

## Building Integral Watertanks

*Vancouver 274 – s/v Soma - Ryan Kieffer*

My old water bladders had reached the point where bleach and clean hoses weren't up to the task against some pretty funky business, and there was no way to get in there and properly clean the things, so I set about constructing integral tanks. Going into it, I wasn't able to find much info on the web, so I'm hoping this might help someone else.

I'm not aware of any certification I hold through any reputable organization in any way shape or form. That said, the process is pretty straight-forward given basic fiberglassing skills (wow, easy!) and a few power tools.

The process of making roughly two 30 gallon tanks took me over a week, made a complete mess of the boat, and cost about \$700. Probably \$1000 if I had to buy everything from scratch. But it probably could have been done a good deal cheaper if you're the typical crafty boat owner.

The one source that was very helpful was this: [Atom Voyages - Integral Watertank Construction](http://atomvoyages.com/articles/improvement-projects/259-watertank-1.html)  
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He describes the process in excellent detail, better than I'm about to do, so I'll just build on that with my experience and some pictures. He also does a good job of selling the benefits of integral tank construction. Most importantly in my opinion, they can be easily cleaned. They also maximize the available space and add strength to the hull. You control the build quality and they are highly customizable.

## The Process

Originally, there were two 30 gallon bladders under the cabin sole. After disposing of them, the old bilge paint was sanded away and the area thoroughly cleaned with water and acetone in prep for epoxy and fiberglass. I had some off cuts of 3/8" plywood that wasn't going to any other use, so those formed the baffles, end walls and tank tops. 1/2" plywood probably would have been more suitable, but I had lots of biaxial cloth left over from another project which I'm sure added plenty of strength in the end. Fiberglass tape would be preferable in terms of how easy it is to work with.

I used cardboard templates to cut the ply into rough-fit shapes. Small voids between the plywood and hull were filled with epoxy thickened with colloidal silica before a couple layers of medium weight biaxial cloth were used to bond and reinforce it all to the hull. The end walls were doubled up with two pieces of 3/8" plywood. Don't forget to cut little holes in between the baffles for water migration! I also glassed in short runs of small pvc pipe under the tanks to allow for drainage.

For the inspection ports, I used sheets of 12" x 12" g10 placed over the intersection of the baffles such that I could get an arm well into each corner for future cleaning. To start, I epoxied in fiberglass bolts to the underside of 1/16" g10 sheets. I then cut out holes in the plywood tank tops corresponding to the placement of the bolt heads and epoxied the g10/bolts flush to the plywood. In the end, there's roughly

a 9" x 9" opening to get in there and inspect things in the future, and a solid 1 1/2" sealing lip. To seal the tanks, I used food-grade buna-n gasket material and 3/16" g10 covers.

All these materials were bought from mcmaster-carr in the US. I bought fiberglass bolts and nuts because I didn't want to use metal that would eventually corrode. The 1/4" bolts that I bought ended up being a bit tender for my liking and I ended up shearing a few of the threads off the first time I torqued the nuts down. Had to cut out and rebed some. If I did it again I might just settle on quality stainless bolts, or perhaps upgrade to 5/16" fiberglass bolts. I also used all non-metal fittings, so there is nothing to corrode and replace over time.

Also, in the states, fiberglast.com is a great source for all things fiberglass. It's basically free compared to buying cloth at west marine and is good quality. I would recommend buying cloth from a bulk supplier because you go through it faster than you think and it gets expensive making trips to the chandlery.

Finally, 3 coats of food-grade epoxy (Brewcoat..[Low VOC, FDA rated epoxy coating for brewery tanks linings, potable water tanks and food processing.](#)) The Brewcoat came in a 2 gallon kit and cost \$220. I had a bunch leftover after doing the interior of the tanks, so I decided to use it on the outside of the tanks as well. It's great stuff..totally non-toxic, very durable, good potlife for applying, and a nice smooth finish. All in all easy to work with and should readily stand the test of time.

The Brewcoat is specifically certified for potable tanks but does use a bpa-resin, if that's not something you're into. They recommend a solid 2 coats which would be enough for a couple hundred gallons worth of tankage. I had a lot leftover. They also recommend wiping the pre-coated surface with white vinegar to give it the right pH (this according to Kathy, the nice lady you'll talk to when you buy the stuff).

Finally, attaching all the pickups and such. When epoxying the nylon fittings to the tank, I cut little teeth into the nylon with a plunge saw bit on my multimaster tool to give something extra for the epoxy to grab onto. Otherwise, you may find epoxy doesn't adhere super well to the nylon, and there would be a risk of fitting failure down the line, particularly in the process of prying off old hoses and such. I also made a point to bed all the lower pickups in large mounds of epoxy so there would be no risk of them breaking off.



Looking forward; after glassing in baffles and tank sides..



Looking aft..



Sanded and ready for the final coatings of food-grade epoxy..



The black strips are leftover bits of carbon fiber tape I had from another project.











