temperatures however temperatures can be changed to desired levels.

Step 7: At this point hot water can be used inside the house. The instant water heater will heat water until the tank is up to temperature.

Step 8: Carefully monitor all piping for leaks the first few days. Also monitor temperatures from faucets for desired levels. After pump shuts off automatically indicating tank is up to temperature, have a partner in the house turn on the hot water and monitor the instant water heater as the water passes through to see if it turns on. Optimally the instant water heater will not turn on when the sun is shining.