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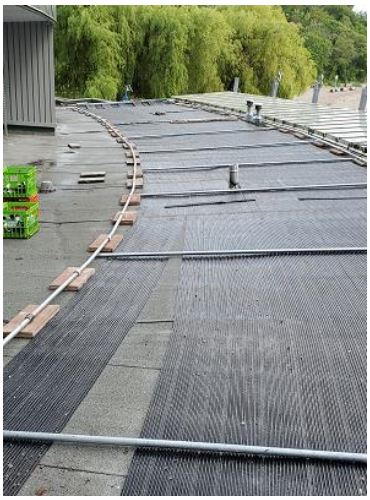
BALLASTED STAGGERED FLAT ROOF MANUAL ADDENDUM

Refer to the General Installation Instructions. This manual addendum only covers specifics to flat roof mounting. Refer to drawing FLAT-1000

Ballasted means weighted. In this design concrete is used as ballast. A framework made up of 1-3/8" OD chain link fence top rail and P4100 slotted shallow Unistrut is weighed down to the roof with 1.5"x8"x16" patio stones or concrete block caps. Don't use full height Unistrut. Use the smaller profiled shallow version. This design has been field tested extensively but technically it doesn't meet structural wind load requirements so if you are in Florida where there is a hurricane standard or under the scrutiny of a structural engineer you have to glue some of the ballasts to the roof.

LAYOUT:
First plan the layout remembering the fin tube rolls are 88 feet long. Make a roof plan based on 1/2, 1/3, 1/4 lengths etc., in other words 88 foot, 44 foot 29 foot and 22 foot lengths and shorter. It is important to look at the elevations of the roof. Flat roofs will have some slope and near the edges of the roof slopes may change to direct water. The water should exit banks of solar collectors at high points in the roof. Flow through the fin tubes can go across the slope of the roof or up the slope of the roof. Plan the piping because you need to leave room for it and you will orient side ballasts to accommodate framework and plumbing.



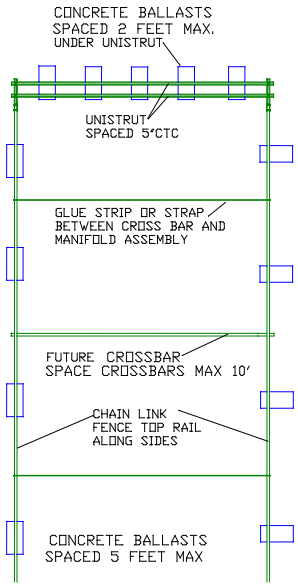
Fin tubes are flexible so they can be arranged to avoid roof obstructions and you can even curve the system to fit unusually shaped roofs.

Flat roof systems are almost always done with staggered manifolds so that we eliminate the spaces between adjacent sections. Each manifold corresponds to 3 fin tube strips that occupy 11.25" each. Ten fin tube sections (30- 6 tube wide strips) will need 112.5" between ballasts.

First lay out the ballast blocks. Its important they are 1.5" tall because this will orient the cross bars to be above the fin tubes precisely. If the roof surface is sensitive glue 7.5" long pieces of fin tubing under the ballasts as shown. Use Loctite Premium 3x PL (PL). Alternatively these pads can be placed under as the last step and because the ballasts never move they don't need to be glued.

Space your ballasts along the edges of the future fin tubes as a guideline.

Before laying out the fin tubes figure out where the glue strips or cross straps are going because they go down first. The system is built based on grids of 10 manifolds by ten feet so if the fin tubes are 29 feet long there will be 2 cross bars over the fin tubes spaced 10' from each manifold location. In between those and the manifolds and each other are the glue strips or straps. Once the fin tubes are cut to rough lengths wasting as little material as possible assemble the manifolds at one end.



Glue strips are made of 2 tube wide Powerstrip fin tubing.

For a more wind resistant design or to make the system easier to roll up for roof resurfacing use vinyl coated ss strap instead of glue strip. Secure it to the edge bars using strap clamps (later). Once the fin tubes are over top the vinyl coated ss strap, lay a one tube wide piece of fin tube material over that and sandwich the fin tube strips in between with UV rated black nylon ties. Do this after you have assembled all the manifolds because adjustments can be made if necessary. Trim the tag ends with wire snips.



The manifolds all face the same direction. Between each manifold is a pvc coupling and a piece of 1.5" pvc pipe approximately 10-5/8" long and slip collar. Chamfer the ends of the pipe before gluing so the glue doesn't "squeegee" off. Use P70 primer and heavy body grey PVC cement on all glued connections except to the actual manifolds where we skip the primer (the manifolds react more aggressively with the PVC cements). Glue the fin tubes onto the manifolds (CA) before gluing the manifold assembly together. 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.

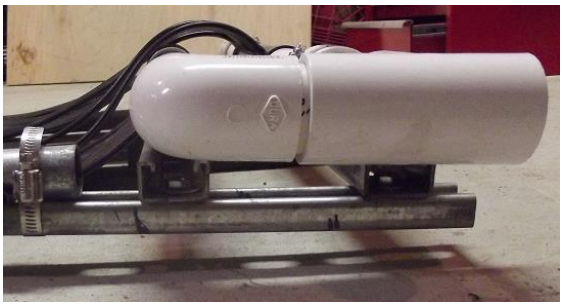
Number 44 - 316 SS hose clamps go over the slip collars (short pieces of 2" pipe) and around the unistrut as the last step. Don't forget to slip the slip collars over the intermediary pipes before gluing them to couplings and manifolds. Make sure the assemblies slide within the slip collars. Do not overtighten the hose clamps.



The Unistrut lengths are separated by a distance of 5” center to center or to match the spacing created by the tee and elbow at the corner where water enters or exits. If plumbing is 2” use a 2” tee, bushing and a 1.5” elbow.


Clamp the edge bar (chain link fence top rail) to the 12” Unistrut using a #32 all 316 SS hose clamp. Two are shown in the photos above but only one is necessary.

At the edge bar locations (somewhat central on the ballasts) create the corner of the framework using a 12” piece of Unistrut. Bolt it to the long unistruts to fix their position using two electroplated 3/8” bolts, washers and Unistrut nuts (without springs) as shown. This creates a space for plumbing to extend out from the manifolds.

As you glue the manifolds to the 9-5/8" long intermediary pipes and couplings you may have to adjust the lengths of these intermediary pipes as necessary to line fin tubes up with each other.

Before working on the other end of the fin tubes where you will create another manifold assembly straighten out all the fin tubes. Pay attention to the look of the fin tubes as the outer row goes over the inner row of manifolds. When you glue the tee and elbow on the feed or exit end remember that this will fix the rotation of the manifold assembly.

Use a chalk line and/ or the 2 lengths of Unistrut to mark the cuts on the fin tubes 5" apart. Cut the longer fin tubes first and attach those manifolds first. Then fold these out of the way before cutting the shorter fin tubes and attaching those manifolds. This way you can't make a mistake and cut a long fin tube short or glue a header to the wrong fin tube.

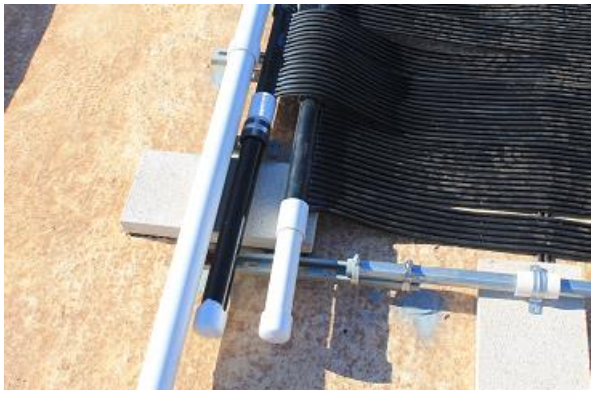
The edge framework can be clamped to the concrete pads with pipe/conduit via a sleeve of 1.5" pipe. The two hole pipe clamp and pipe sleeve can simply be glued to the concrete pad using Loctite PL Premium 3x construction mastic as the last step. This loose sleeve connection provides some flexibility in positioning relative to the uneven roof surface. These chain link fence top rails can also be bent to follow the roof shape.

The above general assembly should occur every 10 Powerstrip manifolds or so. In other words one bank can be 10 or 12 manifolds wide but if you did a bank of 20 manifolds you would add another edge assembly down the middle or create two separately plumbed banks. You have to be aware of that when plumbing the manifolds because the intermediary pipes will be longer.

Cross members should be spaced about 10 feet starting from the manifold assemblies. One inch rigid conduit 2 hole or 1 hole pipe clamps with #20 all SS hose clamps can lock the cross members in place. The cross bars sit exactly on top the fin tubing and serve to hold the solar collector down just like a big strap right across it but stiffer.

The ends of the glue strips go can under extra 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 PL.

Using PL glue to the ballasts to the Unistrut with construction mastic as the last step. Glue the ballasts to the edge rails with PL via the 1.5" pipe collar and 1.5" 2 hole pipe clamp. Notice that we specified a ballast between each cross bar and glue strip or strap. If you add a ballast at each strap/glue strip location the glue strip or strap can go under the ballast which will mean the fin tubes aren't elevated at the edges. You may want to elevate the fin tubes as much as possible to improve cooling of the building underneath. You may want everything laying flat for better esthetics.



The plumbing to and from solar can be done with 2" pvc pipe or 1.5" depending on the flow capacity required. On flat roofs we still have to think about air getting trapped at high points. You want to return water (water leaves solar) at the highest corner so air will release naturally to that point. A 2" tee, 2 bushings and an 1.5" elbow are used at the in and out corners. At the other 2 corners of the bank do not tee or double elbow the headers together. Instead use two drains at each corner. It's a good idea to create the ability to get water out at these 2 free corners. Since its elevated why not use 1.5" 45's , bushings and hose bibs or ½" threaded plugs? Every situation is different. One reason we elevate the header assembly is so the drains can be angled down to fully empty the header assembly.

If the plumbing is 2", then short 2.5" pvc pipes can be used as collars to allow movement with temperature.

Plumbing can share the ballasts or you can add another short piece of Unistrut to the two under the manifolds and use that to support plumbing running parallel to the manifold assemblies. Hose clamp the slip collar to the Unistrut through the slots. Note the Unistrut should be open side down. Whenever you cut Unistrut you need to file the ends and paint with zinc paint

Its important to paint all PVC pipe and fittings with a brush and small roller not with spray paint. Acrylic paint is best for PVC but we have had good success with regular rust paint from a can (not spray paint). Oil base paint is not necessary. Use latex for easy clean up. 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. Let the pvc cement dry before painting and before sealing it up and running water through it.