

# Making a custom project enclosure using [Smooth-On](#) Liquid plastics

Updated 1/20/09

Anyone that has tried to get a custom project box made knows that it can be very expensive for a one time run. This process is inexpensive and allows you to custom fabricate, and duplicate just about any size or shape of project enclosure you need.

Here I will outline just one way to build a simple project box.

Materials used:

1/8" white board (3 mil)

3/8" white board (9 mil)

Pine blocks

Clear packaging

Wood glue

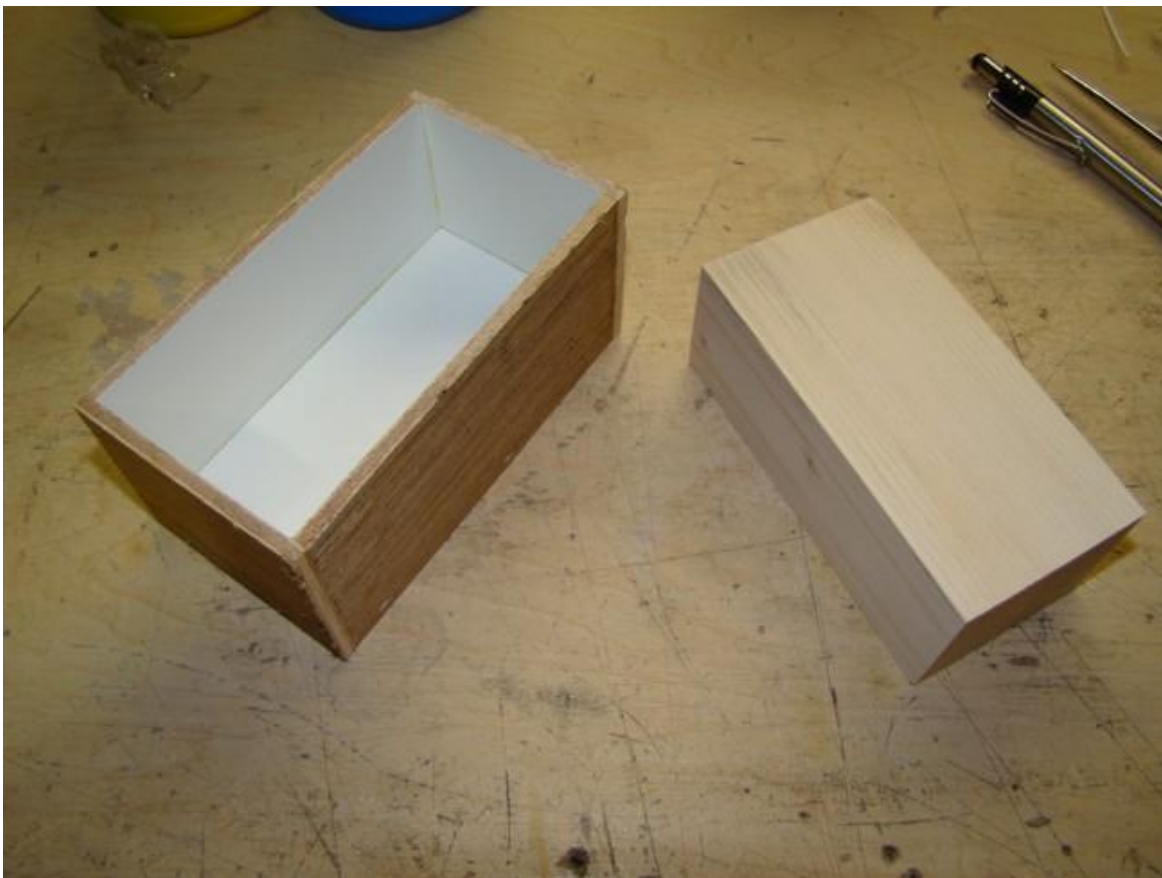
9oz plastic disposable cups

Plastic stir stick

The 3 and 9 mil white board is an inexpensive paneling that has a smooth vinyl coating on one side. This coating keeps the material from sticking and gives a smooth finish. This will be used to build the mold box or "shell" as I call it. You can use any material available to you as long as it is fairly sturdy and you can glue or somehow connect pieces together.

## STEP 1:

Start by constructing the mold box or outer shell. The inside dimensions of the shell are the *outside dimensions of your project box*. The box I am making is 4"x2"x1.75" deep. This is the inside dimensions of my shell. Next make a blank chuck. I used a pine 2x4 for this. The chuck needs to be the size and shape of the *inside dimensions* of your project box. I am going for a wall thickness of 3/32" so I need the chuck to be 3/8" smaller than the inside of my shell, including its height. Remember that you want a bottom to the box, so the chuck must be at least 3/32 shorter than the shell.

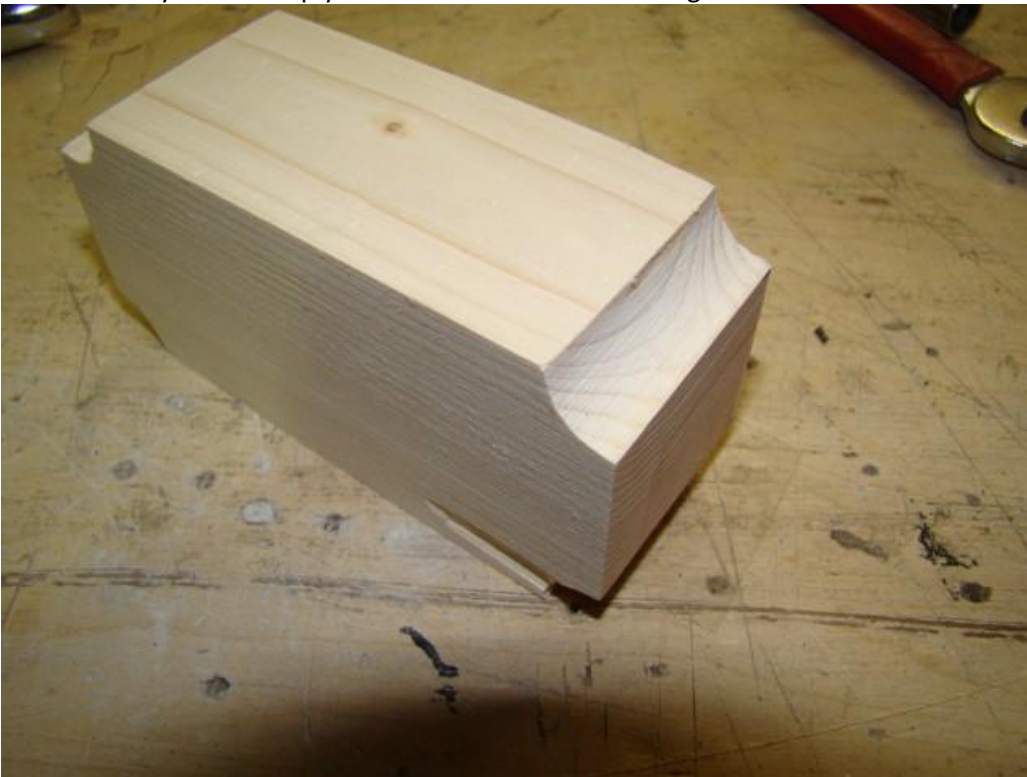


**STEP2:**

Place the chuck inside the shell and check the fit. You should have at least  $\frac{3}{32}$ " space around the chuck between the walls of the shell, and it should be at least  $\frac{3}{32}$ " from the top of the chuck to the top of the shell. However, I want mine to have a lid that has a lip on the inside of the box, so I made my chuck to be  $\frac{3}{8}$ " deeper than the shell to allow for the lip.

**STEP3:**

Next I want to make gussets in the corners to add strength to the box as well as give me some meat to screw the lid on with. For this you can simply chamfer the corners at 45 degrees. I used a router and a cove bit to shape the corners.



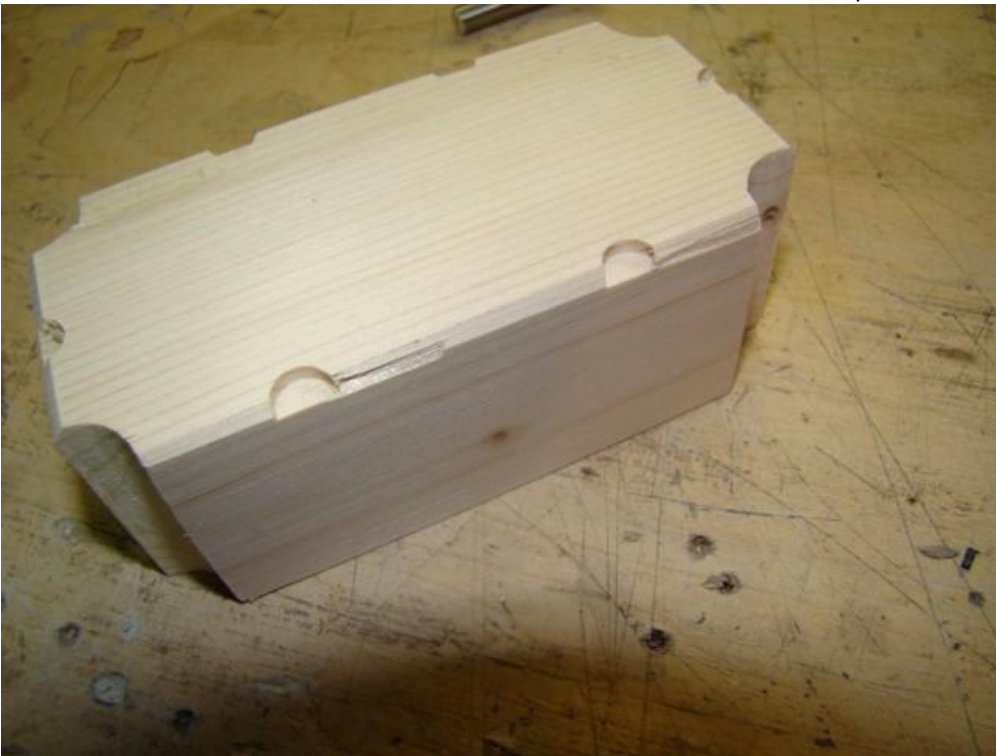
**STEP4:**

Again, check the fit of the chuck.



**STEP5:**

I also used a router to cut knocks into the bottom of the chuck. This will produce a stand-off to support my circuit board.



**STEP6:**

Now remember in step 2 I mentioned I wanted the lid to have an inside lip. I need to make room for this lip so I need the corner braces to stop short from the top of the box. This is why I made my chuck 3/8" shorter than the top of the shell. I cut a 1/8" piece of white board the same size as the chuck and secured it to the top of the chuck. This will stop the material from rising above the lid lip line.

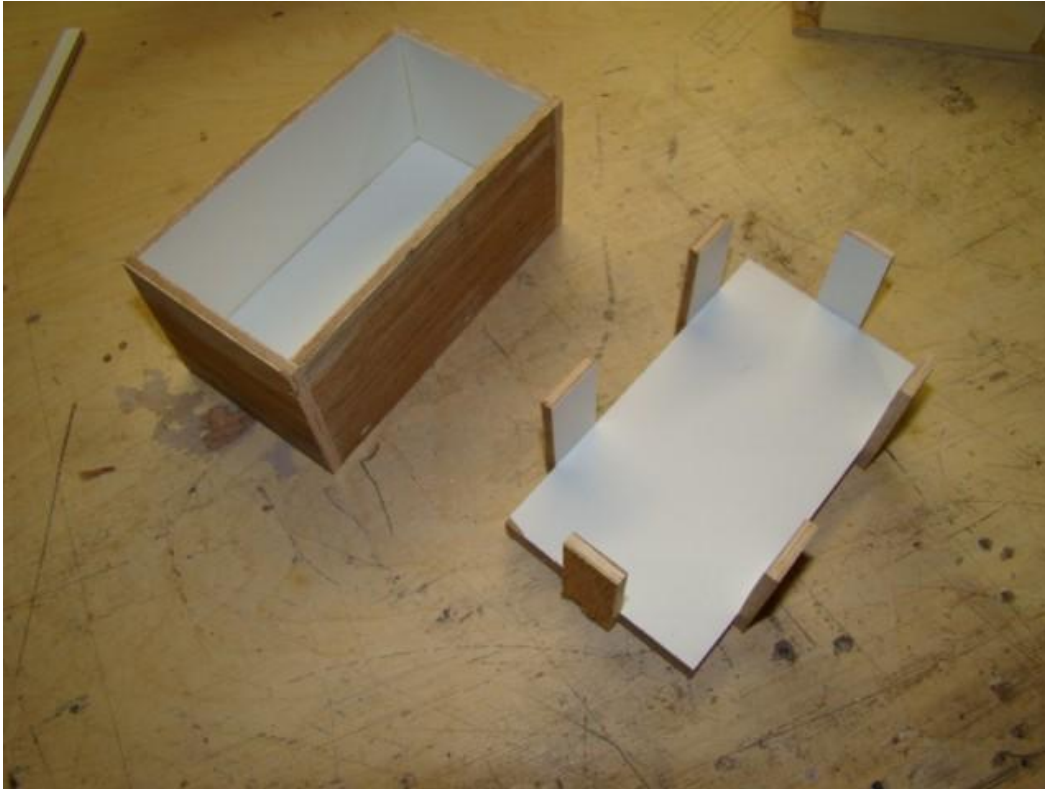
**STEP7:**

Again, check the fit of the chuck, with the added 1/8" whiteboard, my chuck is now only about 1/8" shorter than the shell.



**STEP8:**

Now we need to make a support for our chuck. This support will hold the chuck up off the bottom of the shell so the material will form a bottom for the box. Start by cutting a piece of 3/8" white board the *same size as the outer dimensions of the shell*. Then attach 1/8" vertical strips to the edge of the piece you just made. This will keep the support centered when placed over the shell. Note: make sure the vertical pieces are shorter than the shell.



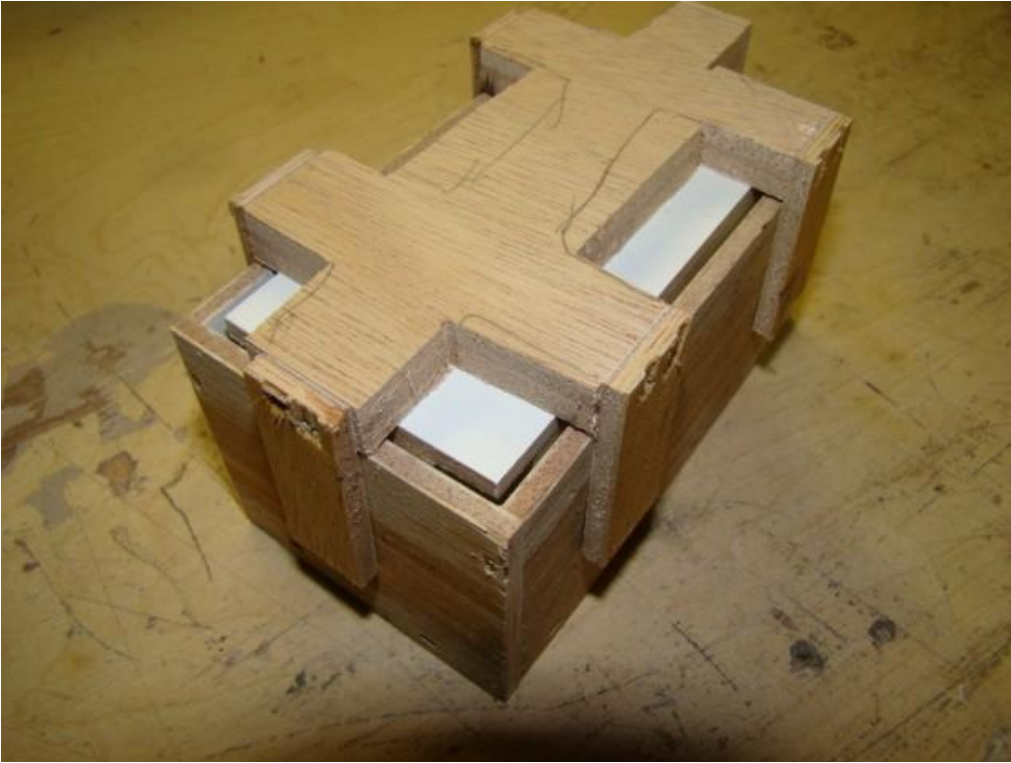
**STEP 9:**

Now cut away some of the excess whiteboard so the material has room to ooze out and test the fit. The support should be snug around the shell.

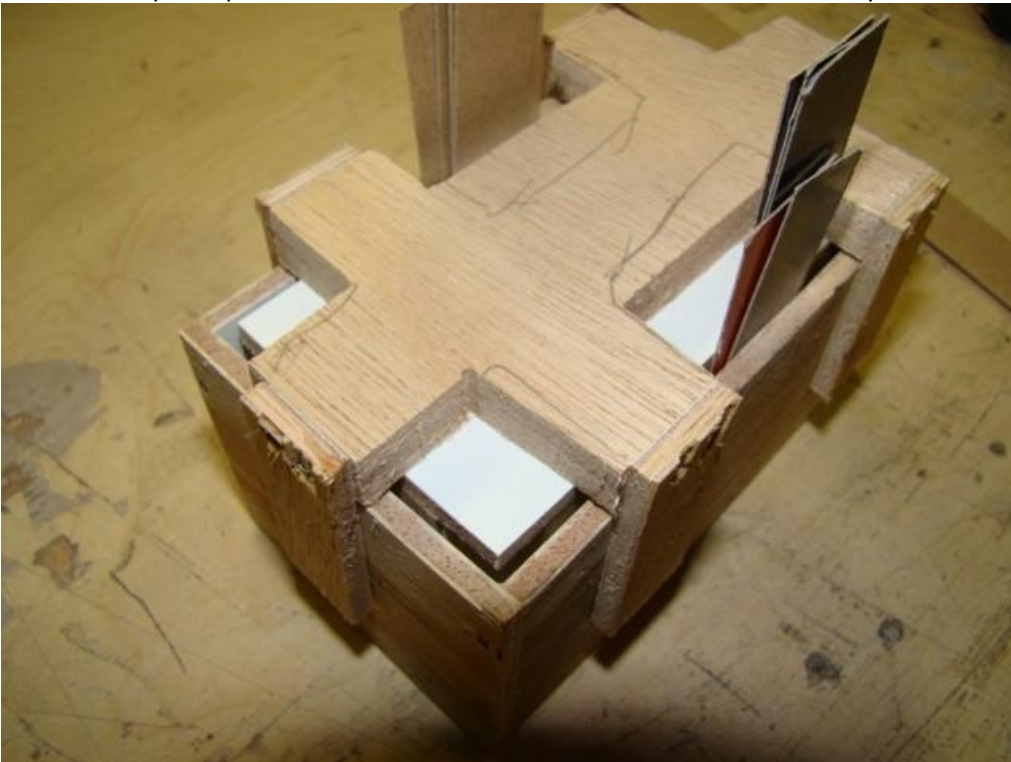


**STEP 10:**

Now place a piece of 1/8" in the bottom of the shell and insert your chuck. This should hold the chuck just above the edge of the shell. Then place the support over the shell, the support should now be resting on the chuck and not on the edges of the shell.

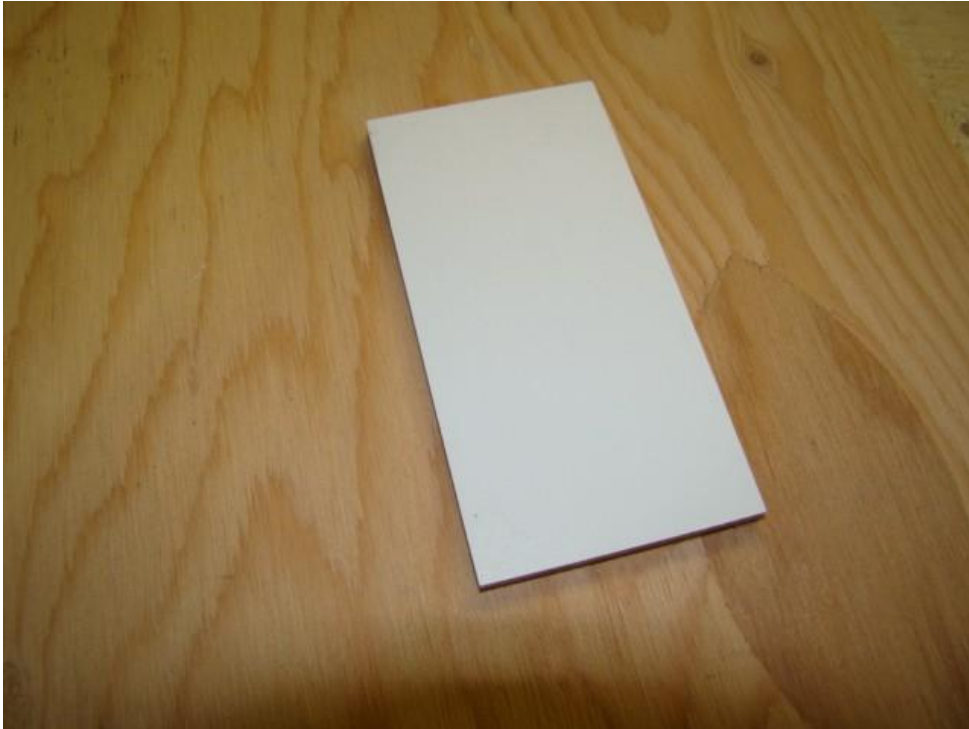
**STEP 11:**

Use strips of cardboard cut from a soda can box and insert equal amounts on all four sides until they are nice and snug, this will center the chuck in the shell and on the support. Once the chuck is center, attach the support to the chuck. I used stappels but use what ever method works best for your construction material. Once the chuck is attached, you can remove the spacer placed in the bottom of the shell, we won't need it any further.



**STEP 12:**

Now set that part aside and we will make the mold for the lid of the box. The inside lip needs to fit inside the box walls, so I cut a 1/8" piece the same size as the chuck and glued it to a piece of plywood. This will serve as the dimensions for the inside lip.

**STEP 13:**

Next I cut some strips of wood about 3/32" thicker than the 1/8" white board. This will give me the thickness of the lip. I then wrapped the strips with clear packing tape to prevent the material from sticking to it. I cut the strips and attached them to the plywood so they were tight against the edges of the whiteboard.



**STEP 14:**

I repeat the process for the outer edge of the lid, which ideally should be the same size as the *inside dimensions* of the shell, or the outer dimensions of the finale box. However it is easier to take away than to add, so I made mine slightly larger than needed and I will trim it down later. I also placed a thick piece of tape in the center, seen here. This will give me an indentation on the inside of the lid for a “Jumper settings” label. I also trimmed off the extra plywood, this makes it a bit easier to handle. The lid needs to be molded upside down so we have a smooth surface on the top. Cut a piece of whiteboard large enough to cover the entire lid mold.

**STEP 15:**

Now our lid mold and box mold are done. But before mixing the material and pouring, be sure to use [Smooth-On Sealer and Mold release](#). The Tape and the whiteboard parts don't need to be sealed, but be sure to SEAL ALL BARE WOOD following the directions from Smooth-On for the sealer and the mold release. Once the molds are ready, measure out the material. I like to guess at how much I need, you can figure out the cubic inch and weigh it out if you prefer. Notice that the material is an amber color, Use [Smooth-on dyes](#) to make the box the color you want, I used black.





**STEP 16:**

Once the material is mixed well, pour the material into the shell until it fills about 2/3rds of the shell. Slowly press the chuck with the support attached into the shell. Once the material starts to ooze out the top, lift the chuck out a little ways, and then back down. Repeat this a few times until the chuck is all the way into the shell and the support is resting on the shell walls. The up and down motion helps spread the material evenly as well as push air out. Hint, to keep the material from sticking to your work bench, lay down a layer of clear packing tape first.

**STEP 17:**

Now use the rest of the material to pour your lid mold. Fill the mold until the material crowns the edges of your mold.



**STEP 18:**

To make the lid top flat and smooth, use the piece of whiteboard cut earlier and place it over the top of the mold first from one side towards the other so excess material oozes out one side. Then carefully flip the entire mold over while holding the board in place. Add some weight to hold the mold together. This allows air to rise to what is now the bottom, or inside of the lid.

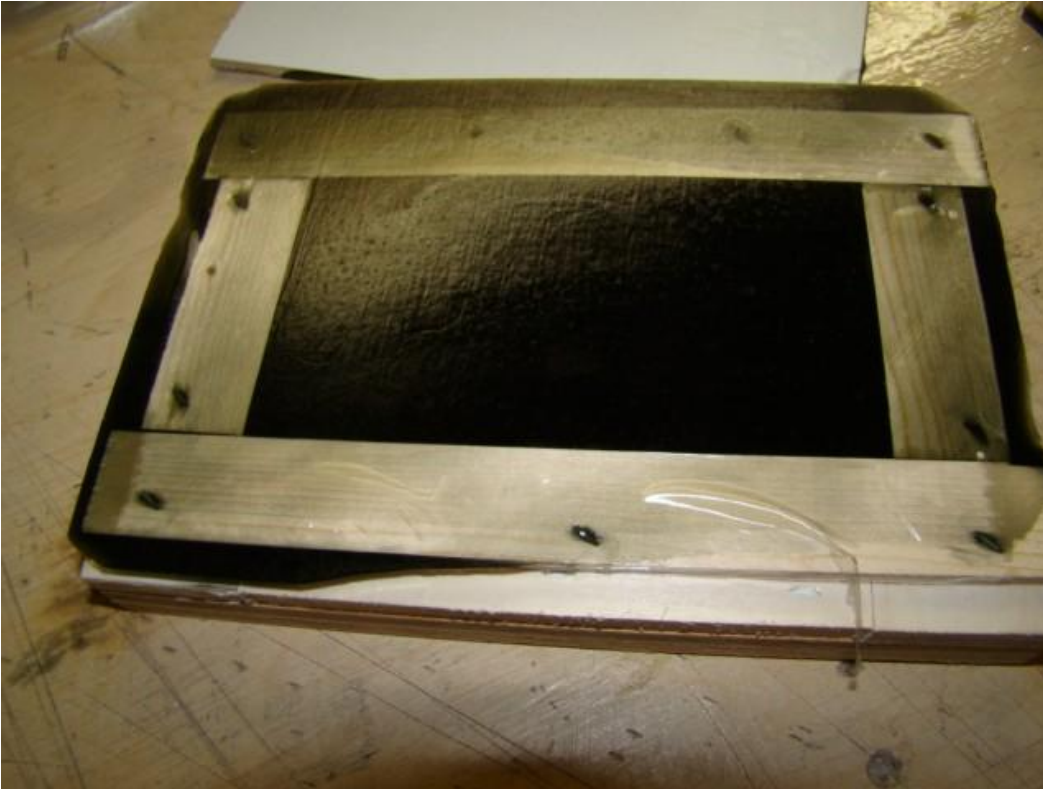


My guess wasn't to far off!

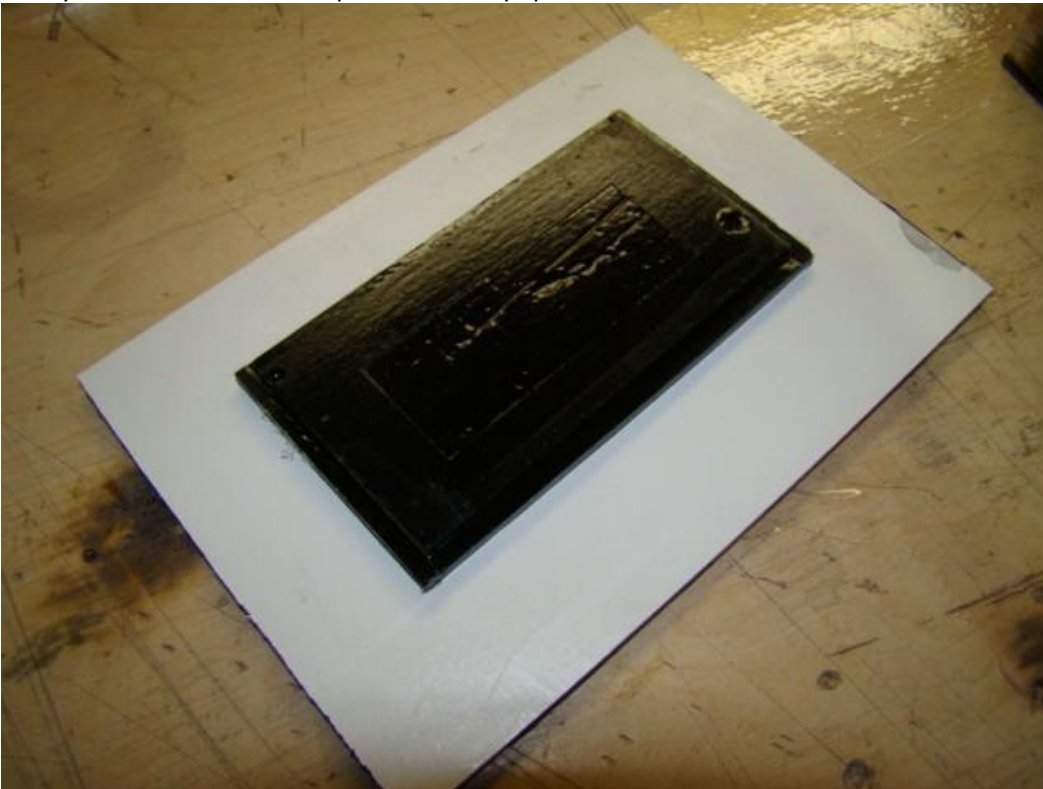


**STEP 19:**

De-Mold Time! After your material has set up according to the instructions, it is time to remove the project from its mold. Let's start with the lid, remove the weight from the mold and turn the mold over. Carefully pry off the loose piece of whiteboard. You should have a nice smooth surface for the top of your lid. Using a hobby knife or other small point, carefully lift one edge of the lid and remove it from the mold.



Here you can see the inner lip as well as my spot for the label.



The Material will still be a bit soft, so lay the lid on a flat surface until fully cured.



**STEP 20:**

Now to the box. Use a utility or hobby knife to trim off the over flow. So you have a nice edge and no overlap of material.



**STEP 21:**

Use 2 wood screws and screw them into the top of the support. This gives you something to grab onto to pull the chuck out of the shell.



**STEP 22:**

I usually clamp the screw heads into a vise, but you can also grip the screws with a pair of pliers. It is a bit difficult to get it started, but once it pulls loose, the chuck will slide right out. Carefully pull the chuck out of the mold. In the second picture you can see a white dot in the bottom of the box. This is an air bubble. At this point you can mix a small amount of material and fill in any air holes if you want to, sometimes air holes are unavoidable.





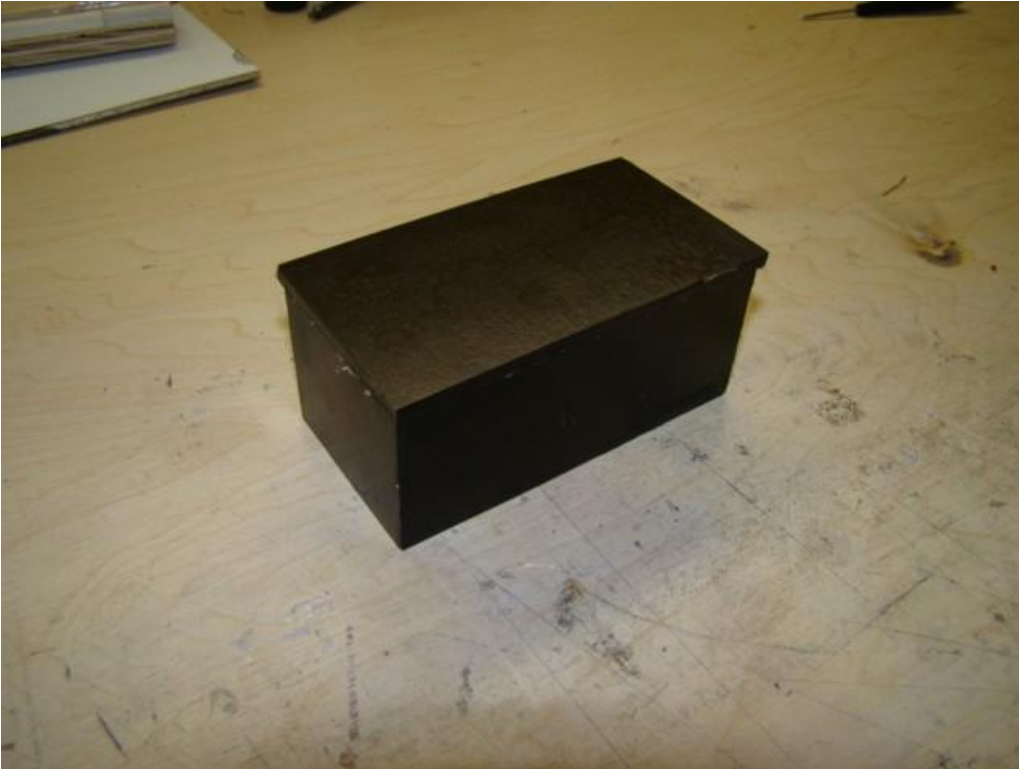
**STEP 23:**

The edges will still be soft and flexible, so you can pull one of the walls away from the shell and grip it to pull the box away from the shell. Don't worry about the box twisting and contorting while removing it from the shell. Once allowed to relax the box will straighten back into shape. At this point, let the box and lid cure over night. At first it will seem that it is too soft, but the material takes a full 72 hours to fully cure.



**STEP 24:**

Test fit the lid, the inside lip fits snugly into the box walls and as you can see the edges of the lid over hang the box. I will use a sander to trim these edges. The plastic can also be filled smooth.



After sanding the lid flush and rounding the corners. Hint: the finer sandpaper you use, the smoother the box will be. Use ABS cleaner to remove dust and clean up the sand marks.



**STEP 25:**

Use a small drill bit and drill a hole in each corner to accommodate a #4 screw to attach the lid.



Circuit board test fit.





**In conclusion:**

Although the process might be a bit time consuming it produces great results for proto-typing purposes and is an inexpensive procedure to test before going to production. It is also great for those home projects that you need a special enclosure for. Getting 1 or 2 enclosures special mad by a manufacture can be very costly.

If you have any questions, feel free to email me [jassper@jassper.com](mailto:jassper@jassper.com)