

Photo Tank Construction

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I've been asked several times to explain how I build photo tanks. I hope this article will accurately describe how I'm constructing them. I should explain that I don't believe this is the best way to make small acrylic tanks; in fact, I believe the use of a table saw and router could easily cut your time in half, reduce or even eliminate the need for sanding and assure perfectly square pieces of acrylic. This method will only require very inexpensive tools/equipment allowing just about everyone to build a tank of their own.

Materials List

To get started you will need: IPS "weld on #4" welding solvent, glue applicator, small jigsaw, fine tooth blade for jigsaw, sanding block, medium, fine, and extra fine sandpaper (Fig. 1). Other supplies needed are masking tape, tee square and suitable sized 1/4" acrylic sheet.

A few notes on material that I feel are worthy of mention: Most local hardware stores will offer to cut the acrylic for you. It will cost more for pre-cut pieces but can save you a lot of trouble and time. Make sure the acrylic has its protective film intact since any imperfections in the film will allow the solvent to ruin the finish. I like acrylic with paper backed protective film since it holds up to this process much better than plastic film alone. It's very important to use a jigsaw blade with the most number of teeth possible for an uneventful cut. Additional sandpaper with a finer grit (as fine as 600) can be used for a polished look on the edges.



Fig. 1.

Some of the supplies needed for photo tank construction.

Design/Layout

Much of this step is personal preference but I can tell you what I like and why. I most commonly use a tank that is 12" wide, 6" water depth by 4". This tank size when used with a paddle will allow you photo the tiniest fish as well as sunfish and *Esox* up to 11". It's important to know what the actual thickness of the acrylic is before your final design is implemented. Most 1/4" acrylic is roughly .22" (not .25"). This discrepancy isn't of major importance but it will affect the bottom plate dimension and you're likely to have it slightly oversized if you're not careful. If you think of the sides of the

tank as identical pairs, you'll eliminate leaks and assure a proper fit. For this reason make sure and lay out your lines to cut the pieces as shown (Fig. 2) to assure the widths are identical. Please remember to handle your backing carefully and never remove the backing. This is the only thing preventing the welding solvent from damaging the acrylic.

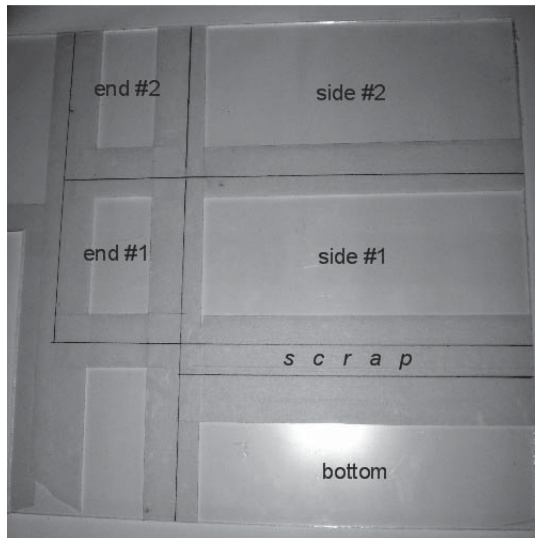


Fig. 2.

Layout of the pieces needed to be cut for the sides and bottom of the box.

Cutting

I simply mark the paper when I use paper backed acrylic. I use masking tape on the areas I will make cuts when I use the plastic film backed acrylic. It's most important that your marks/cuts are perfectly square since the pieces will be of no use unless true. Slight errors in dimension can be fixed but pieces that aren't square can force you to spend much time reworking the pieces. A square is a must for marking your lines. When cutting, I place the acrylic on the edge of a table and hold it firmly. I make sure and have the line I'm cutting less than an inch from the table edge to prevent flex and binding the saw blade. When cutting, make sure to not deviate from the mark since this will create much work for you when sanding your edges. Don't force your saw to cut quickly (watch your feed rate) as this tends to cause you to deviate from the marks as well as heat the acrylic enough to melt it. When finishing a cut, be careful to not allow your piece to drop or chip either corner. Corner damage will either create leaks or lots of sanding work. If you make a mistake, it's not the end of the project. In the next step you'll be able to inspect the accuracy of cuts and fix some errors.

Sanding

If this is your first tank, it might be a good idea to see how your pieces fit in case you've made an error that can't be easily remedied. If the pieces generally fit well, I place a piece on the edge of the table just as when they were to be cut. I use 100 grit paper and sand about 10 strokes and look at the edge. If cut well, the edge will not have deep saw marks. It's critical to sand gently, apply even pressure, use full strokes, hold your sanding block exactly perpendicular to the piece, and never round the corners. Continue to sand all edges until your saw marks are gone. I usually count strokes and make sure I apply a similar number of strokes to opposite edges (remember your pieces must be paired or exact copies on the width dimension). This is a good time to mention you get one free mistake edge. This is the edge that will later be the top of the tank. Since you will not be welding anything to this part, it's not important to have a perfect edge. Identify your problem cut and make this your top. Once the edges look good, assemble the tank (use masking tape to hold the pieces together; Fig. 3) and inspect for rounded corners and oversize pieces. Make corrections and move to 150 grit paper or similar. Sand in the same fashion as with the 100 grit paper until you see the marks from the 100 grit paper disappear. All edges must be done in this way and 50 strokes or less will often get the job done. Now repeat with 220 grit and feel free to move onto 400 and then 600 grit but 220 will be suitable for welding. Please pay particular attention to the smallest piece (ends) as they have three edges that are welded. The ends are by far the most critical piece.

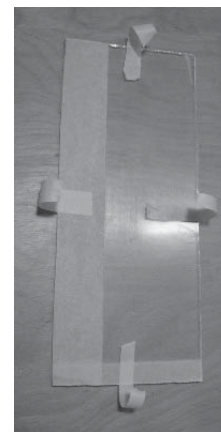


Fig. 3.

Place masking tape along your inspected edges in order to put the box together for the gluing process.

Inspection

Now you should inspect your edges and decide where you want to place them depending on quality. It's a good idea to at least mark the top and the outside with permanent marker. Once marked, clean the piece, then assemble your tank with tape (Fig. 4) and very closely inspect all edges for good contact. It's important to understand the welding solvent is water thin and isn't glue. I presume it reacts with acrylic and bonds parts that are in contact. If your pieces aren't properly fit, you will not bond and most certainly leak. If the pieces aren't contacting well, identify the issue and sand until they fit. It's possible to use the glue applicator and apply water to your contact areas to be sure they contact well.

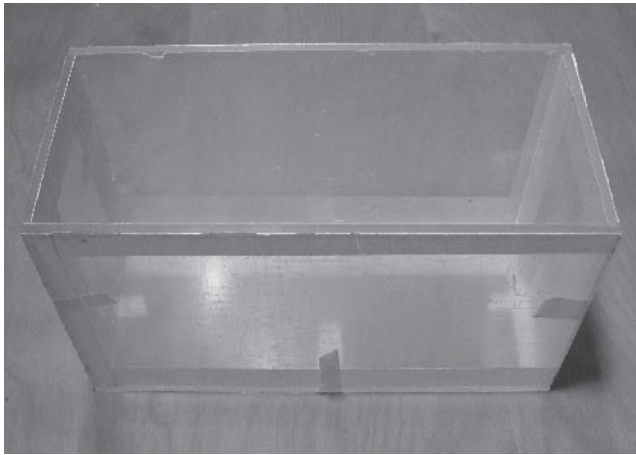


Fig. 4.

The box preliminarily constructed and held together with masking tape. This is the perfect time to insure that all edges that need to be glued are touching.

Film Removal

With all of your pieces inspected and marked, you can remove the protective film in the specific area that will be welded (Fig. 5). With the tank disassembled, mark the areas you need to remove the film. Remember, you need to have the acrylic contact acrylic and not the film or any other debris. I use a very sharp razor and gently use the razor perpendicular to the acrylic. When done properly, this mark will be all but invisible. Since you're using a razor on acrylic, you will leave a mark. Please be careful and cut closely to the required mark so the cut will be out of the area that you'll be photographing fish. Remember, any exposed acrylic will be damaged by the solvent. Now gently remove the narrow strips of film.

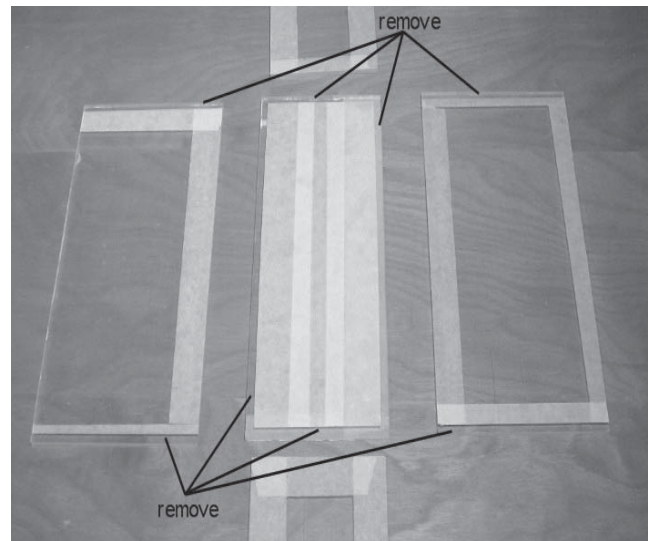


Fig. 5.

Remove the protective backing in those areas that will be glued.

Final Assembly

Make sure the pieces and work area are impeccably cleaned before final assembly. I use liquid dish soap and warm water on the pieces to remove all of the dust, shavings and abrasive remnants from the sandpaper. Your pieces must be free of water prior to welding so letting them dry overnight is a good idea. Have plenty of narrow strips of masking tape handy and put your tank together. Use enough tape to secure all pieces and pay particular attention to the corners (Fig. 6). Inspect again and make sure all edges make good contact with acrylic. This is your last chance to correct any errors.

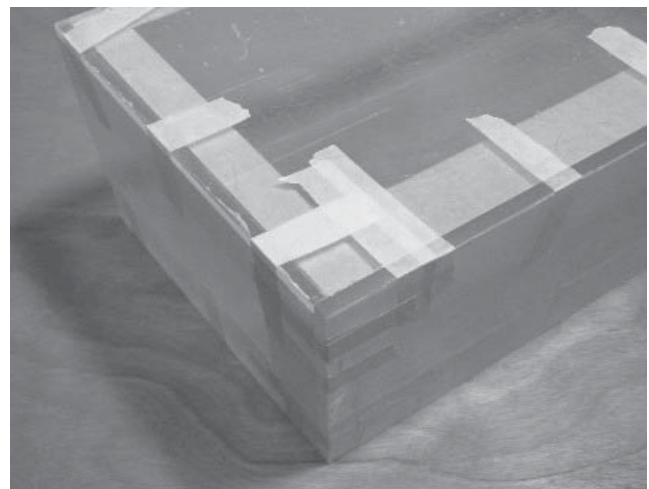


Fig. 6.

Make sure to securely tape the box together prior to gluing.

Welding

When using the welding solvent, please remember that it's as thin as water and you can only apply solvent to contact points that are on the horizontal plane. I always place the tank on its bottom and weld the bottom to the sides first. I usually recheck all of the fits (Fig. 7) and then fill the glue applicator with about a half-teaspoon of welding solvent (make sure the work area is well ventilated when using the solvent). A little solvent goes a long way (a 4 oz. bottle will make dozens of tanks) so no need to fill the glue applicator with more than you need. The solvent can be applied from either the outside of the tank or the inside. The joints will draw the solvent in and fill the slight air gap. Work the glue applicator quickly to fill the gaps but try to avoid working too quickly as this might cause you to miss areas. Some solvent will be drawn up the side contact areas and this should not concern you but don't try and fill all of the air gaps at once. Quickly inspect the bottom contact areas and add solvent where needed (you might have to apply a little solvent here and there from the opposite side that you originally placed the solvent).

If all looks good I wipe up any excess solvent and place a book or similar object of moderate weight atop a folded bath towel. The bath towel helps evenly distribute the weight to all parts of the sides. Make sure and not disturb the tank in any way once you apply the solvent. Allow the tank to cure for a few hours minimum (I usually wait overnight) and place the tank on its side (again make sure and only apply solvent to the horizontal plane). Apply the solvent as before, wipe up excess and use the book and bath towel. Allow to cure and weld the last side. If you've complete all welding in one day, make sure and allow to cure overnight at a minimum. Please remember this instruction is specific to a tank of this size. Larger tanks require a bit more care and longer curing times.

Post-Welding Inspection

Its time to inspect one last time before the water test. If you notice areas that have not been welded properly (a visual inspection will immediately reveal mistakes) simply apply more solvent and hope for the best while repeating previous step. You might be able to fix the problem area by adding more weight but not always.

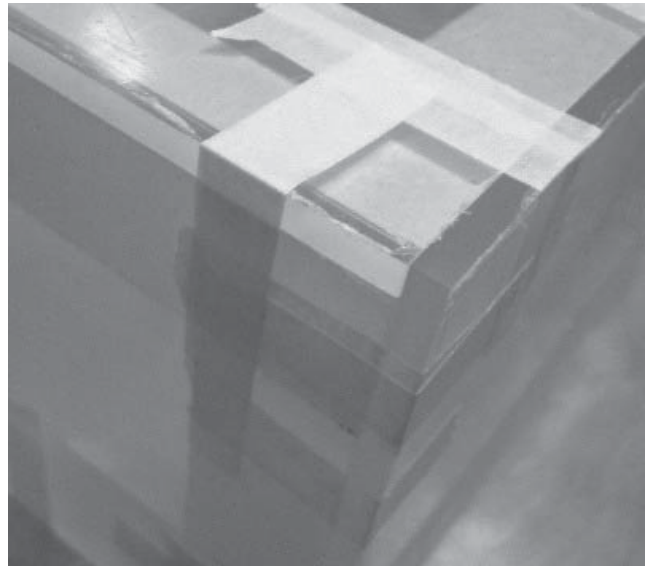


Fig. 7.

It's always a good idea to double- and triple-check your edges and how they fit one last time before filling the glue applicator.

Water Testing

Do not remove the film before adding water. Simply place the tank on a firm surface but one that allows you inspect all edges without moving the tank. Look for drips and mark problem areas. Dry the tank well with a towel and allow to air dry 24 hours (or until you're certain all water is gone from the gaps). Look carefully and try to identify the leak. About this time you'll wish you had just purchased cut pieces. If you must, you can remove roughly 1/4" strip of the protective film from the bottom plate to aid inspection. Be warned that any film you remove will expose the tank to solvent. In most cases, you will be unable to further weld the tank but applying solvent again with weight can't hurt as long as the protective film is intact. Generally corners are the most susceptible to leaks and are also the hardest to fix if not properly fit in advance. A little dab of silicone is an excellent last resort for corners. The corners are out of the viewing area so this is not a great concern.

The tank portion is done and you can remove the film but handle carefully since acrylic can easily be scratched.

This is the way I've found fits my primitive technique and in no way am I suggesting this it the most efficient or best way to make these tanks. I hope this helps and I'll add instruction for the paddle shortly and perhaps the protective case as well. 