



Rogue Sub Works Presents

DIY MOLDS & CASTING

Foreword:

Before we begin with this Do It Yourself session, there are a few things that must be said about what you do with this knowledge and what products are used herein.

First I would like to talk about the use of this knowledge. Personally, I only reproduce products with direct permission of the person who made them or that I have made myself. To me it is just the same as stealing when you replicate or reproduce to sell. Some of these products take large amounts of time to make, and the people who produce them expect to make some cash. If they did not get paid they would stop and you would not get the benefit of owning their products. However, there are no laws that I am aware of that prevent you from cloning a product for yourself, but there are ones out there to prevent you from reselling the same product, especially when a copyright violation is involved. Don't expect to make many friends if you're cloning other peoples' products, and don't expect vendors to keep selling to you!

Second, this DIY session is geared towards showing the average Joe how to make a mold and then cast it. There are higher quality products and better methods out there, but this methodology will get the job done as simply as possible using the least amount of specialized tools and products.

Please note that I have done my best to ensure any links and prices were up to date at the time this article was written (2011). Some sources may no longer be available or have moved. A quick internet search can usually yield a new source.

If you have any questions about what has been covered here, please feel free to ask questions on one of the boards or email me at:

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The Goal:

Using a master, create a mold and then a casting using the simplest or most cost effective way possible.

The Products:

Keep in mind that the quantities I bought my supplies in are not the only ones available. Many companies offer smaller quantities, down to a pint. I just happen to go through a lot of the stuff, so I order enough to ensure I use it all before it goes past expiration. Getting fresh product is also essential. If possible, only buy factory direct when selecting a rubber or resin. When you deal with third parties you can't guarantee that the product hasn't been sitting on a shelf for the last year or two.

Here is a short list of everything I have selected for this walk through. More will come up later, and I will make sure to mention it.



1. Resin- Alumilite RC-3 1 gal kit -\$105.00 <http://www.alumilite.com/>

I like this stuff because it mixes 1:1. There is no fancy math involved. I also like this stuff over the standard line they have, because it has a pot life of 3 min compared to 90 sec. Another benefit is the stuff is so close to water in viscosity that it degases a bit better and gets into those detail parts well. The stuff is also wonderful to machine.

Mix Ratio (wt. or Vol.) 1:1

Pot Life 3 min.

Demold Time (100 gr. Mass) 5-15 min

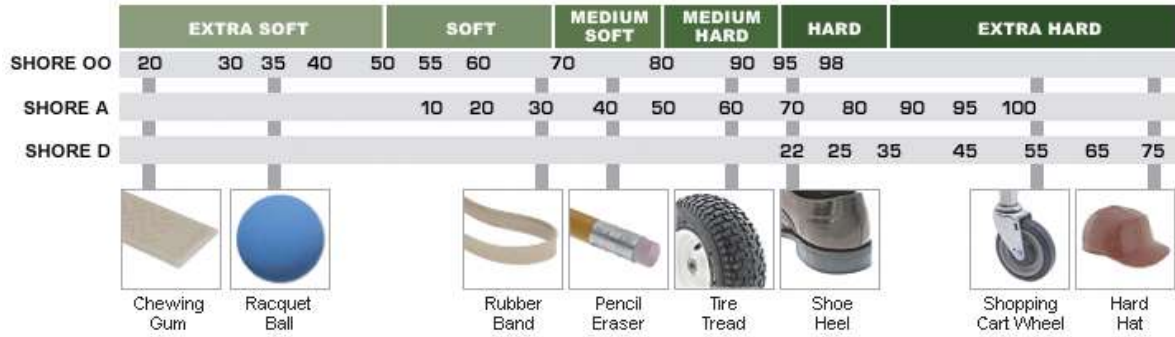
Mixed Viscosity (cps.) 110

Shore Hardness 74 D

Shrinkage (in./in.) .004

2. Rubber- OOMOO® 30 - Shore 30A hardness 1 gal unit - \$145.74 <http://www.smooth-on.com>

There are two types of silicone (rubber) I use, platinum cure silicone and tin cure silicone. Platinum cure last longer, doesn't deform as bad, and can handle much higher temperatures. The down side is that it costs a lot more and it can be sensitive to paints, latex, etc., leaving a gooey incurable mess where it contacts. Tin, on the other hand, can be very forgiving, regardless of what you pour it on. It will deform over time due to stretching and such, but its cheaper cost helps out there. Omoo 30 also degases very well, which means you can get away with not molding in a pressure pot, a huge bonus for the hobby modeler. For those of you that are curious, when I buy the good stuff I like to buy BJB tc 50-50. It is amazing silicone. I have seen ancient molds that are still in service. When selecting the shore hardness I usually get at least a 30 – 50A. Softer is better for more intricate details, but the hard stuff is more durable.



"OOMOO® 25 & 30 are easy to use silicone rubber compounds that feature convenient one-to-one by volume mix ratios (no scale necessary). Both have very low viscosity for easy mixing and pouring, and vacuum degassing is usually not necessary. Both products cure at room temperature with negligible shrinkage and have good tear strength. "

A:B Mix Ratio 1:1 by volume

Demold Time 6 hours

Pot Life 30 min.

3. Molding Clay- Klean Klay 11b- \$8.25 <http://www.kleanklay.com/>

Remember how I said some silicones were sensitive? Well, that is another reason I stick with Klean Klay. I know without a doubt that it is sulfur free clay. Sulfur = nasty goeey molds. Besides that, the stuff isn't too hard at room temp. I still like to knead my clay a bit to soften it up before I get to work anyway. It is like prepping to clay bar your car.

"Art Chemical Products produces non-drying, non-hardening, no-sulfur modeling clay for a variety of applications. It is non-toxic, sanitary, and odorless. Klean Klay is easy to handle and work with and remains hand-pliable at room temperature. Klean Klay keeps its smooth, firm consistency and retains the shape into which it is molded. "

4. Mold Release- Mann 200- \$11.49 <http://mann-release.com/erelese2.htm>

Comes in a spray and it is easy to apply. Why use it though? Nothing sticks to silicone except silicone. Right? It will help with separating your parts from the mold, extending the service life of your molds.

"General purpose mold release that works with silicones and urethane mold making rubbers. Will release urethane, epoxy and polyester resins from a variety of surfaces."

5. Mixer- Turbine Mixer- \$11.30 <http://www.smooth-on.com/gallery.php?ga ... cPath=1221>

O.K, you do not really need this, but I love it. It does a wonderful job and doesn't aerate the silicone too bad. On a serious note, I have used a tongue depressor to a model boat prop on a shaft and been just fine.

6. Mold Housing- Legos- \$? Anywhere in the world

These little engineered blocks are great for molds. They always fit together in perfect shapes that can be reproduced easily. You could cut out forms using plastic or wood, but then you have to get it all square so that when you flip the mold over it still fits in the jig.

7. Mixing Cups - Disposable cups

Buy a big pack and never worry about it again.

8. Resin mix sticks

I buy these by the 1000 at the local crafts store. I use them a lot. Its basically wood Popsicle sticks.

9. Scale

The scale does not have to be ultra sensitive. This process requires accuracy to the first decibel, at least. Technically you do not need this,

as everything here is 1:1 by weight or volume. I find weight is easier.

10. Glove- Nitrile

<http://www.harborfreight.com/pack-of-100-medium-nitrile-gloves-37050.html>

The use of latex glove will give you a gooey mess when dealing with platinum rubber. Do not bother with latex just get the good stuff.

“Use these disposable nitrile gloves instead of latex for superior hand protection. They're resistant to oil, fuel and other chemicals, and they conform to your hand the longer they're worn, providing some support.”

It is also important to note that Alumilite and other companies offer beginner casting kits like the one here.

[http://www.alumilite.com/ProdDetail.cfm ... ting%20Kit](http://www.alumilite.com/ProdDetail.cfm...ting%20Kit)

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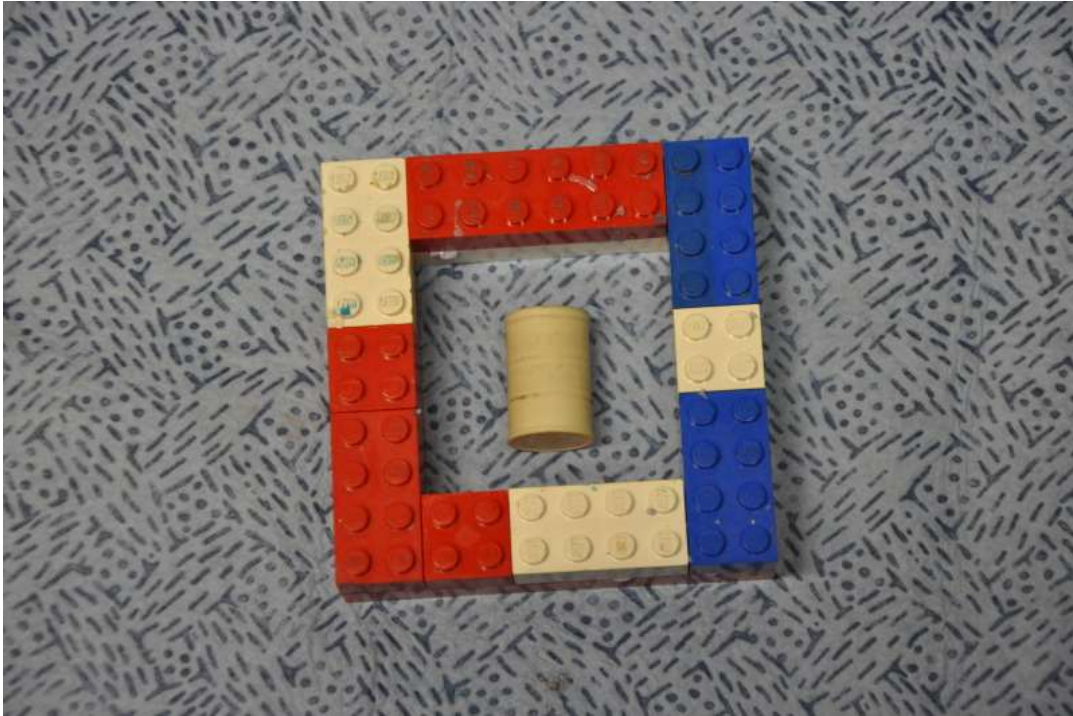
They will get you where you want to go for a cheap price, but there isn't generally a lot of silicone to make many molds, nor is it always the best quality silicone. It is where I got my start though. I can't deny it is a decent place to get your start. Either way, the process will remain the same.

Preparing The Part:

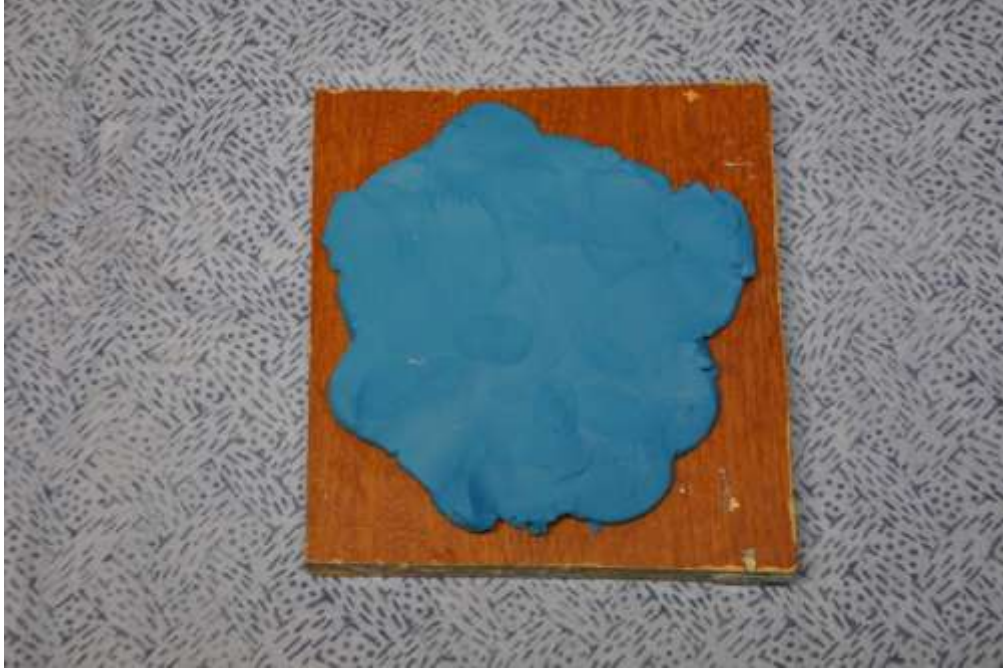
The first step is to select the part you are going to cast. For this article I will be making a mold of 1/32 scale 35 gallon oil drum that I am putting on one of my tug boats.



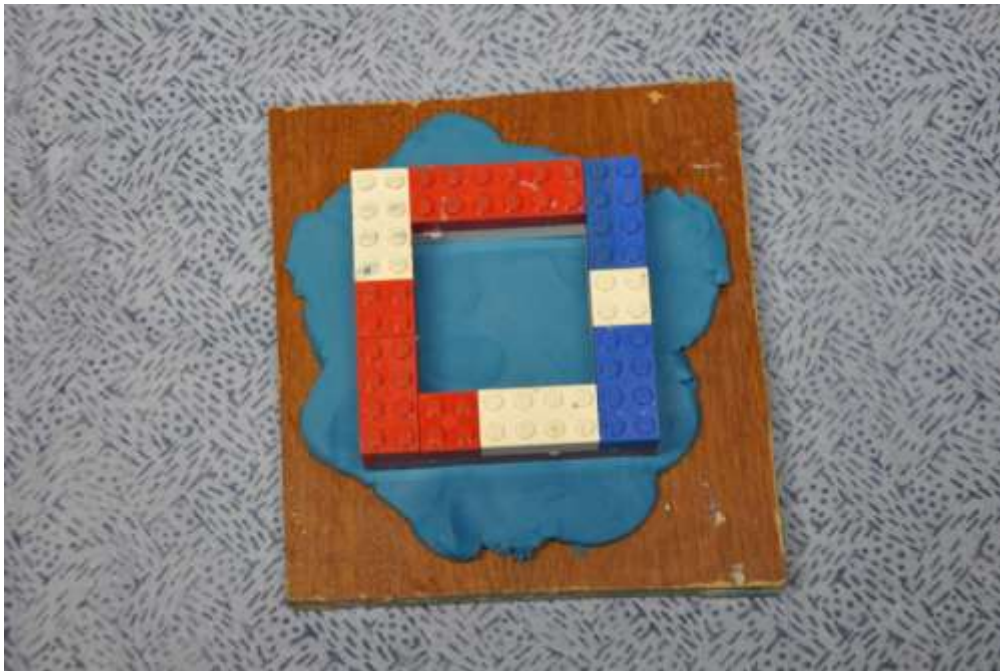
Now that the subject has been selected, a box can be made around it using Legos. You should leave about .5" around each side of the part or between the parts you are casting to help reduce flashing and ensure the part does not distort. It will also give you room to make "keys" for the mold.



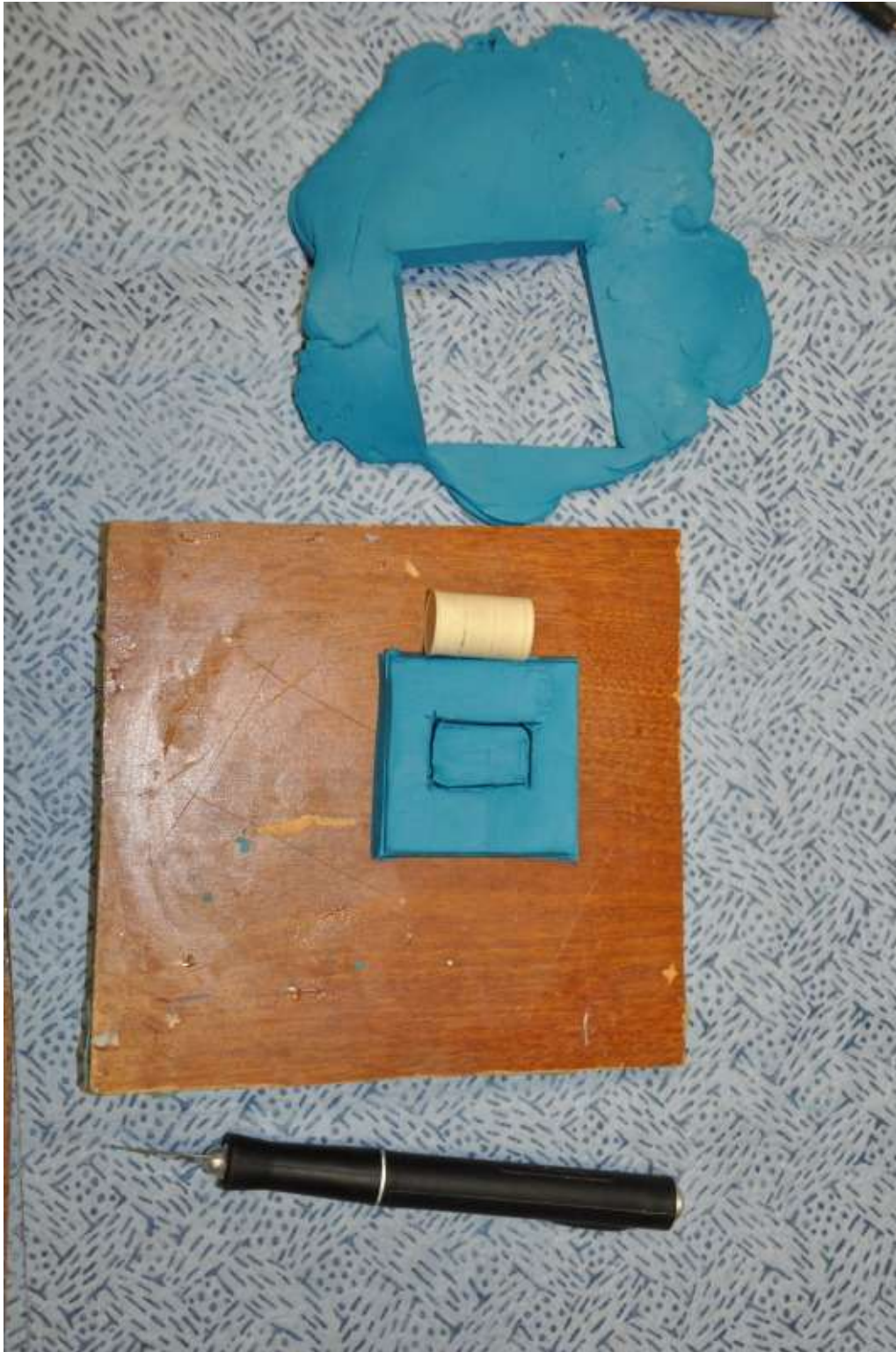
With the box size selected, put on a set of gloves and begin kneading the clay to soften it. I highly recommend the gloves as the clay does not come out easily once it gets... well... anywhere. After it's softened, roll it out to a thickness that is half the thickness of the diameter of the piece being cast. Using your thumbs works pretty well for this process, but a rolling pin and a piece of wax paper on top works well too.



Now, set your frame on top and score the inside of the box onto the clay.



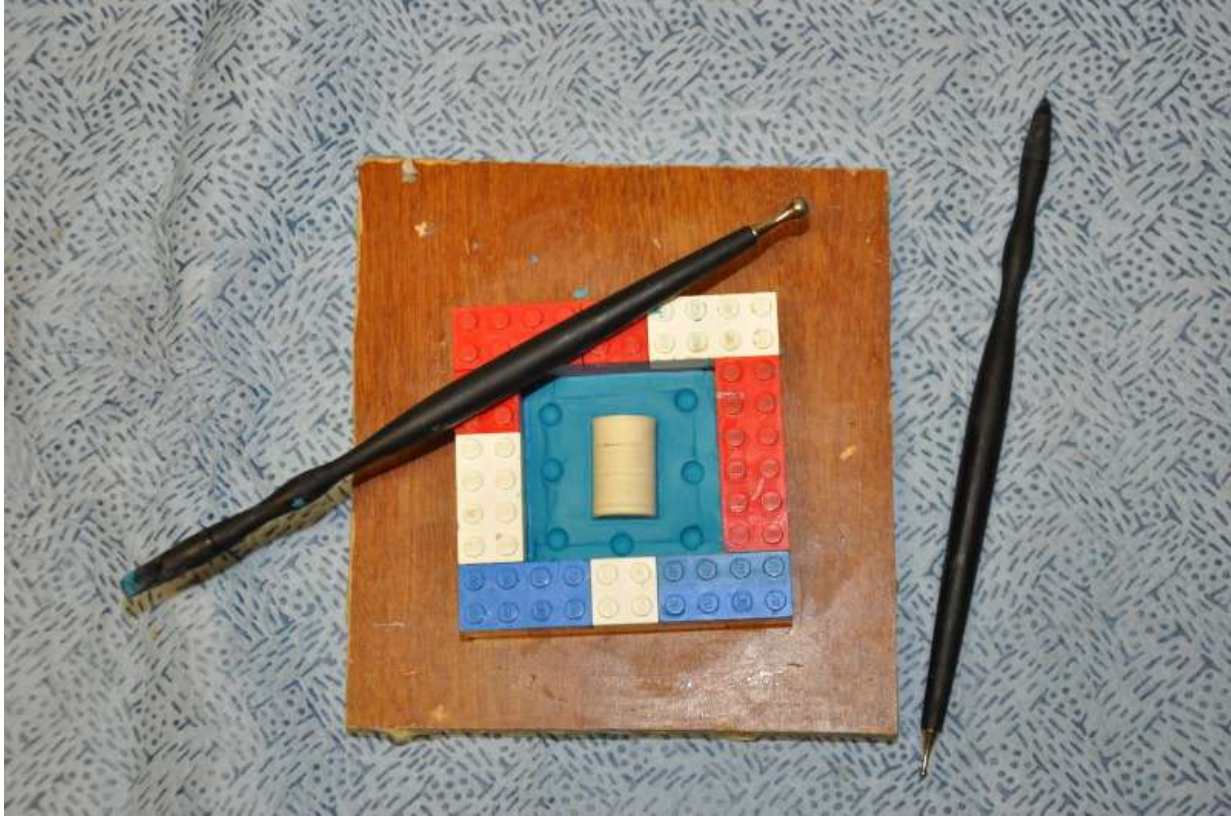
Next, place the part you are molding on the clay and outline it in the middle of the box.



Remove the clay and insert the part. Once in the clay the edges need to be smoothed to the part so that the silicone won't run down underneath. I have used Popsicle sticks, fingers, or in this case, a set of clay working tools. It helps to give a shot of Mann 200 on whatever you are using.



Now it is time to put the framing on top and smooth the clay to the edges of the box making a tight seal. I then use the bulbous end of one of my tools to make indexing keys in the clay. These will help ensure the mold is properly aligned every time you cast. Some people like to put a piece of scrap rod in to cast in a smooth pour spout for their part. That works fine, but you don't have to. It can easily be done after curing. It should also be noted that some shapes need vent ports in order to be properly cast. I will go over this later in the casting section.



It is now time to mix up the silicone.

The Mold:

Here is a quick look at what is needed for this step.



- ✓ Silicone
- ✓ Mixer
- ✓ Gloves
- ✓ Stir Sticks
- ✓ Scale (or measured cups)
- ✓ Bowl to mix in
- ✓ Disposable cups to get the product out

There are several methods to calculate the amount of silicone you will need for your mold. One method is to calculate the total volume with some simple math (made easier by the square shape from the Legos). Another method I have seen is to take some rice and pour it into the

mold, and then pour it into a measured cup to get a total volume. I'm not a huge fan of this because it usually involves cleaning out some rice (quick blast from the air gun helps). I personally just guess. I've done enough of these now that I am pretty good with my calibrated eye. If I make too much, I just build up the wall of Legos a bit and use some more, which just makes a more robust mold. This is better than tossing it away!

I like to start with the yellow bucket first. Get your gloves on. Put your bowl on the scale. Zero the scale. Use your cup and get some of the product out to your desired amount. I then use the stir stick to scrape as much material as I can back into the bucket. Waste not, want not.



The blue bucket is a bit of the same as the yellow bucket with one exception.



You really need to make sure this stuff is mixed well before using it. It is another reason I highly recommend the tornado mixer!



Once you have the same amount of blue stuff mixed in with the pink, just transfer the mixer over to the mixing bowl and begin mixing. This is the reason I start with the yellow bucket.



Once you have everything all mixed up you have 30 minutes to get it poured up. So just like the Hitch Hikers Guide to the Galaxy says "Don't Panic". There is plenty of time to get things right.

You may also have noticed that there is a large amount of bubbles on the surface of your bowl.



Again, don't panic. This is normal for this product. It is very good at degassing so all the air trapped in the bottom is making its way to the top. Just think, if you weren't using this product, all of those bubbles might be hiding down in your rubber. Yuck! That is why this product is so great; you don't need to have a pressure pot to make it work.

Let's pour the rubber. It is best to do a very slow pour, almost like laying a string down. This will help minimize air getting into the mold. I also start with any corners, edges, or minute details to ensure no air pockets form over these areas, as they are more prone to trap air. Never scrape the sides when pouring a mold. You don't want to add any unmixed material, as this will make uncured sections of the mold.



This side of the mold is now done. You can technically demold after 6 hrs. of curing. I always give it 24 hrs. There's no need to rush perfection; patience always pays off with this stuff. Temperature also affects cure time, and it may take more than 6 hrs.

Following these steps will get you on your way to making decent molds that you can use over and over, BUT you can take things to the next step. To get the best quality molds I use a pressure pot. A pressure pot is a chamber used to apply a pressure to the mold, causing any air left in the rubber to collapse or dissolve into solution. It also assists in forcing the rubber into any small detail areas.

You could go to some of the rubber supply shops and pay their \$300 for a pressure pot or you can get smart! We don't really have a need for a +5 gallon pressure pot. Something smaller will work just fine for small parts. I bought a 2.5 gal. pressurized painting pot for \$75 and it came with a regulator and relief valve and was rated for 80 psi (more than enough). All I had to do was use a wrench and remove the paint pickup line and cap off the

Place the mold in the pot, seal it up, making sure to use a proper torquing pattern (like putting a tire on your car), and apply 40 psi to the mold.



After the mold has cured it is time to finish the other half of the mold. First, pull the mold out of the clay and Legos and clean the clay off of everything with a paper towel. Next, reinsert the part back into the mold exactly as it was.



Now build up your Legos again with enough height to give you at least a 1/4" thickness and spray everything with mold release.



Mix and pour your rubber and allow it to cure.

After the rubber has cured remove the mold from the Legos.



It's time to locate the seam and separate the mold halves. I find just rubbing my fingers along the edge can peel back the excess rubber. An xacto knife can also be used, but care must be taken as it will slice through the rubber very easily.



Since the mold is separated, remove the master and set it aside. It is now time to determine where to place the pour spout and any required vents. This is going to take some critical thinking on your behalf. It is always best to arrange the spouts so that the high points can easily be vented. A longer pour spout will also provide more head pressure, allowing resin to fill smaller areas more easily. This part should only require a single pour spout, but after a cast or two you may find it needs more areas to vent and you can simply add those in as needed.

I like to use a brass tube that was sharpened with an xacto knife to make my channels. Some people also place solid tubes in their molds, so that when the molding is done the channels are already in there for you. It makes things really easy.



I then selected the center of the mold and made my hole.



Here is an example of a part that would need venting. I arranged all the points to face upward, then made a fill path that went straight to the bottom. This allows a natural flow for the air to exit the mold.



Casting:

Spray the mold halves with mold release, put them together between two wood blocks, and wrap it with rubber bands.



To get a good idea of how much resin to use, place the master on the scale and split that number in half for each part of the resin. This part weighs 4 grams, so 2 grams of part A and 2 grams of part B. This is not very much resin and is a difficult amount of resin to mix. Instead, I use 10 grams of each part. This will account for the fill spout, and I will use the rest on one of my other molds I have around. There's no need to waste product.



Next, I pour both parts of the Alumilite resin into a Dixie cup and mix it with a tongue depressor.



You now have approximately 3 minutes to get your work done, so don't sit around! Pour the resin into the mold until it is full. Some light tapping of the mold may assist in the process. Now leave it alone.

At this point you could also place it in the pressure pot at 40 psi to aid in collapsing bubbles and forcing resin into small places.

Here is a picture of what I used the rest of the resin for. It is a one piece mold where one side of the part did not contain any details.



That just about wraps it up. In a few hours you will be able to demold your product and make another part if you like.