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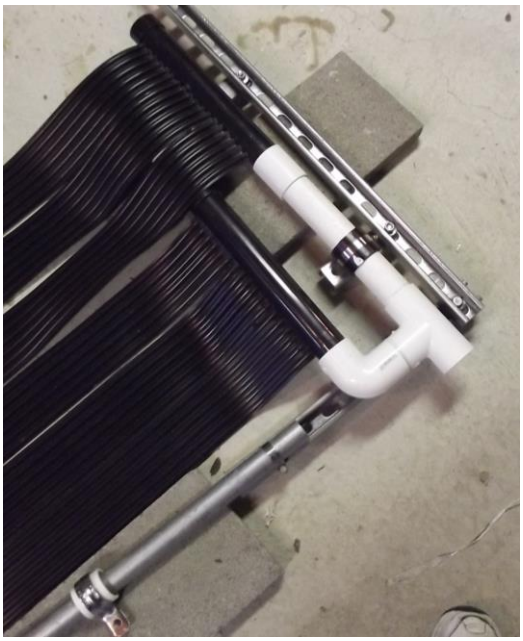
Safety First!

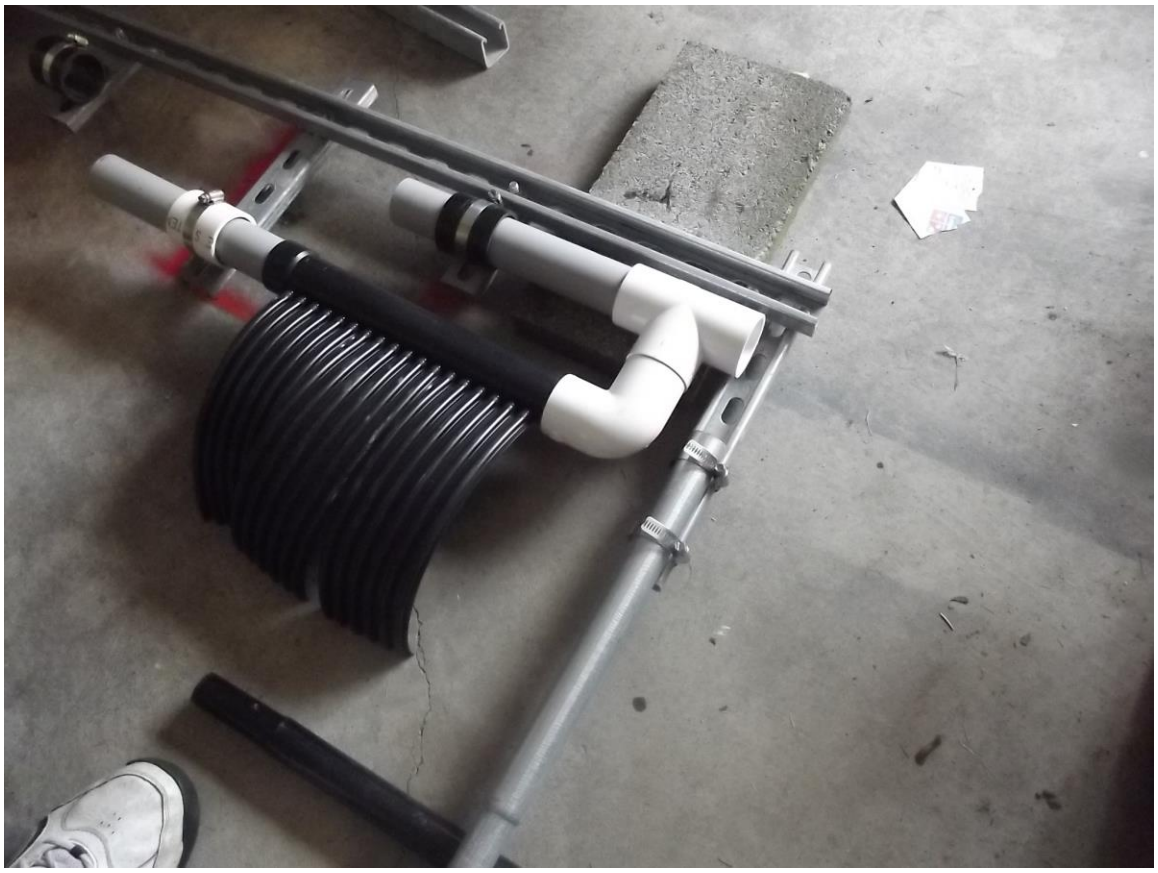
Note: Most occupational health and safety boards require workers to be tied off with safety harnesses when working within a safety zone adjacent to the edge of the roof. Municipal projects often require the solar system to be set back from the roof edge just to prevent workers from veering too close to the edge of the roof. Guardrails are often the best way to safeguard a roof work space. Working on a flat roof can be more dangerous than working on a pitched roof because you are walking around freely and you can forget you are working at height. You will be tempted to walk backwards when taking measurements. Never walk backwards. Fall protection training is available and to use safety equipment you are required to be certified in the use of ladders and fall protection techniques and equipment. These courses are inexpensive and only take one day of your life and they look good on your CV. Hot Sun assumes no responsibility for injury or death caused by the work described in this manual.

Ballasted Framework System for Flat Roofs.

Ballasted means weighted. In this design concrete is used as ballast. A framework made up of 1-3/8" chain link fence top rail and slotted P4100 shallow Unistrut is weighed down to the roof with 1.5"x8"x16" patio stones or concrete block caps.

Drawings of this design are available in the DRAWINGS section of www.h2otsun.com
The direct link is www.h2otsun.com/drawings.html





The ballasts are spaced every second header along the top and every 3 feet on the edge bars parallel to the flow.


The edge framework can be clamped to the concrete pads with pipe/conduit clamps and plastic anchors or via a sleeve of 1.5" pipe. The two hole pipe clamp and pipe sleeve can simply be glued to the concrete pad using construction mastic. Liquid Nails or Lepages Premium or the same Loctite Powergrab we commonly use when fighting gravity are brands of construction mastic. This loose sleeve connection provides some flexibility in positioning relative to the uneven roof surface. These chain link fence top rails can also be bent to follow the roof shape. It's not a bad idea to glue some Powerstrip material to the underside of the concrete pads using construction mastic depending on how sensitive the roof surface is. This allows water to run through and it protects the roof surface from direct contact with the concrete. If the surface is granulated that isn't an issue.


1" 2 hole emt conduit clamps fit the chain link fence top rail perfectly .
Cross members should be spaced about 10 feet starting from the header pipes.
These conduit clamps with #20 all SS hose clamps can lock the cross members in place.
Note the cross bar's purpose is to strengthen the framework. Holding the solar panel's fin-tubing in place is actually done with glue strip. Glue strips are 2 tube wide strips of our collector material upside down, perpendicular to and underneath the solar collector. Spacing on the glue strip is about every 5 feet. Don't forget to lay out the glue strip before laying out the collectors over top.

The ends of the glue strips go under the concrete ballasts and then tie off to the framework. Once the job is complete arrange all the fin tubing so it is straight and evenly spaced and then glue the glue strip to the underside of the Powerstrips using construction mastic. Construction mastic takes a while to dry.

Its best to attach headers to fin tubing before attaching headers to each other or to the unistrut. See main installation manual for header to fin tube attachment. When "staggering" headers as in this design (2 rows of headers at each end) the headers are glued to PVC pipe and fittings using 2711 or 711 grey PVC. You can use primer on the pvc to pvc connections not on the headers. They react aggressively with the cement and primer is too aggressive. Once glued do not move the assembly for 24 hours. Once glued let it air out. Don't seal it up right away (complete the plumbing) or run it for a day

so the glue has a chance to set. If you don't do that its like the pvc cement is still in the can. It'll eat away at the plumbing from the inside for years. Its important the connections are not stressed before they fully set up. Its also very important to paint all PVC pipe and fittings with a brush not with spray paint. Acrylic paint is best for PVC but we have had good success with Tremclad. Oil base paint is not necessary. The purpose of the paint is to protect the PVC glue joints from UV. Interestingly UV penetrates white PVC pipe and attacks the glue joints over a fairly short time frame. We speak from extensive experience on this issue. Your local paint expert does not have our level of experience and knowledge on this issue so believe this.

The above assembly should occur every 10 Powerstrip headers or so. In other words one bank can be 10 or 12 headers but if you did a bank of 20 headers you would add another edge assembly down the middle.

Note the slip collars secure the pvc pipe joining adjacent header manifolds fully and still allows for several inches of thermal expansion and contraction. Each slip collar is gear clamped to a 6" or 10" piece of unistrut. Hot dip galvanized 3/8" nuts bolts and washers Fasten these 6" and 10" pieces to the main unistrut member. In this design that member is accessible so it can be lifted slightly and glued to the concrete pavers (patio stones) (ballasts) as the very last step. Save all the construction mastic work as the very last step just before painting.

Notice above how the piping can get out of the framework without having to go up or down. Its important to do the framework before trying to plumb out of the banks of collectors. In this set up the cross bars lay pretty close to the top of the fin tubes. They do in fact hold things down and you can skip glue strip right at these locations. Cross bars before edge bars because cross bars go under edge bars.

Rotate the headers so the fin tube does not abrade on the concrete blocks. When gluing be aware of the alignment of all the nipples of all the headers as you work.

At each of the 4 corners of each bank of collectors tee the headers together and provide a means to drain the plumbing and header manifold assembly. Every situation is different. One reason we elevate the header assembly is so the drain can be angled down to fully empty the header assembly. Winterizing a flat roof system is best done with a shop vac. Compressed air does not work because you need high volume and low pressure not the other way around. By blowing the entire system out not just the headers we eliminate the possibility of water expanding in the fin tubes and finding its way into the headers where is then freezes and causes damage.

Pay attention to the slope of the roof surface when designing a flat roof system. All roofs have some pitch. You want the water exiting the highest points and you want to avoid water travelling downhill from one bank to the next. Draw the roof and indicate the roof slopes and Hot Sun will recommend a layout. Sometimes this can be a bit of an art. The good news is that if you make a mistake it can almost always be remedied by venting air from any zone that doesn't flow properly with an automatic air vent. Check flow by checking collector temperature in hot sun. We like to use an infrared thermometer. It will surprise you to discover how many perceived problems don't actually occur. If the air can rise up and out naturally (air likes to rise in water so let it) then these systems tend to balance themselves out quite naturally. If one bank is a lot smaller than others then it may need a flow control valve on it to restrict flow to it and force more flow to the longer panels. Consult with Hot Sun. Its our job to provide you with a layout that will give trouble-free flow.

Note: Be very careful not to glue the manifolds before slipping the slip collar over the pipe between manifolds!