

# My DIY Solar Hot Water Drainback System

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**Below is a description and some construction pictures of my simple drainback solar hot water system.**

I used as many used items as I could find to put my system together, however my solar hot water collectors are new, purchased from [www.HouseNeeds.com](http://www.HouseNeeds.com) who by the way, has everything you could possibly want at very reasonable prices when it comes to solar as well as complete heating systems, pex tubing, pumps, controllers, you name it.. they have it. Great people to deal with too. Ask for Gary should you decide to purchase there.

## **Back to Collectors:**

Anyway... I purchased and installed 2 – New Evacuated Tube Collectors. Each collector consists of 20 Tubes.

## **Solar Controller:**

My controller is a Resol which allows me to setup multiple configurations/combinations of tanks, collectors and various sensors, etc. – Example: If you wanted to install 2 collectors facing South and run them to a certain time in the day then have those SHUT DOWN and 2 other WEST FACING collectors kick in ‘later in the day’ and run their own individual circulator pump you can do that if you wish with this Resol Controller. You can also hook the controller to your computer, install some software and see/monitor your system readings not just from home but from ‘out of state’ while you are on vacation in the tropics. Ho Ho! Pretty cool. (Now if I could only hit the lottery or win a trip to the tropics?)

## **Storage Tanks and Type:**

For hot water storage tanks I picked up a used 6 gallon electric hot water heater for the drainback tank, a used 45 gallon superstor stainless steel tank for heat distribution and a used 33 gallon Phase III tank (also stainless steel) for domestic hot water use.

## **Why Drainback System?**

There are no expansion tanks, pressure relief valves, no glycol/antifreeze necessary with a drainback system and sloppy, ugly copper soldering is permissible because there is ‘never’ any pressure in the system during operation. About the only time you would see/hear any kind of volcano eruptions ‘resembling pressure’ would be in the top of your drainback tank as red hot solar collector water returns to the tank. That’s about it, and the hot water dumping into your drainback tank never proposes a problem. After the water returns which only takes about 5 to 10 seconds there is no water left outside in the collectors to ‘freeze’ so you are good to go.

## **Evacuated Tube Collector Location:**

My collectors WERE mounted on the ground next to the house which worked fine there but decided recently to move them up to a roof over my deck for additional sunshine during the winter days.

## **So how does it work?**

When the solar collector pump shuts down, solar heated water drains back to the 6 gallon tank in my basement which is mounted on TOP of the 45 gallon Superstor tank. When the water drains out of the 6 gallon drainback tank I installed a copper Y there allowing the hot water to split off and divert into the 2 individual hot water storage tanks at the same time. So basically, both storage tanks get heated during the day at the same time.

**Tank #1** – 33 gallons of stored solar heated water.

The 33 gallon tank for domestic hot water use is directed straight to my Quietside Tankless Water Heater (cold water IN piping) so instead of ground water entering my Tankless domestic hot water heater at 55 degrees I am bringing in solar heated water at temps in the range of 90 to 127 degrees. When hot water is called for at the faucets or shower head solar heated water passes 'thru' my tankless domestic hot water heater on route to the showers but **the propane burner inside the tankless hardly 'ever' turns on while hot water is being used. Just amazing.**

**2<sup>nd</sup> Tank** – 45 extra gallons of stored solar heated water.

The 45 gallon storage tank of extra solar heated water is used for heat distribution. I SCORED a used 14 ft Runtal (STEEL) Radiator and installed it in the largest room in my house. I then installed a Taco variable speed pump on the 45 gallon tank and have that water being pumped out to the radiator (using Pex tubing) to assist in heating the house. All Pex tubing to/from the radiator is heavily insulated. I'm finding that if I run the heat distribution pump steady the tank temp will drop a steady 6 degrees per/hr so what I did is I put the system on a timer which allows me to run the pump in ½ hour increments. ½ hr ON ... ½ hr OFF which ended up working out perfectly for my situation here.

The Runtal radiator is made of 'steel' so shutting the heat distribution pump off after ½ hr allows the radiator to radiate heat into the room off the hot steel. About the time the radiator begins to cool, the pump turns on and sends more hot water out to the radiator to repeat the process.

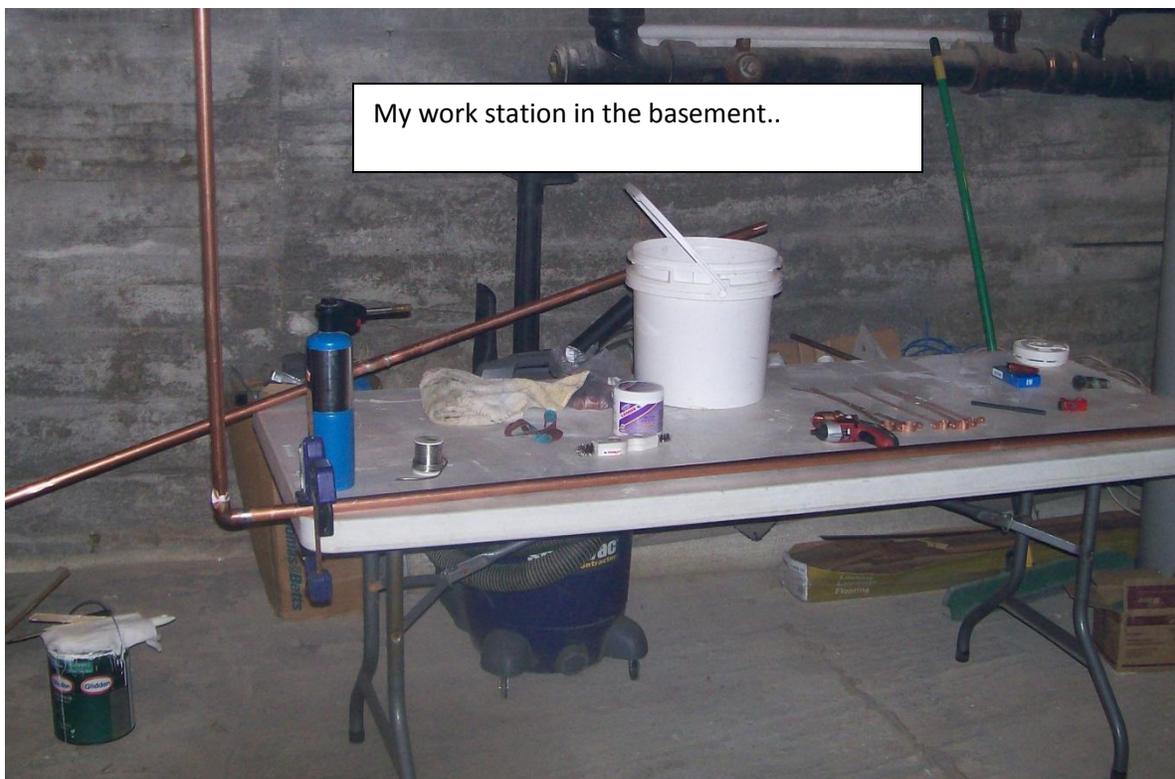
I have the Taco pump send hot water to the radiator starting around 6:30pm each evening and run (On/Off) to about 10:30pm then shut down till 4:30am in the morning at which time it comes ON/OFF in ½ hr increments again to around 7:30am. By that time the water temp in the

heat distribution tank has dropped to about 83 degrees so it just sits idle waiting for the SUN to come up, heat the tanks and repeat the process all over again.

### **Turning Radiator On/Off/Cloudy Days etc:**

To control the heat distribution to the radiator from upstairs I installed a thermostat in the room with the Runtal radiator allowing me to shut the pump/timer system down in the event there is not enough stored hot water for heat distribution on cloudy days. (In the near future, I plan on installing a sensor of some type on the heat distribution storage tank (down in the basement) in order for me to 'monitor the tank temp' from upstairs in my house so I don't have to go into the basement to see if I have hot enough water to use for heating purposes.)

A few PICTURES during construction.





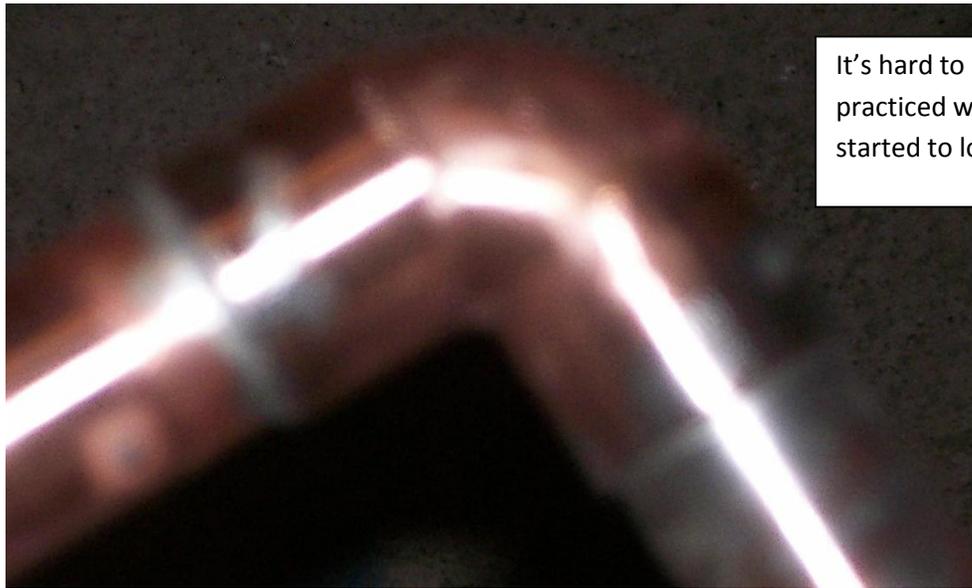
One of my very first soldered elbows..

*As you can see.. I can't solder worth a CRAP but ya know what!*

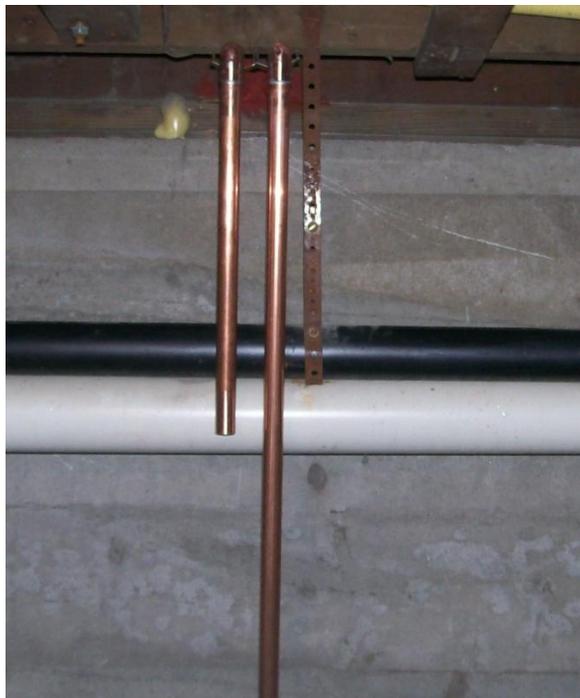
*It doesn't have to be pretty just as long as it doesn't leak right!*



I used squeeze clamps to hold the pipes in place for soldering. Sure made things a lot easier..

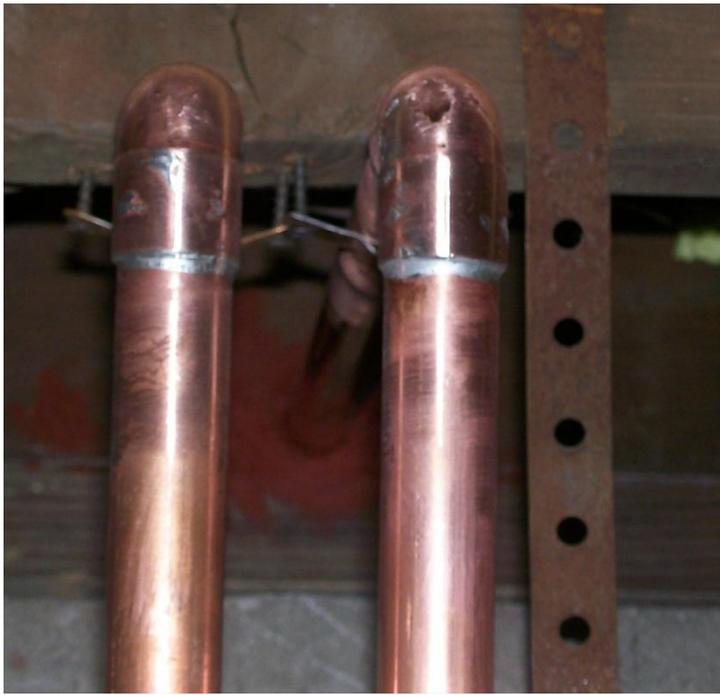


It's hard to see in this blurry picture but as I practiced with the soldering.. they actually started to look a little better..



Here's some pictures of the supply/return  $\frac{3}{4}$  copper tubing going out thru the side of my house from the basement... All pipes will be insulated before I'm done.

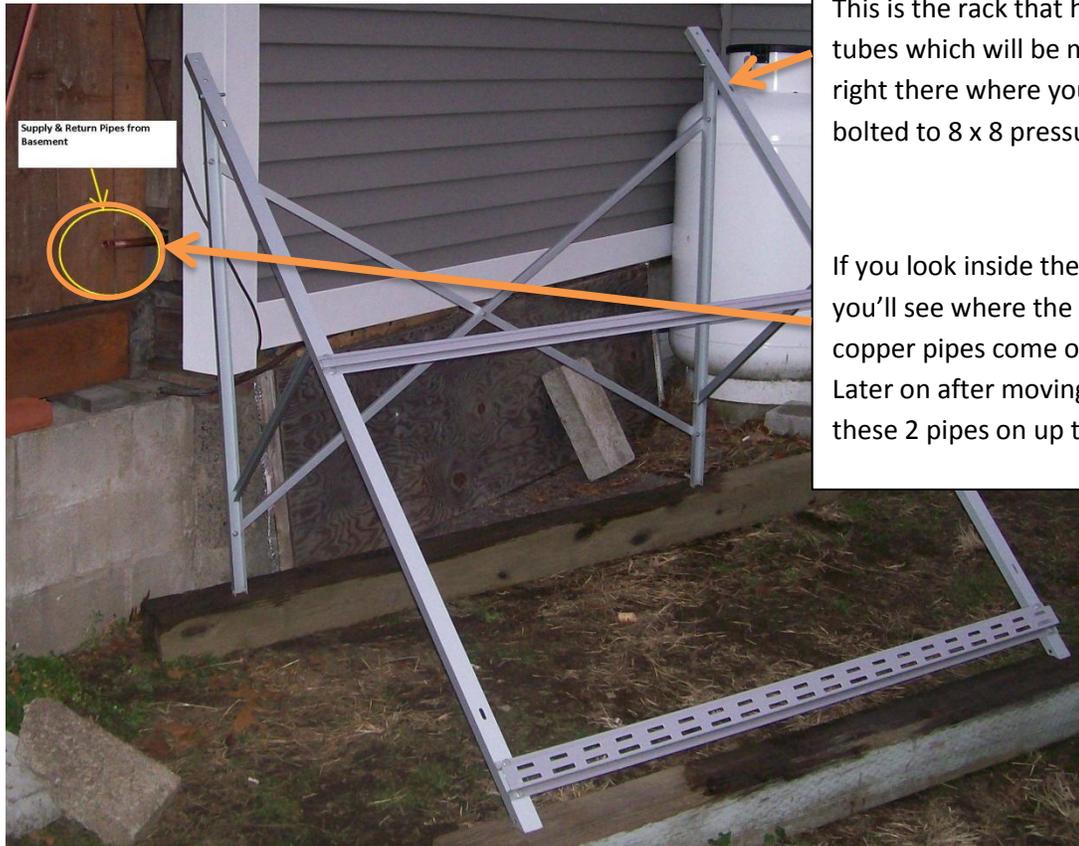




This is the supply/return 3/4 pipes attached to floor joists. If you look behind the elbows you'll see where they go out thru the side of the house. The hole openings around the pipe are sealed with high heat furnace type silicone. Take a look at next picture to see the silicone..



**I first mounted the 2 evac tube collectors on the GROUND next to my house however later I moved them to the roof as you'll see below in the other pictures near the end.**



This is the rack that holds the evacuated tubes which will be mounted on the roof or right there where you see it on the ground bolted to 8 x 8 pressure treated.

If you look inside the yellow/orange circle you'll see where the  $\frac{3}{4}$  Supply/Return copper pipes come out of the basement. Later on after moving the collectors I ran these 2 pipes on up to the roof above..



This is a close up of the supply/return coming outside the house from the basement..

***Now on to the basement to work on getting the 2 water tanks positioned and connected..***



2 x 4 / plywood platform I built so drainback tank isn't sitting directly on top of 45 gallon tank.

Here's the 2 tanks in place but not finished with copper piping yet. Nothing is soldered yet. You can see the pump is not hooked up yet nor is there any piping connected to the top of the pump. The Taco pump you see in the picture was later changed out to a Grundfos circulator with a much better HEAD pressure because I later moved my collectors up to the roof. Drainback tank sits on a platform on top of the used 45 gallon Superstor storage tank.

I'll be installing a Y fitting just below the drainback tank which will allow me to split the returning hot water into 2 individual storage tanks.

1 will be used for domestic hot water use and the other storage tank will be used for heat distribution.

I will install ball cock shut off valves above and below the pumps and tanks for easy removal of pumps, tanks etc..

Ball valves are installed above/below pumps and tanks.

Taco variable speed pump was changed out with a Grundfos HIGH HEAD PRESSURE pump. Taco was installed on 45 gallon Superstor tank for use in heat distribution to Runtal radiator.



Ok.. Most everything is in place and connected now except for installing the sight glass on the drainback tank. I installed another storage tank with built in heat exchanger for domestic hot water use to the RIGHT of the 2 tanks you see in the picture.

Hot water OUT fitting which will be piped to Wall Mounted basement heater.

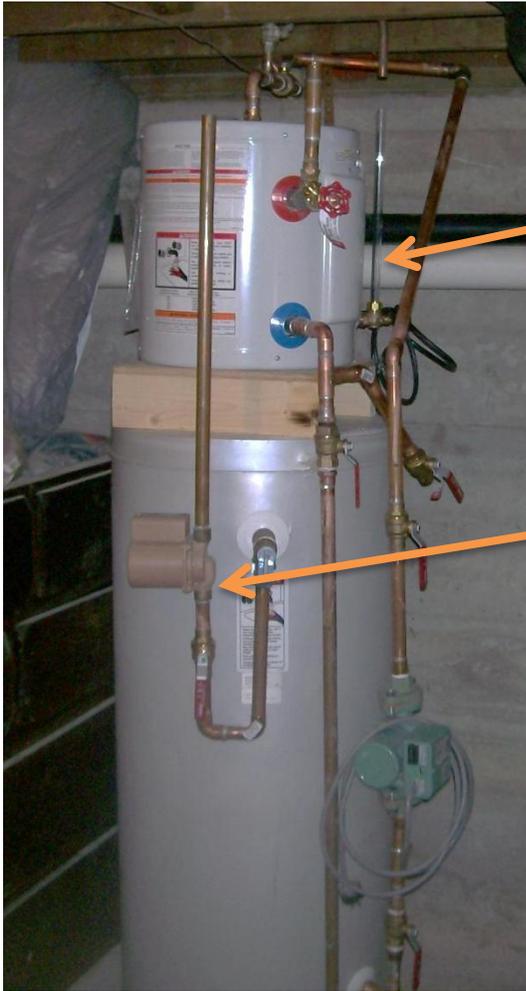
Taco Variable Speed Pump is all connected/soldered as well as the ball valve shut off's / T fittings & other pipes you see. It's not wired in yet though..

This is where I installed the 3/4" T fitting which allows returning solar heated water to be diverted TO/FROM the heat exchanger in the additional potable water storage tank.

In other words, I'm heating 2 storage tanks at the same time with 1 solar collector circulator pump.

This is the installed T fitting location I used for returning water from heat exchanger to bottom of Taco pump.

So pump sucks water from this T fitting which is attached to potable storage tank heat exchanger and sends this water on up to the roof collectors for heating.



This is a picture of the drainback tank and 45 gallon Superstor storage tank used for heat distribution.

Sight glass has been installed here on small drainback tank...

There's a larger picture of this below..

This small brass pump was removed and replaced with the green Taco variable speed pump you see in the picture for use in circulating hot water out to a Runtal 14 ft. used radiator.

This is the supply line to Runtal Radiator.

The RETURN hot water from Radiator returns HERE into this pipe just below ball cock valve, which allows me to have a closed loop heating system.

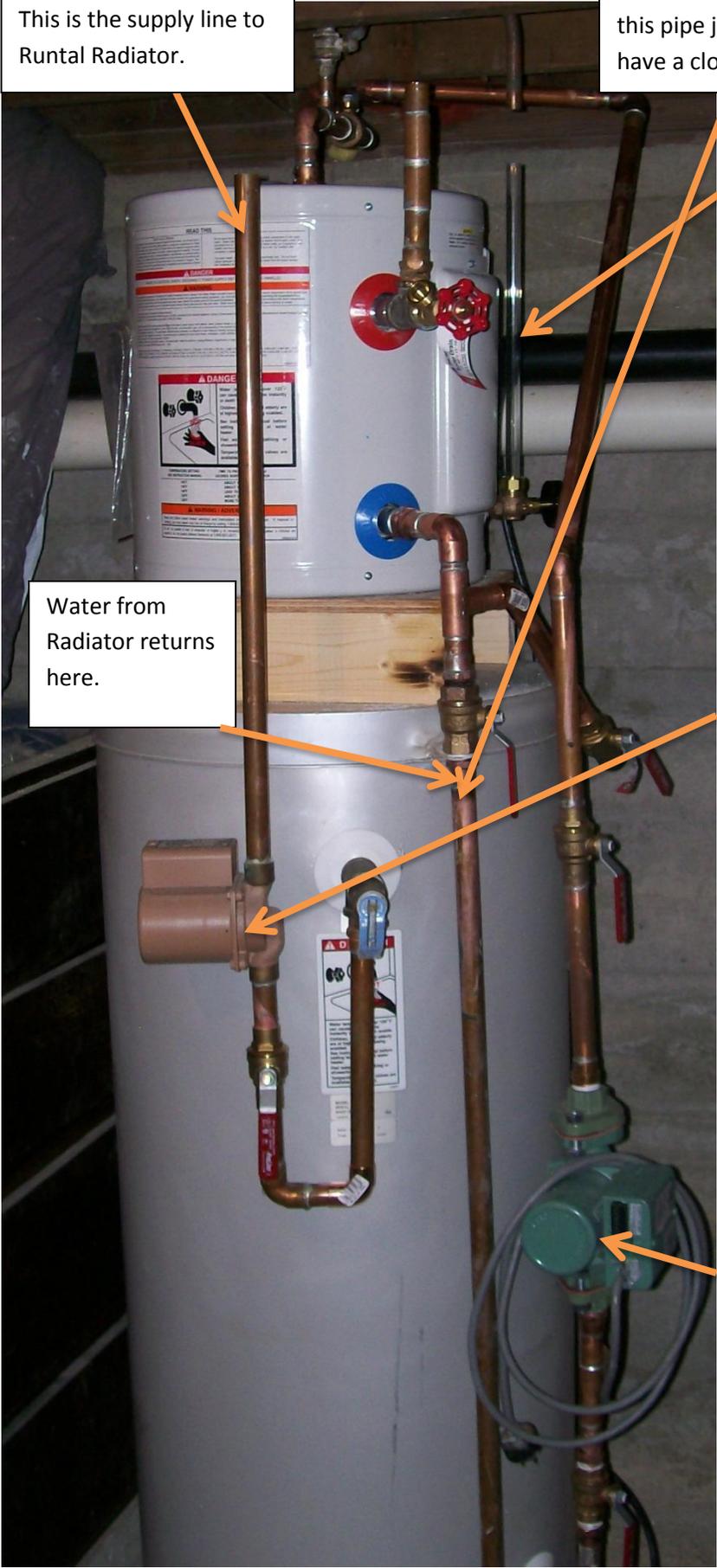
Water from Radiator returns here.

Drainback tank and sight glass.

As I was earlier, the brown brass pump was removed and I installed the green Taco pump in it's place.

A Grundfos high head pressure pump was installed where 'green Taco' is now to make sure I had enough head pressure to pump up to roof collectors.

The green Taco variable speed pump is now all wired in HERE instead of the brown pump.



## Additional Information and Performance

### **Be aware of VERY HIGH STAGNATION TEMPS:**

I used  $\frac{3}{4}$  copper piping TO/FROM collectors in order for water to drainback easily and also because of extremely HOT WATER returning from collectors during summer season.

My tanks reach maximum set temps by 10:30am to 12:30 noon in the summer months causing circulator pump to shut down via Resol Solar Controller. From that point on in the day stagnation temps in collectors can reach over 300 degrees during summer months so I chose to use 'copper' on my supply/return lines. I honestly believe anything else other than copper will go bad/warp or melt with high 300+ degree temps running thru them..

**PICTURES OF COMPLETED TANKS/HOOKUPS IN BASEMENT AND COLLECTORS ARE BELOW.**































