

Step by step directions for building your own 1500 gallon aquarium, 350 Gallon Sump, and a radiant heater.

PART 1 – Building the aquarium

PART 2 – Building the sump

PART 3 – The plumbing

PART 4 – The radiant heater

This project took me 8 weeks, but this was an accelerated schedule as I was working on this every night after work, and on weekends all day long.

I choose to use a product called Pond Armor for several reasons. The first was the fact that it was not toxic to work with and I didn't have to ventilate the house in order to apply it indoors. Second reason was it has a very reliable track record with other larger aquarium builds.

Choose a location that best fits into your basement. Try to pick a spot near a floor drain and plumbing that can be easily extended if needed. The spot I choose for my monster aquarium was in use for a mini office and was the perfect place for a tank in my basement.

The overall outside dimensions with stand are 123"x91"x60" with the inside dimensions 115"x85"x36" for a total of 1523 Gallons. The sump actually can hold another 350 gallons of water which brings the system over 1800 gallons but since only 1500 is for display we call it @ 1500 gallons.

The design of the tank was originally done by another person on MonsterFishKeepers.com who goes by the name Gator I took his original design for a 600 gallon aquarium and simply doubled the dimensions and added an additional support structure under the tank. I will include his picture here for his design.

It's powered by a single Reeflo brand Hammer Head pump that pushes about 4200 Gallons per hour.

PART 1 – Building the aquarium



This was the original design I used to build my aquarium.

Materials needed:

- 2x4 12' = \$25.00
- 2x4 10' = \$57.00
- 2x4 8' = \$15.00
- 2x6 8' = \$7.00
- 2x6 10' = \$59.50
- 2x6 12' = \$20.00
- 2x8 12' = \$14.00
- 2x8 10' = \$105.00
- 2x8 8' = 9.00
- Treated 4x4 = \$13.00
- 3/4" Plywood sheets 4'x8' = \$120.00
- 5/16" Concrete sheets 4'x4' = \$132.00
- Construction adhesive = \$10.00
- Screws = \$32.00
- Muraitic acid = \$5.00

- Seam tape = \$8.00
- Glass = \$1750.00
- Pond armor (2 gallons) = \$700.00 (with shipping)
- Lights = \$100.00
- Bulbs = \$28.00
- Bulkheads = \$80.00
- Tax = \$255.00

Estimated Costs: \$3700.00

Here is where the tank was going and how the area looked prior to starting.



Demolition of area was the next step.







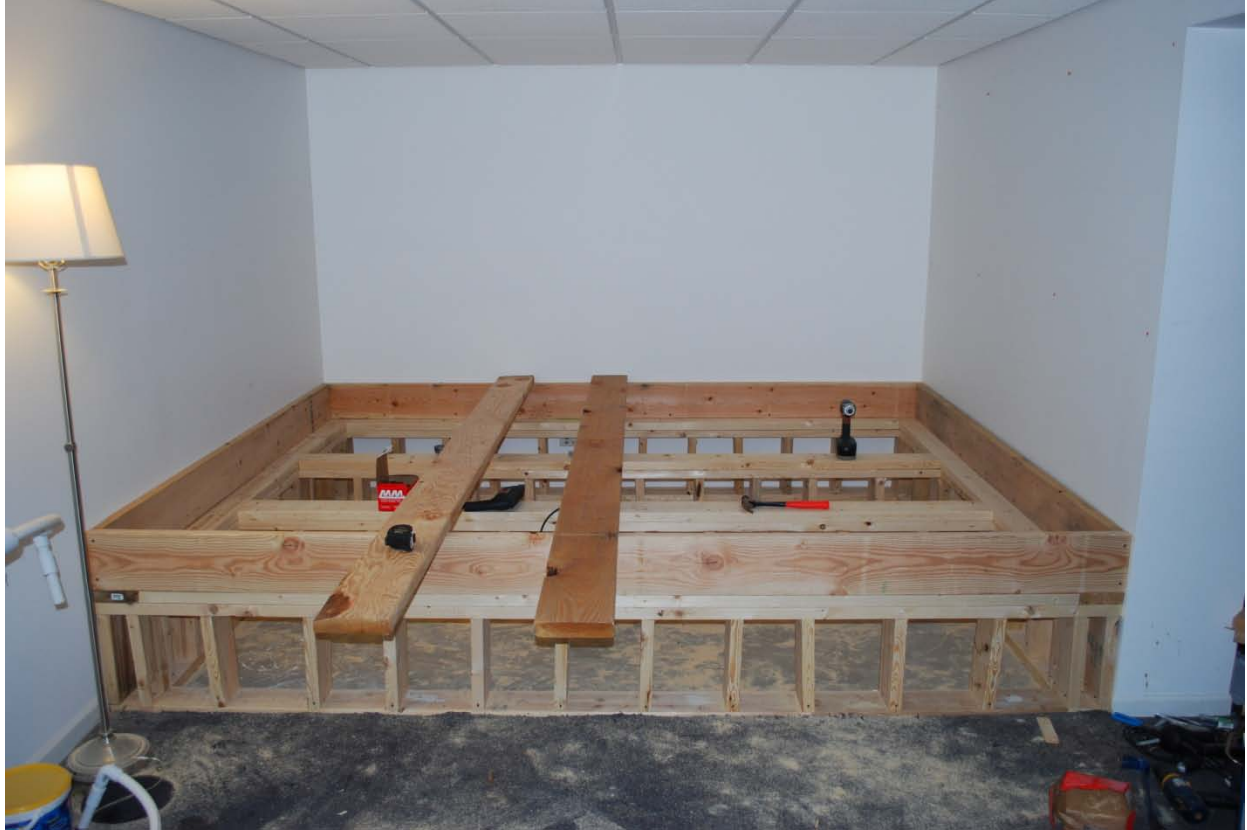
Once the area was open and ready for work, I started to lay out the base of the tank. I also left the base about $\frac{1}{2}$ " in from the edge of the one forward facing wall to allow for drywall to be matched up to it so the tank would look like it was not an afterthought.



Next I put down a layer of 2x6 that I would build the tank on making sure it was square then using Tapcon screws I secured the boards to the floor. This might be one of the few areas of my build I would do differently. I should have used pressure treated wood since they do rest on concrete and when I finished the basement we did use PT sill plates. I guess I just didn't think about it until after the tank was half way built.



Next to be installed are the vertical risers using 2x6's placed 10" on center then 2 layers of 2x6 overlapped in the corners for added stability.



Over top of those I used 2x8 as horizontal joists and again 10" on center and placed directly over top of the 2x6 risers.



IMPORTANT NOTE: There are additional 2x8 supports on each end to support the plywood as well as the frame of the tank. Basically the layout on the 2x8 is as follows

X-XXX---X-----X-----X-----XX-----X-----X-----X-----X-----XX-----X-----X---XXX-X

The double joists (Not shown in the picture above but are in the one below) are additional plywood supports where the seams would end up.

The height measurement for my base worked out to be 23" tall. This was based on the 2x6 base + 12" 2x6 studs + 2 layers of 2x6s + 2x8 joists = 23" tall

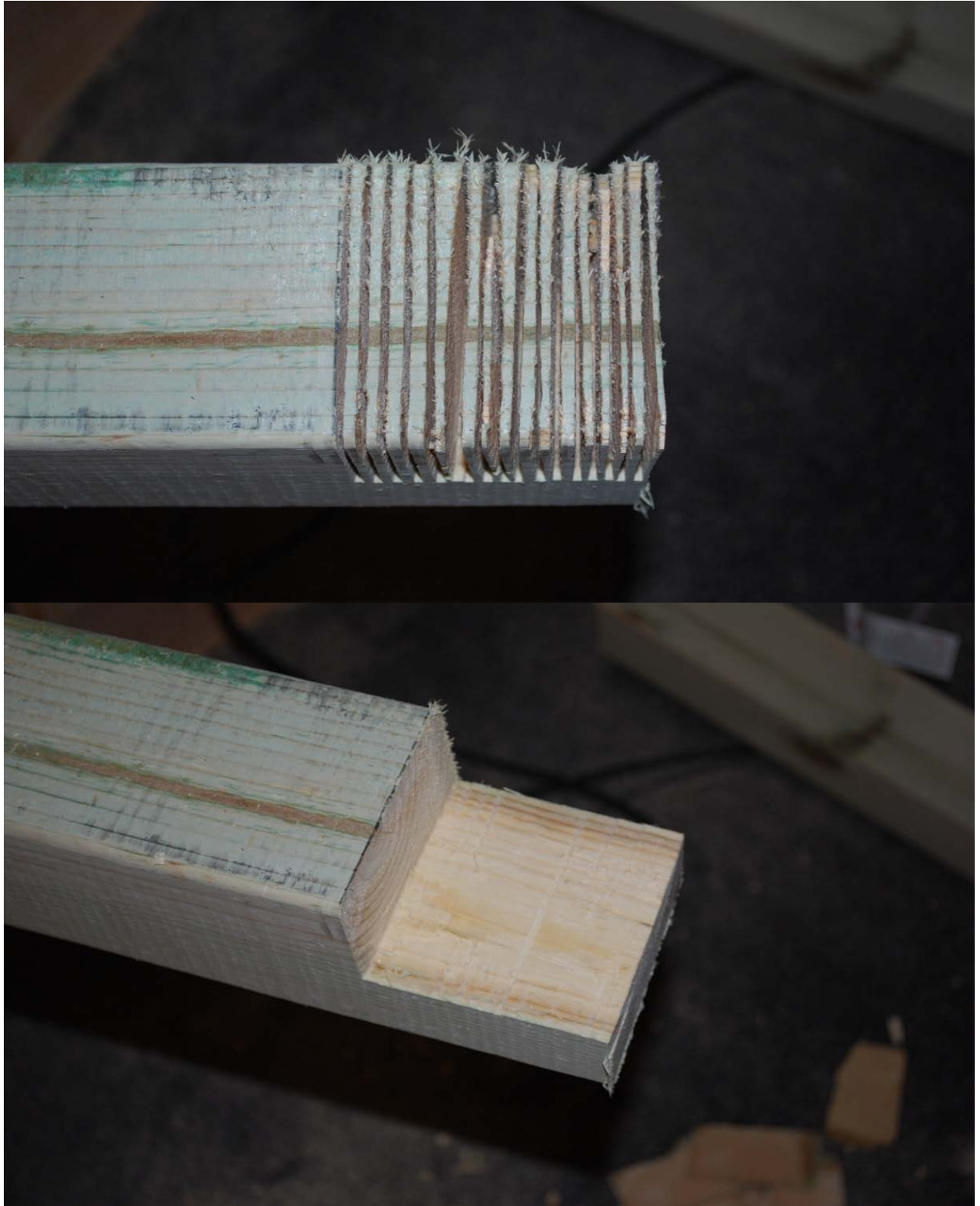


After the base of the tank was done it was time to start framing the walls of the tank itself but now using 2x4's. I started off the same way as the base but I used 2 layers and overlapped the ends for extra stability. Once again everything was 10" OC (NOTE: In the back corner of the tank where I planned on putting the drains I did 12" OC so I would have room to work with my 3" bulkheads)

I finished framing in the tank and ended with another double layer on top with overlapped ends. The front posts actually ended up being on top of the original finished wall studs so I took advantage of that fact and attached them to the existing wall studs for even more front support.



Now that the Framing was done I used 3/4" plywood. I used 2" drywall screws about every 6"-8" to secure the plywood to the 2x4 frame. Soon after that is when I noticed a bow in the upper header. This was due to the 120" span that it had to make so I opted to go with a 4x4 as the header of this viewing window instead of a center support and breaking up my viewing window.



I notched out the new 4x4 and fit it into place



Now that the framing and plywood were in place I used had two more steps to do before I could waterproof the aquarium. First was to acid etch some 5/16" concrete backer boards (Typical tile underlayment) and glue them into place with construction adhesive. Then I would cut my holes for the (2) 3" bulkheads for the drains.

The concrete backer boards were suggested to me by the manufacturer of the Pond Armor product that I choose to use. These were cut to cover the entire inside area of the tank, including the front viewing area.





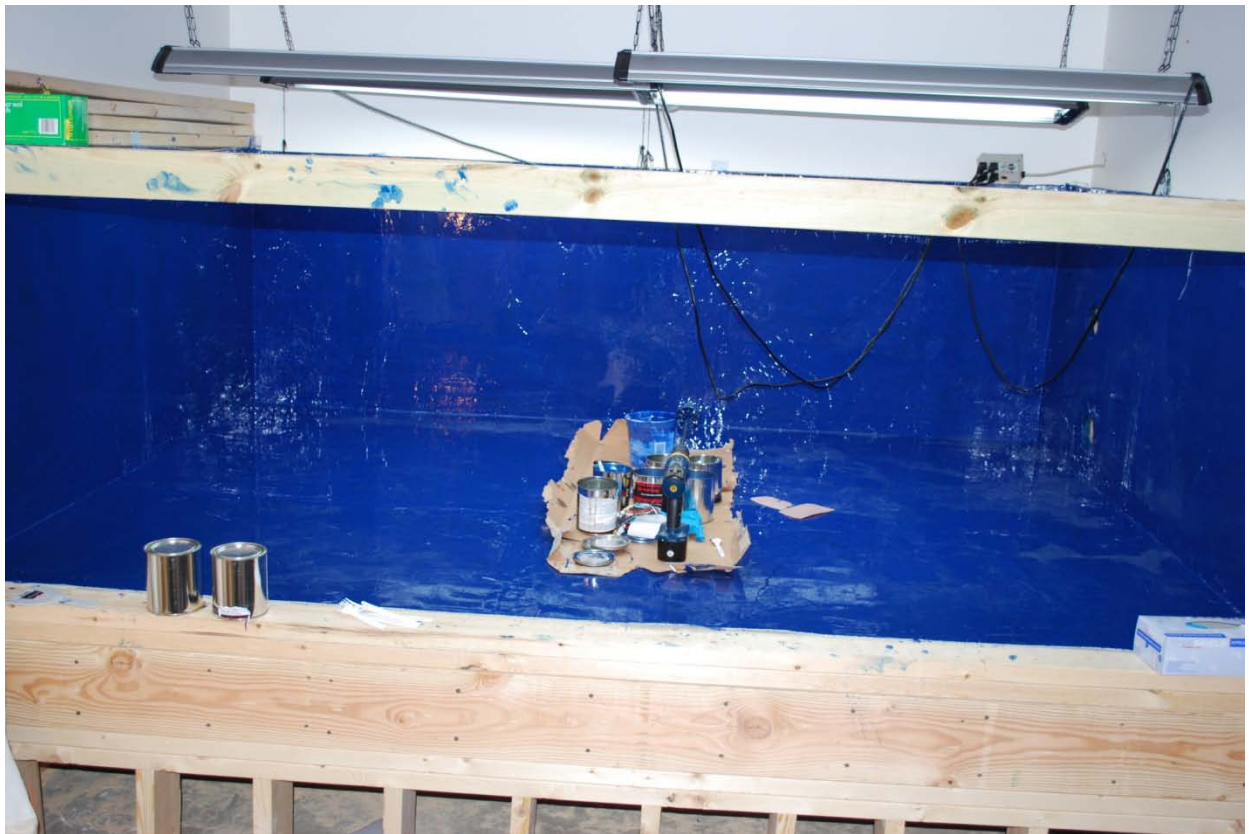
After the plywood and concrete boards were in it was time to apply the Pond Armor product.

Vacuum up every little bit of dirt and dust you can to make sure the Pond Armor goes on without too much contaminants being picked up.

NOTE: Fiberglass drywall tape was used on the seams of the concrete boards to add some support to the Pond Armor when bridging the gaps and seams in the boards.

The seams were filled with Pond Armor. I first used a ketchup style bottle with some fresh Pond Armor and 30% denatured alcohol (Again per manufacturer) to coat all the joints with this solution and allow the Pond Armor to penetrate the concrete board better. Then after a few hours of allowing it to soak in and harden up, I come back around and add the regular coat to the area. Lastly, I will put a final thick coat on the seams to fill any remaining gaps and to completely cover the tape.

If I had a larger gap somewhere I would mix in some crushed up concrete board chunks as filler while I was doing the 30% alcohol solution step.



Pond Armor is very thick and can harden quicker with more activity or working with the material. Because of this I decided to work with half the mixture at a time. I would only mix half the materials from a quart kit at a time. I also applied it much thicker than recommended which in turn cost more money, but I think it worked out to be more durable in the end and I had no leaks to deal with either.



I measured out where the bulkheads would go and cut the holes for these. One was almost to the bottom, while the other one was about 2/3 the way up the tank. This was done so I could do a 30% water drain by simply turning a single valve.



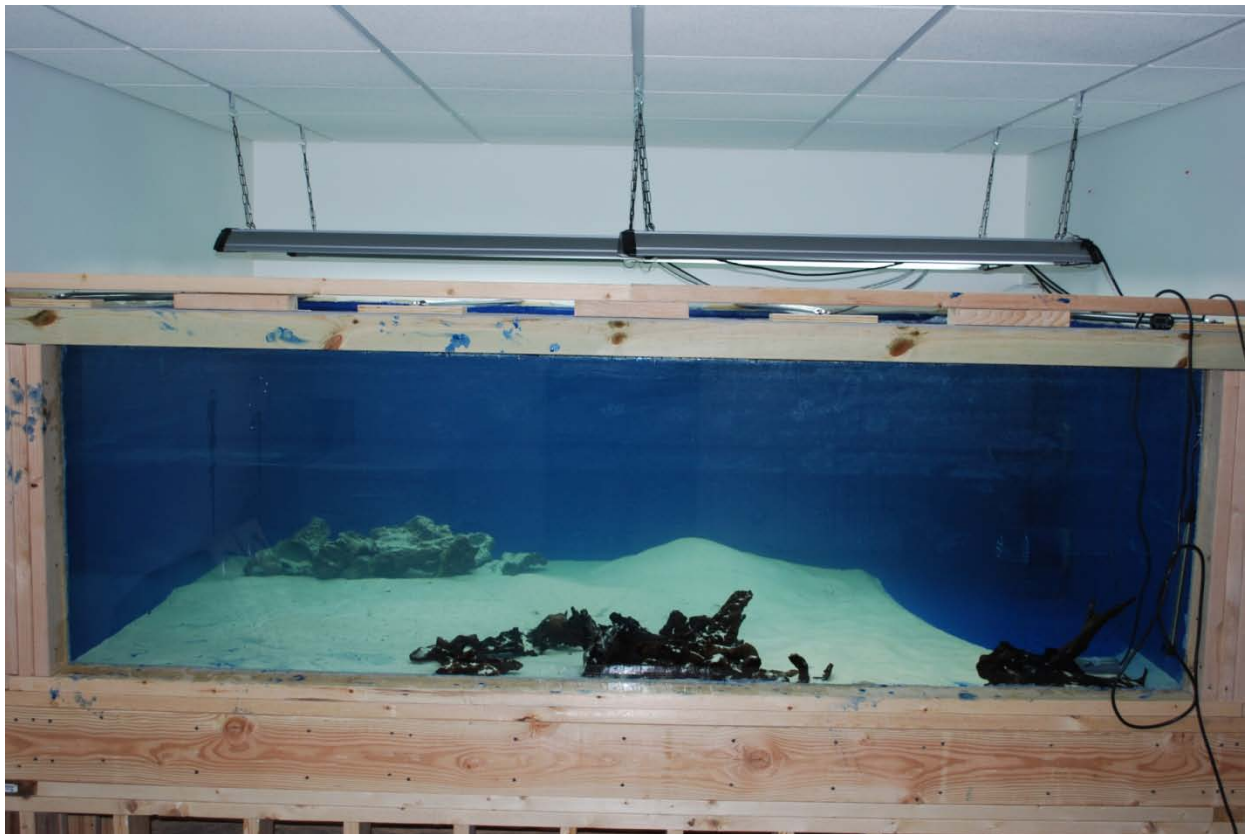
After allowing the Pond Armor to cure for 2-3 days the next step was to install the 113" x 36" x .75" glass window. 9 tubes of GE Silicon I were used to adhere the glass to the inside window supports.



The glass is braced and the silicone is allowed to fully cure for 7 days before filling.



The top bracing is (4) 3/4" EMT pipes with the ends flat and lag bolted (2 on each end) to the front 4x4 and the back. There is one near each end and the other two will split the difference between the span. I used 3/4" plywood under each end to keep the supports from resting on the tank walls. Finally a few coats of DryLock was added to the entire top edge of the aquarium to prevent water splashes from soaking into the top of the wood.



Now I finish the front.



The top panels (Not shown) are (3) Clear Polycarbonate corrugated roofing panels 3'x9' to keep in the moisture and cut down on evaporation. This also helps to prevent the fish from jumping out of the tank.



PART 2 – Building the sump

Overall inside dimensions are 2'x6'x4' and can hold about 350 gallons

Materials needed:

- 3 sheets of $\frac{3}{4}$ " plywood
- Pond Armor
- (4) 8' 2x4s
- 2.5" decking screws
- Construction Adhesive
- (2) Egg crate light diffuser panels
- (5) 3' sections of 4" PVC drain/sewer pipe (With holes in it)
- Assorted PVC Pipe and fittings

Estimated Costs: \$250.00

Where the sump was going to be installed



I used $\frac{3}{4}$ plywood on the sump with 2x4 bracing on the outside for extra support.

Plywood was cut to the following sizes: 2 pieces were 2'x4', 2 were cut to 4'x6', and one (For the bottom) was cut to 2'x6'. I used 3 sheets of plywood for this sump and used all the scraps.

I used construction adhesive and 2 ½" decking screws every inch or so to secure the plywood together.







The basic box was now complete.

Next I secured the both the 2x4 top edge support and the middle support with decking screws from inside the sump



Next came the wall between bio media chamber and return area. Again glued and screwed.



The Bio media area is on left, overflow area from main tank on right. I had to build up the wall on the right in 3 sections due to the limited room (7 inches) in that chamber. I also had to pond armor it in stages as well.





This is the return area of the sump.



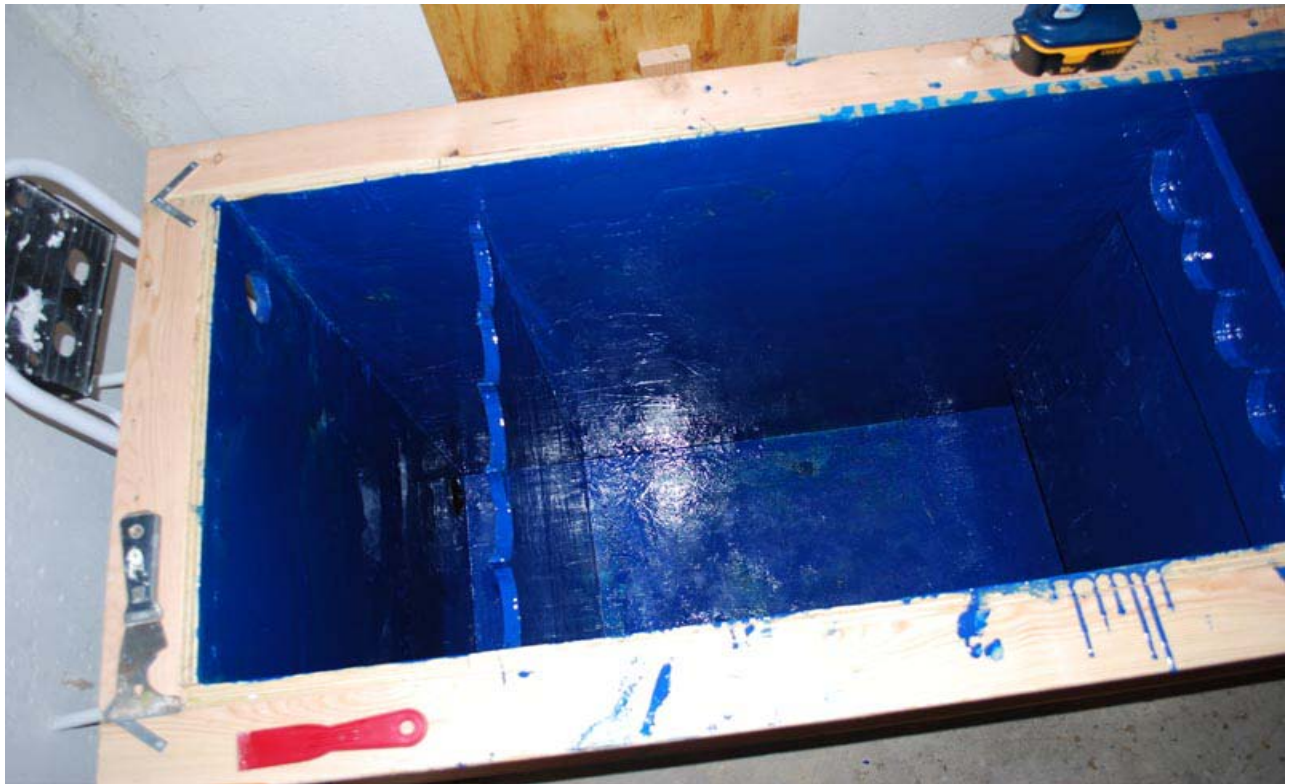
The inner supports for the sewer drain pipe (In 3 sections):



To create the cutouts for the pipe, I simply traced the pipe on the wood and cut out the half circle.

Once all the pieces were in I coated the sump with the same 2 thick coats of Pond Armor.





I next cut holes in the sump for the plumbing and the sight glass.

2" Return opening and lower sight glass opening:



Upper sight glass opening:



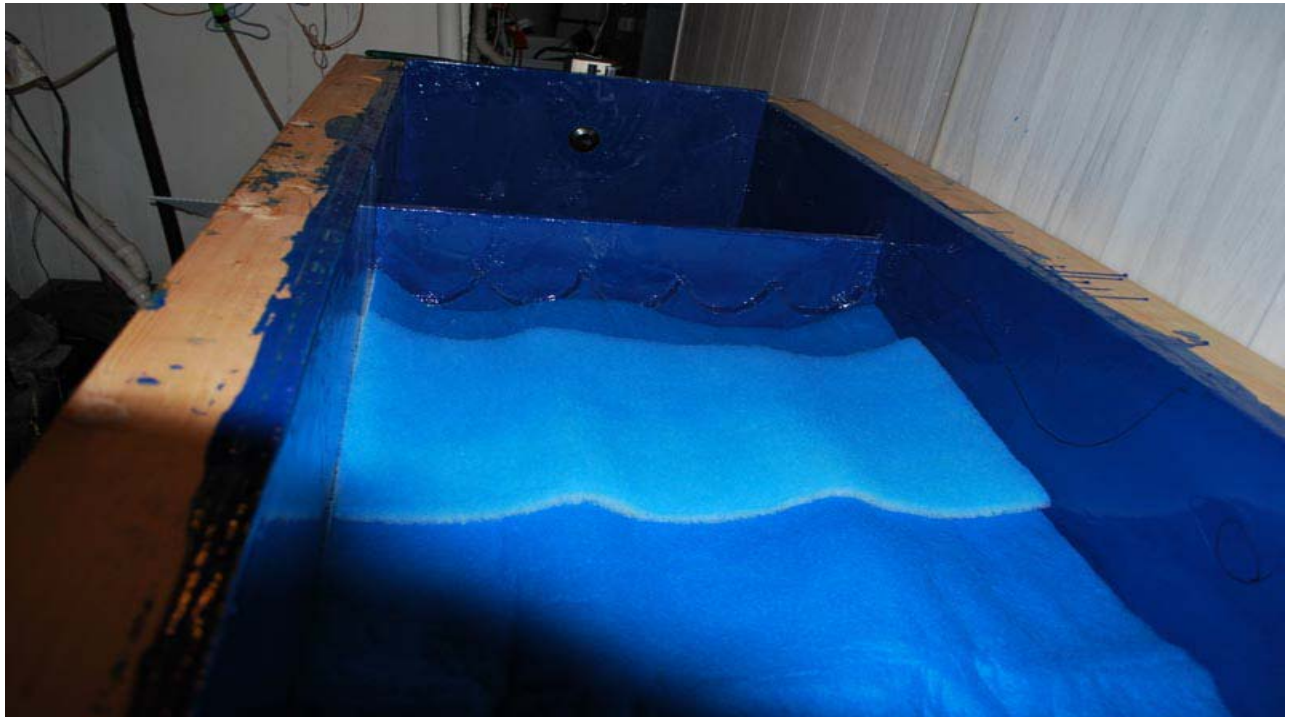
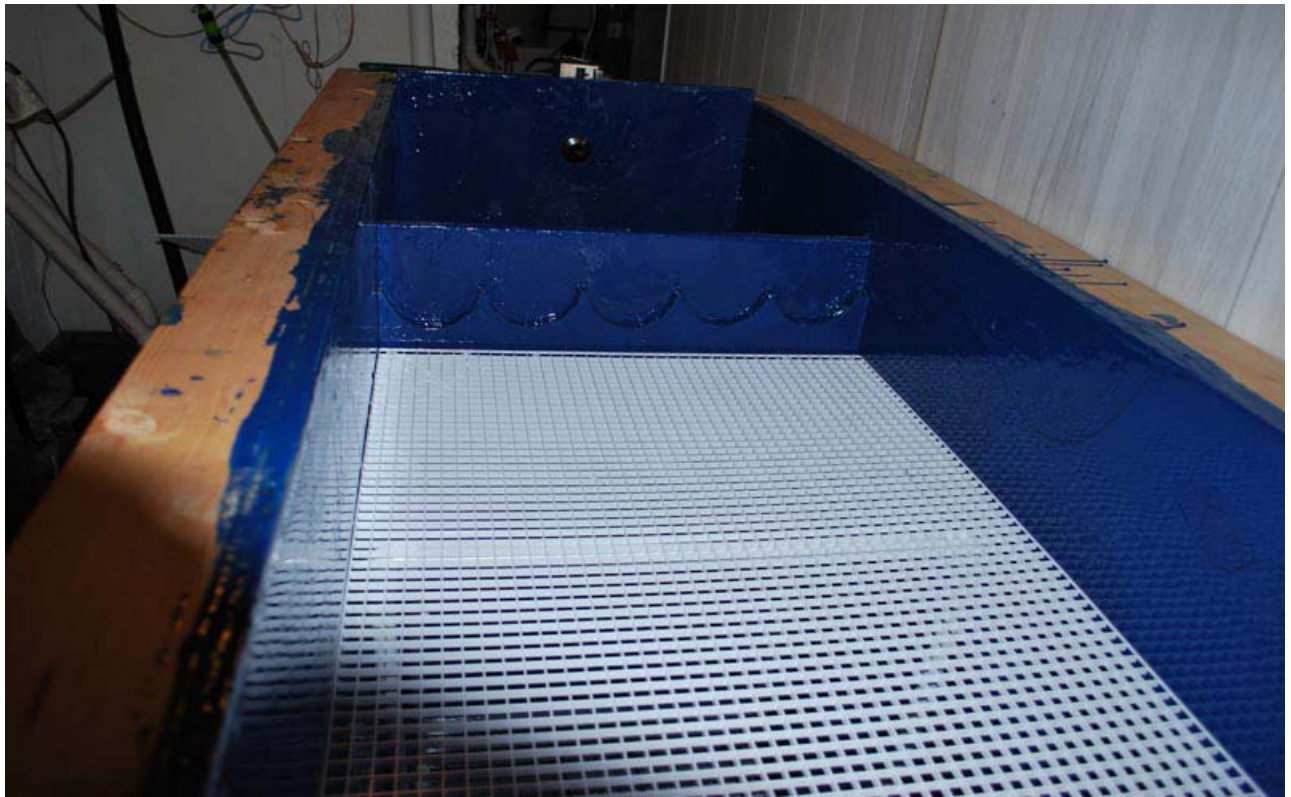
Bio media holding area (2'x3'x'3') (I decided to use all nylon pot scrubbers)





Top of bio media chamber that will support the mechanical filter pads.





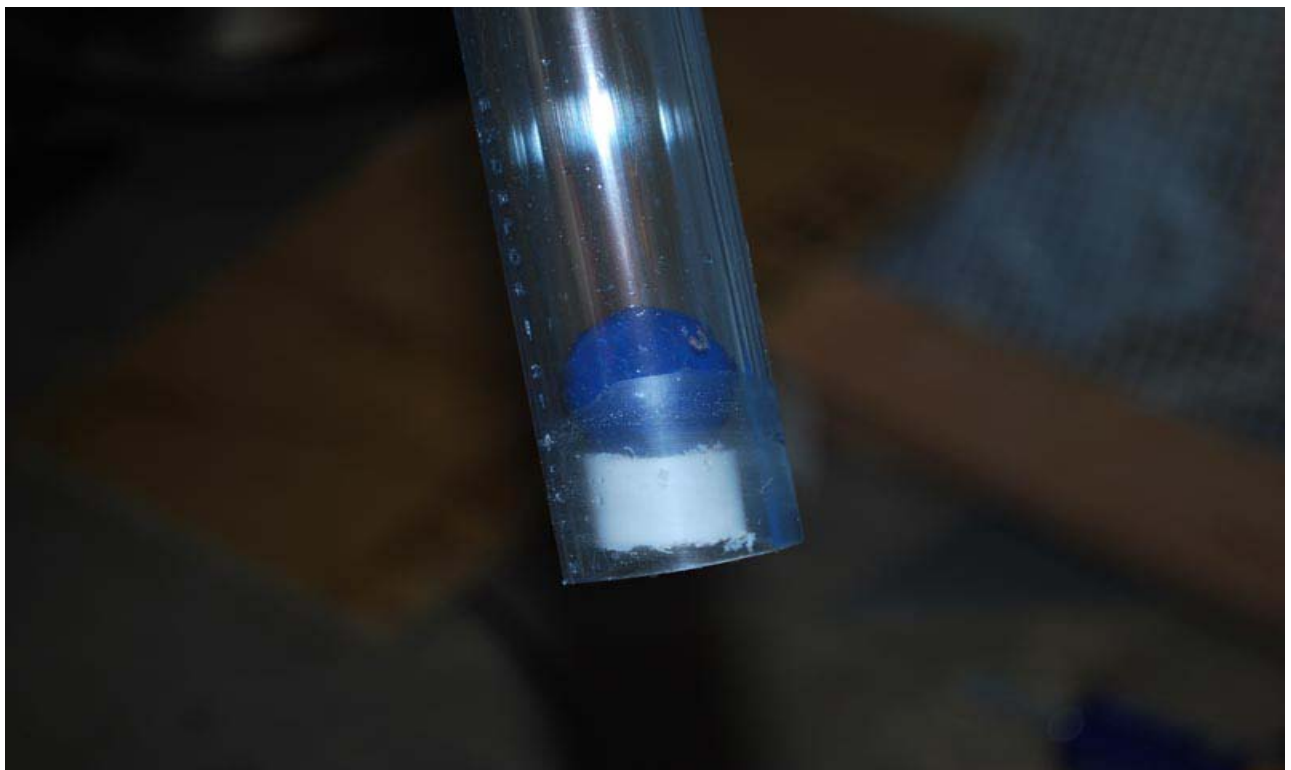
the 5 4" pre drilled drain pipes 3' long to help spread the water over the large bio media area. Water drops into the sump in the overflow area then fills up until it spills into the 4" drains and on to the mechanical media which then drips all over the bio media.



Building the sight glass for water level.



1/2" PVC glued into a 1" clear PVC pipe to keep the pond armor coated styrofoam ball from going into the 90" turn.





PART 3 – The plumbing

NOTE: The sump was originally not meant to be back in this room but it had to be put there for other reasons after I had already built the tank and made the holes for the drains. Otherwise I would have had the drain lines on the other wall and not have had to run the plumbing this way. I could have come straight out the wall into the sump without all the horizontal runs.

Materials needed:

- 3" PVC Pipe
- 2" PVC Pipe
- PVC Fittings and cement
- (4) 2" PVC ball valves
- (2) 2" PVC Unions

Estimated Costs: \$400.00

3" drains with 2" side drains to emergency drain as well as 20% water change.





Upper valve is for the 30% drain and the lower one is the emergency drain.







The 2" line you see with the red valve handle is the return line back to the tank. It's branched off to allow extra water running through the sump.

The sump has an overflow drain as well.





Final hookups go down under the tank out back then up to the sump.



PART 4 – The radiant heater

Complete Parts list with cost:

- 1 x Grundfos UPS15-58FC 3 speed Circulator Pump - \$73.00
- 1 x Pump Flange kit 3/4" plates - \$12.00
- 1 x ETC-111000 Single stage Temperature Controller - \$49.00
- 1 x 100' 1/2" PEX tubing - \$22.00
- 4 x 1/2" PEX x 1/2" MIP Brass adapters - \$15.00
- 1 x 3/4" Boiler Drain Cock - \$5.00
- 3 x 1/2"x3/4" Bushings - \$7.50
- 1 x 3/4" Threaded T - \$5.50
- 1 x Fem Hose adapter to 3/4" - \$3.75
- 2 x Ball Valve body - \$8.00
- 4 x Adapted ends for valve bodies - \$6.00
- 24' 1/2" insulation - \$5.00

Grand Total - \$211.75

Step 1: Assemble the brass fittings to the drain of the hot water heater. This includes the ball valves and the PEX connector.

This will be where the water returns into the hot water heater after going through the PEX tubing. I couldn't get the original drain cock out of the heater so I had to use the hose adapter to 3/4" fitting to attach it to the T connector to allow the water to return that way.

Step 2: Install copper T into the outlet side of the hot water heater. Then install Valve and PEX connector.

This will be where the water feeds into the PEX tubing.

Step 3: Assemble the circulation pump and mount it to the wall.

Step 4: Wire the controller and pump together

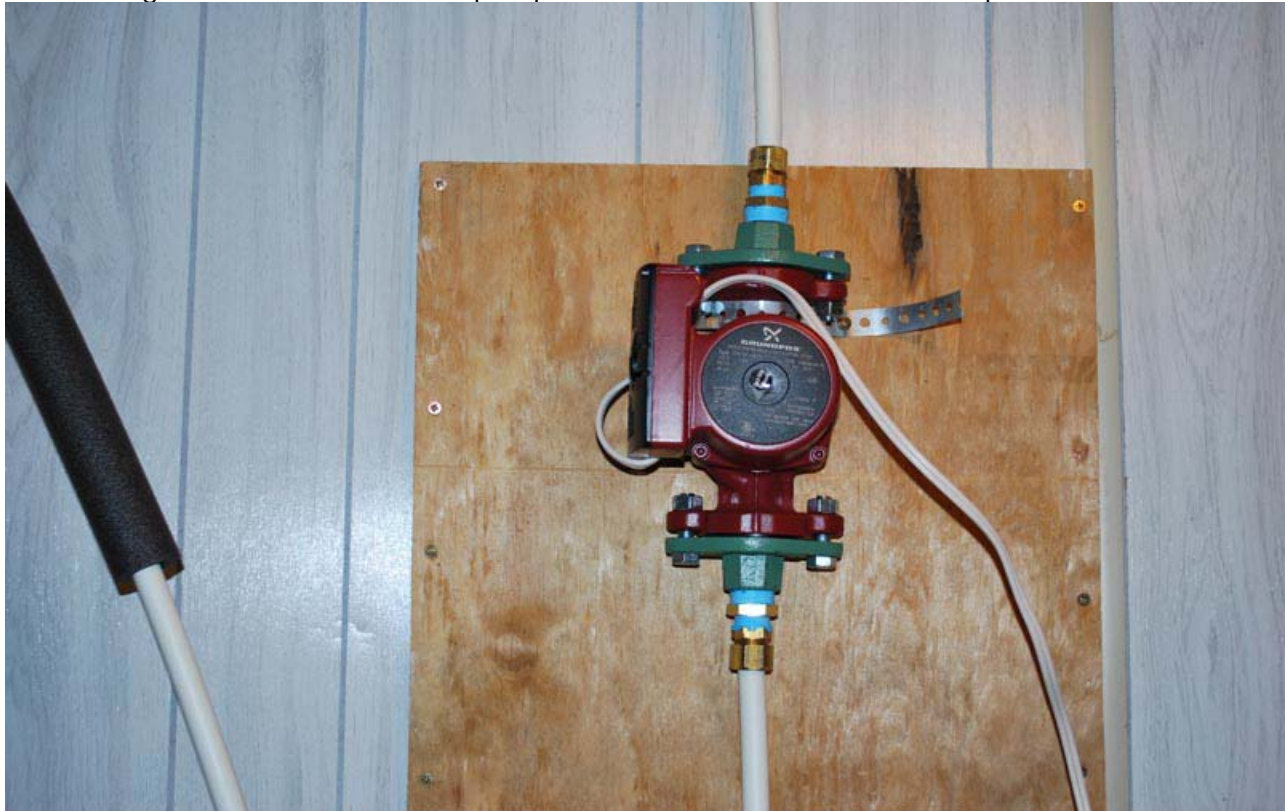
Step 5: Make final PEX tubing connections between pump and water heater.

Step 6: Plug in controller and set heat points.

Hot water is fed into the heating system from the main hot water pipe



Hot water goes into the circulation pump and down to the coil in the sump



Circulates though the coil and back out the sump toward the hot water heater



Water then returns to the bottom of the water heater after going through the pex tubing



The controller is what tells the circulation pump to turn on and off

