Glass Campus *presents:*

Mold Making for Glass Art

a tutorial by Dan Jenkins

When Dan Jenkins retired he did not originally intend to make tools and molds for glass artists. However, his wife and friends who work in fused glass were constantly calling on the skills he developed during 30 years as a marine engineer in the Canada Navy to produce items that were needed but unavailable. He began his career on steam driven ships for which it was impossible to get parts. The engineers had to fabricate their own parts out of whatever was available to them. Dan has drawn on his knowledge of woodworking, metalworking, design, engineering and making something out of nothing. He discovered that he enjoys the challenge of designing new tools that are practical economical, and easy to use. Dan has always enjoyed teaching and spent much of his time in the navy as an instructor both at sea and onshore. Dan currently lives in Victoria B.C. with his wife, two cats, and 3 dogs.

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Choosing a Prototype

Making molds for your own use or for reproduction is fairly easy to do and very satisfying. Making your own molds frees you from relying on molds made by others and allows you to tailor your mold for your own taste. Using found objects to copy and transform into glass is fun and enables you to produce some pretty unique pieces. If you are one of the lucky people to be gifted with an artistic talent beyond drawing straight lines, and you are able to do some carving, you are moving into a whole new level of personal art.

When you first start to think about making your own molds you will probably do the same thing I did and figure that if it is out there I can mold it. I found out in a hurry that my ambitions were well outpacing my talents. My first attempts ended up with some rather large chunks of plaster with my found object permanently embedded somewhere inside. I also found out to my surprise that not every object that I pictured cast in glass and gracing my mantel was able to be cast.

Many objects are beautiful to look at and at first glance seem to be prime candidates for making a mold from, but beware of hidden pitfalls. Many prototypes you will encounter will have a fair amount of detail on them; however you must be aware that they still may not be suitable for glass work. If the detail is very ornate, shallow or delicate the glass may not be able to pick up very much detail.

There are many different types of casting molds around and many different techniques for making these molds. Molds come in one piece, two piece, multiple piece, they also come in reusable, one-time use only, to mention a few. The one-piece mold is the simplest one to make and this is where we will start. It is easy to produce and gives you a 3D casting which can be combined with other glass projects you wish to make or even combine with other materials.

The first projects you wish to tackle should be fairly simple because failure the first few times is not only possible it is probably inevitable. The first objects I tried to cast were self-produced wood blocks in the form of squares and triangles, simple shapes which should have been no problem. These turned into the large plaster chunks of which I alluded to earlier. I found that there were a few things to consider on an object before plaster was poured over it.

- when glass is in its molten state it is the consistency of honey, this means that it will not be able to fill in very shallow or small details. So the prototype should have good detail definition.

- examine the object and make sure there are no undercuts which will hang up and not allow the object to release from the plaster.

- If the surface is porous it must be sealed watertight or it will stick in the plaster

To produce a one-piece mold the object must have no undercuts in its surface; an undercut is when there is a part of the object that is more indented than the main surface. If there are undercuts present, the object will hang up in the casting and will not release, thus creating a big block of unusable plaster. The surface of the object is also important; the surface must be impervious to moisture as the plaster is wet and if your object allows any moisture to penetrate its surface then plaster and object become one.

Getting Started - Basic Equipment

To get started is pretty easy, find an object you would like to try to mold, assemble the materials needed and have some fun.

To make your first mold you will need the following basic materials:

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- Number 1 pottery plaster
- Scoop for measuring out plaster
- Plastic putty knives various sizes
- Kitchen scale, it will be easier if it reads in both metric and imperial
- Containers for measuring water and plaster separately
- Container for mixing water and plaster to
- Water
- Modeling clay non-hardening
- Piece of old glass or mirror
- Hot glue gun and glue sticks
- Material for making a dam around the object to be molded
- Kitchen timer
- Buckets for cleaning up equipment

Containers to measure plaster and water

Scoop for plaster and plastic putty knives

Foam food containers for dams

Kitchen scale

Modeling Clay non- hardening

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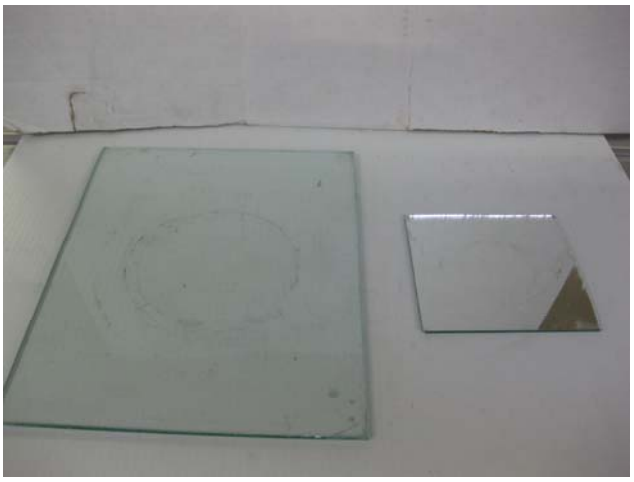

Glass and mirror pieces

Kitchen timer

Hot Glue gun and glue

Plastic tubs with cut bottoms for dams

The Journey Begins
- Let's Begin to Make a Mold

Beginner mold makers often pick objects which have undercuts, are overly complicated and can be beyond the scope of their ability at that moment. It is better to start with something simple and straightforward to learn on; this will cut down on the frustration and rate of failure with your first few molds. As I said before failure of your mold is always a possibility and can be very discouraging if you try running before you can crawl. My first few attempts made me realize that I was having trouble slithering let alone crawling. So I had to back up and start simple.

The type of mold I will cover first is a simple mold. Slip casting will be covered a little later in this paper, because **first** we have to make a mold to use the slip in. Once you have found a simple prototype you wish to use, place it on a flat table and view it from above, if you can see the entire exterior surface then it is suitable for a one-piece mold.

The first prototypes I used were ones I tried to make myself; I had limited successes as they were very crude and I am no Michelangelo. So I was digging around in the kitchen and came across some plastic candy molds in the bottom of a drawer, and having been a Chief in the Navy, figured I could borrow them and then

return them with the Admiral of the house none the wiser. Well, let's just say the Admiral is no dummy and I spent some time in the brig. My brush with death did allow me to see that candy molds produce a very nice product with no undercuts and you can make multiple exact copies of each item.

Empty Candy Mold

Plaster filled candy mold

The plastic of the mold does not require you to seal it and the set plaster will release easily. Let the plaster dry for a day then gently work the mold back and forth to release the plaster. Be careful not to hold the mold too far off the table as the plaster is still quite fragile and will break if it falls even a few inches. If you own an air compressor you can use a quick shot of air, about 40 psi, to pop the plaster free. Be careful to make sure your hand is over the casting or it can fly out. After the plaster castings have released from the candy mold they will need to be dried until most of the moisture is gone. Air drying will take a few days, depending on your particular climate. If you place the castings in a warm area, or a dehydrator, they will usually only take overnight.

Plaster casts from candy mold

Cleaning Up & Preparing Prototypes

From now on I will be referring to the item that is to be copied as the **Prototype.** When the plaster prototype finishes drying it must be cleaned up as the edges will be rough from the casting process. My Drill Sergeant always referred to me as a rough casting, I never knew what he meant until I started mold making. I am sure he meant what he said in the nicest possible way. As anyone who has ever had a Drill Sergeant knows, they are the kindest, gentlest most compassionate people the military can find.

But I digress once again. The edges of the plaster can be gently sanded down, making sure not to undercut them. With a plaster prototype you will have the option of carving the details deeper or wider to ensure the glass will pick up all the detail. When the prototype is to your satisfaction the next step is to seal it against moisture.

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The sealing of plaster is done with a preparation known as **Mold Soap**. It is pretty well what it sounds like, it is a kind of soap.

Mold Soap

Mold Soap can be purchased at most pottery supply stores. To use the soap you must ensure the prototype is dust and dirt free. Then put a small amount of the soap into a dish and using a brush or paper towel, or even your hands, apply it to the plaster. Put a generous coat on all over the prototype, even the bottom, and rub it into lather.

Let the soap sit for a minute or two, then take a dry paper towel and gently wipe the surface. Make sure all of the lather is gone; check all of the small nooks and crannies of the piece to ensure that you got it all. If lather is allowed to dry in the corners it will build up and fill in some of the detail. Let the prototype sit until the soap is all dry then buff it with a soft cloth.

Mold soaping a plaster prototype

Wiping off the lather

Repeat this procedure four or five times. A lot of articles say you only need one or two coats. I have never personally been able to make it work with only a few coats, but each person must find out what works for them. If there is one thing I have found since starting mold making, it is that there are no absolutes. What works for one person does not necessarily work for another.

Preparing Sealed Prototype for Mounting

Now that the prototype is sealed it is time to start preparing it to be cast in plaster. To make a good solid mold you need to start with a good base. Find a piece of window glass or wood with

a sealed top. Old countertops with laminate make a good base. The reason that it should be glass or sealed wood is that the moisture from the plaster will soak into any unsealed porous surface. An unsealed porous surface leaves a rough face on your finished mold and makes the hot glue, which holds your dam on, very difficult to get off.

Once your base is on a level surface it is now time to affix the prototype to the base. Non-hardening modeling clay is a very cheap and easy medium to use.

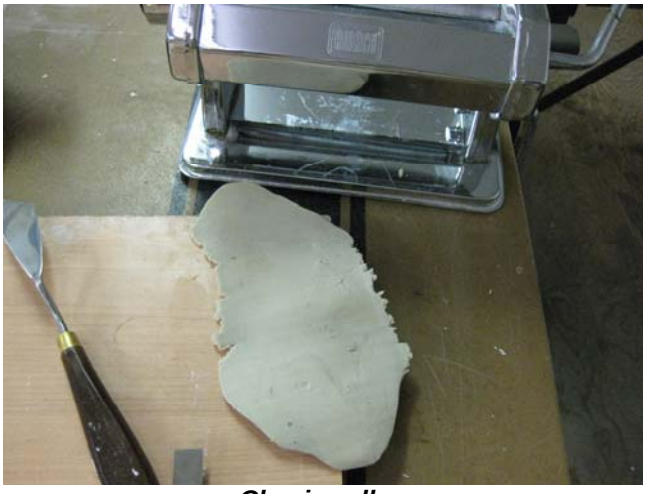
Non-Harding modeling clay

I use a pasta roller; in a hobby store it is called a clay roller. There is a thickness adjustment on the roller so you can tailor your clay to your needs.

Clay Roller

Cut a fair-sized chunk of clay from the block. Do not worry about getting too much, all of the excess clay can be reused over and over again. Knead the clay into a ball, and then flatten it out on a table with your hands. The clay must be fairly flat or it will not work in the roller. Before you do your first rolls on the now flattened clay make sure you set the thickness gauge on the side of the roller to the thickest setting. You may have to roll the clay a few times to get it to the desired thickness. If the thickness setting is too thin for the chunk of clay you have, the clay will not feed through the rollers.

Once the clay is flattened, place the clay in between the two rollers and start turning the handle. It should roll through nice and smoothly. I personally like to use the #8 setting.



Clay in roller

The first time you roll a chunk of clay you tend to get a long narrow strip which is normally not wide enough to mount your prototype on. Take the narrow strip of clay fold it over into a double layer, then fold the edges over again until you have a piece of clay that will just fit lengthwise into the roller.

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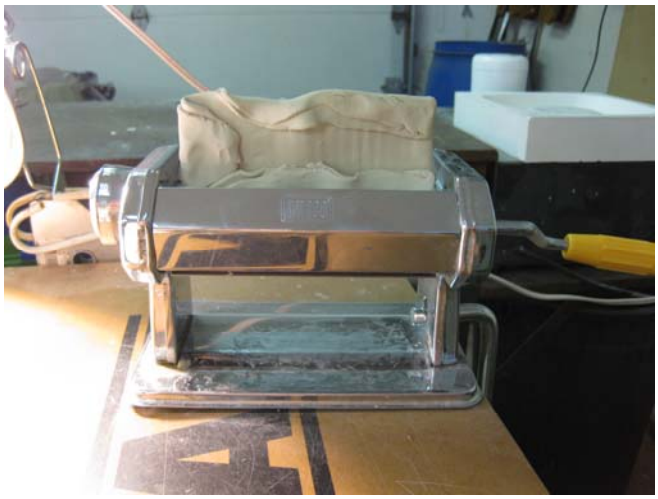

Clay doubled to create a wider piece

How Thick Does the Clay Have to Be?

Before you can begin to mount your prototype onto the backing you must first figure out how thick you need the clay to be. The clay will add depth to your prototype and help create more room for the glass in the final casting mold. Remember that the frit you will use to create a casting has a lot of air spaces in it when piled into the mold. When you go to a full fuse the air comes out and the glass shrinks into the mold.

If you have a casting mold with shallow details towards the edges you need a deeper reservoir so you can add more glass to allow for the shrinkage of the glass. If you do not allow for the shrinkage you will lose the details around the edges. A depth of 1/8” to 1/4” will normally be enough for most sized projects. These depths can be achieved by laying down several layers of rolled clay. This is just a rule of thumb I use. You may find you need more depth so you will have to play a little to settle in your own comfort zone.

Mounting the Prototype to the Backing

Place the wide piece of clay onto the nonporous backing and then place your prototype on top of the clay. Gently press the prototype into the clay using the palm of your hand. Be very gentle and apply an even pressure as it is very easy to break a thin piece of plaster. You only need to make sure that the prototype will stick to the clay and not move around when you start to work on it.

Prototype on clay

Now that the prototype is fixed to the clay it is time to seal the edges to ensure no liquid plaster can leak under it during the pour. Take your clay tool and gently start to push the clay towards the sides of the prototype. Be careful not to push too hard as the prototype is only gently stuck to the clay. Go all around the outside and also do any inside details present.

Gently push clay towards sides

Do outside and inside details

When you have completed this task it is time to remove the excess clay. Peel any large amounts of clay away first. Now you need to use an Xacto knife or other sharp object to finish the trim job. When cutting the clay around the edges make sure not to create any undercuts. Try to slope the clay gently out from the side of the prototype, this prevents undercuts and also creates more space for the frit.

Trimming the excess clay

Not a B, but you get the picture

Once the trimming is complete, you need to do a final sealing of the prototype. I use a very thin film of Murphy's Oil Soap to ensure that the plaster is fully sealed. I have found that you can use a thin film of petroleum jelly if that is what you have.

Some people tell you to never use any sealing agent other than mold soap. This may work for them, but I have never been able to reliably ensure that the prototype will release from the plaster using only mold soap. The Murphy's Oil Soap is a vegetable-based product and works well. It does not clog the pores of the plaster. An argument against using any type of petroleum product is that it will seal the pores of the plaster slipcast mold. I have not found this to be the case. And when we finish the slipcast mold pour I will tell you how to ensure the plaster is clean.

Sorry got a little off-track there, but then age and a wandering mind will do that to you.

Seal with a thin coat of Oil Soap or Petroleum Jelly

Using your fingers and a small artist's brush gently rub the entire surface area of the mold. Make sure to use the brush to get into any small nooks and details. Wipe any excess off with a clean paper towel.

Building a Dam for Pouring Plaster

For smaller prototypes you can use any type of plastic or styrofoam container to create the dam. For bigger projects you will need to revert to the wooden cottles and clamp system referred to in the Tools and Materials Section of this article.

Make sure that the surface around the sealed prototype is clean of any clay or petroleum jelly as this will leave marks on the plaster when it dries.

Place the dam over the prototype ensuring that there is adequate and equal clearance around the edges.

Dam in place

Plug in the hot glue gun and let it warm up for a few minutes. To test the gun to see if it is ready to use, gently squeeze the trigger. If the glue flows smoothly out of the nozzle it is ready. Carefully place 3 small dots of glue around the perimeter of the dam ensuring you maintain the clearance from the prototype, and let these harden.

These dots now ensure that when you apply the bulk of the glue the dam will not move on you. Apply an even bead of glue around the entire outside of the dam. Make sure that the glue adheres to both the backing and the dam; this will ensure a leak-proof seal.

Putting Glue bead around dam

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Plaster Mixing and Pouring

One of the keys to the whole mold making process is the mixing and pouring of the plaster. Plaster comes in many forms, but the one I use and have the best results with is #1 Pottery Plaster. #1 Pottery Plaster can be purchased at most pottery supply stores and is fairly inexpensive. A 50 lb bag is around 15 to 20 dollars and goes a long way.

When I first started using the plaster I would scoop it straight out of the bag. This method proved to be a messy and frustrating one, and led to more plaster on the floor than in the mixing pail. Once the bag is open it is hard to reseal and the bag itself leaks plaster dust everywhere. An open bag also leaves the plaster powder open to the atmosphere and allows it to absorb moisture making it lumpy and unusable. Now when I open a bag I pour it into a five gallon bucket with lid, the kind you get at the paint store.

A 50lb bag of plaster will pretty much fill up two five gallon plastic buckets. Now I am sure a lot of you are probably like me and not a body builder or circus strongman, sorry, strong person. Lifting a five gallon bucket of plaster is a good way to end up in the hospital. The answer I found was to use the five gallon pails as clean storage for bulk plaster and use a smaller plastic pail with cover for ready use. A plastic kitty litter container, either a fifteen pound or twenty eight pound one are perfect for ready-use plaster. These containers hold enough plaster to get a lot done but are light enough to move around without hurting yourself and have a lid to keep your plaster dry and clean.

Kitty Litter container

To begin mixing plaster for your project, you must first have a ballpark figure for how much you will need. The following formula comes from a book called *"The Essential Guide to Mold Making & Slip Casting"* by Andrew Martin. This formula is the easiest and most accurate I have found so far.

Calculating Plaster Volumes

For a Rectangular Shape

The volume of a rectangular shape equals its length multiplied by its width multiplied by its height. For a rectangular shape that is 15 x 10 x 3 inches (38.1 x 25.4 x 7.6 cm) calculate its volume as follows:

15 x 10 x 3 inches (38.1 x 25.4 x 7.6 cm) = 450 cubic inches (7.4 liters)
You will need 450 cubic inches (7.4 liters) of liquid plaster to fill this shape.

Divide the volume (450 cubic inches) by 80 to find the number of quarts of water you will need in order to make enough plaster.

$$\frac{\text{450 cubic inches (7.4 L)}}{80} = \text{5.6 quarts(5.3 L)}$$

Round the results up to 6; you will need 6 quarts (5.7 L) of water

To determine the weight of plaster you will need, multiply the number of quarts or liters of water by 3. This gives you the parts, by weight of plaster required for each quart or 2 pounds (or 1 liter (1 kg) of water).

6 x 3 = 18

You will need 18 pounds (8.2 kg) of plaster.

For a Cylinder Shape

The volume of a cylinder equals pi (3.14) x radius squared x height.

For a cylinder that is 10 inches (25.4 cm) in diameter and 6 inches (15.2 cm) high, calculate the volume as follows;

Remember from math class that the radius of a circle is half the diameter.
The radius of a 10 inch circle is 5 inches so the radius squared will be (5 x 5) + 10

Pi x radius squared x height
3.14 x 10 x 6 inches = 471 cubic inches (7.7 L).

You will need 471 cubic inches (7.7 L) of liquid plaster to fill this cylinder.

Divide the volume by 80 to find the number of quarts of water you will need in order to make enough plaster.

$$\frac{\text{471 cubic inches (7.7 L)}}{80} = \text{5.9 quarts (5.6 L)}$$

Round the results up to 6; you will need 6 quarts (5.7 L) of water.

To determine the weight of plaster you will need, multiply the number of quarts or liters of water by 3. This gives you the parts, by weight of plaster required for each quart or 2 pounds (or 1 liter (1 kg) of water).

6 x 3 = 18

You will need 18 pounds (8.2 kg) of plaster.

For a quick glance guide for mixing see Appendix A.

Mixing Plaster

Okay, now you are probably saying to yourself, finally the long-winded twit will get on with it, but grasshopper, you need to know the formula so you do not end up with way too much or way too little plaster.

Believe me when I tell you, until I found this formula I wasted a lot of plaster and time guesstimating the volumes I needed.

You will find that even with the formula you will end up with slightly more liquid plaster than will fit into your mold. But it is a case of better too much than too little. The excess plaster you can dispose of in your garbage can. The main reason you will end up with more plaster than you need is the prototype that is sitting in the middle of your mold. The prototype takes up some of the volume inside the mold. I found it an exercise in frustration to try and calculate the volume of my prototypes. The cost of the excess plaster is negligible.

Hey - where are you going? I really am now going to mix the water and plaster.

The first thing you need is water. The water should not be freezing but I have found regular tap water temperatures work just fine. If the water is very warm the working time you have with the plaster is reduced. Working time being the time between when you mix the plaster and water together and the time the plaster starts to set or harden.

To begin mixing you will need:

- Water in an easy-to-pour container
- Plaster in a container with scoop
- Weight scale
- A container to measure plaster into
- A container to mix the liquid plaster in
- A stirring stick

- A bucket of clean water to clean tools in

Figure out the amount of water and dry plaster you will need.

Measure out the volume of water you are going to need and place it in the mixing container.

Place an empty container onto the scale and turn it on. Make sure the scale reads zero with the container on it. Slowly add the dry plaster to the container on the scale and carefully watch the readout.

Weighing plaster

Take the plaster, and by the handful, carefully sprinkle it on top of the water. The reason for slowly spreading the plaster on the top of the water by the handful is as follows: The powdered plaster needs to soak in the water to ensure that it will activate properly. When dumped into the water in a great lump the plaster sinks to the bottom in large chunks. The large chunks act like flour and will be wet on the outside but have dry powder in the middle. This means the entire amount of plaster is not properly soaked.

A great amount of air is also carried to the bottom of the container with the plaster chunks. Air bubbles are a huge problem. When you pour the liquid mixture the air will be trapped in the plaster and when it cures you will have voids in the final product. Voids weaken the mold and ruin the finished product.

So slowly sprinkle a handful of the dry plaster on top of the water and let it sink before adding more.

Adding plaster to water

Do this until all the plaster is added to the water. Now lightly tap on the sides of the container and watch for air bubbles rising to the top.

Tapping air from mixing tub

When very few bubbles are rising let the mixture sit. Plaster can soak for up to thirty minutes. I usually let it soak for five minutes. Set the kitchen timer for five minutes. Five minutes is enough to let the plaster soak before mixing.

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Timer

When the timer rings, reset it for three minutes then begin mixing the plaster. Mix the same as you would do with paint. Try not to mix too vigorously as you are trying not to introduce air into the mixture. Mix well for two minutes then do the last minute by hand. I know it is messy and gets your hand dirty. Gently stir the mixture and gently release any trapped air.

Pouring Plaster

Now that your plaster is mixed it is time to pour. You only have a short window of time in which to pour the plaster before it starts to set up. This is called the working time. If you wait too long to begin pouring the plaster, it will begin to set up (harden) in the mixing tub. When plaster starts to set up it becomes like heavy cream. If this cream is poured into the mold you will probably not be successful in getting a good mold. The cream is too thick to get into all of the details of your prototype which means cavities will appear in the dried mold. Also it will be too thick to allow any air to be released from the mix and air bubbles will weaken the finished mold.

Pour the plaster into your prepared mold using the pouring ramp. By using the pouring ramp you avoid the plaster splashing as it enters the mold. If the plaster is poured straight into the mold a splashing action occurs which introduces air back into the liquid.

Slowly pour the liquid plaster down the ramp and let it fill the mold. When the mold is full to the desired depth remove the pouring ramp and agitate the mold. Be very careful if you are using a hot glue secured dam. Do not tap on the sides of the dam to release any air as this will break the seal and the plaster will be lost. Take hold of the mold backing and bang it gently up and down on the table. You will see some air rise to the surface of the plaster, this is what you want. You only need to do this for a minute or so.

Cleaning Tools

Now that your mold has been poured and the air released, do not forget to clean your tools. If the plaster is allowed to dry on the tools or in the mix bucket it is very difficult to get off. Most times you will have some small amount of plaster left in the mixing tub. Pour this into a plastic bag and put it in the garbage can.

Never dispose of plaster down the drain as it settles and hardens in the pipes. And I am sure you do not want a visit from the plumber as you will be putting his child through college. Have a bucket of clean water, preferably warm so your hands don't freeze. Use paper towel and wipe off as much of the plaster as you can and dispose of it in a garbage can. Then clean all the tools in the warm water. Let the plaster settle out of the water to the bottom of the bucket then gently pour off the clear water. Dispose of the rest in a plastic bag and rinse out the bucket.

Leave your newly poured mold in the dam to dry overnight before you start to work with it. Wet plaster is still very weak and is easily damaged.

Letting the Mold Sit

Once the plaster is poured into your mold it must be left to cure. If during the first hour of drying you carefully place your hand on top of the plaster you will find that it is warm to hot to the touch. This heat is part of the curing process that plaster goes through. The heat that builds up in the plaster as it cures is the reason you

should never try and cast a body part with plaster. You can give yourself serious burns trying that.

Do not disturb the mold when it is in the heat curing phase as it is very fragile. When the mold cools let it sit for a few more hours to let it get stronger before you attempt to remove it from the dam.

Removing Mold from Dam

When the mold has been drying for four to six hours it is strong enough to remove from the dam. The first thing you need to do is break the seal of hot glue around the bottom of the dam. This can be done with a screwdriver or a metal scraper. Place the scraper or screwdriver against the glue bead and work it slowly under the bead.

Breaking Glue bead seal

Do not push too hard or you will damage the plaster inside the dam. Slowly work the scraper along the glue bead following the outside contour of the dam. The glue bead should start to release from the backing. Once the glue bead seal has been broken all around dam the mold can be released from the backing.

Hold down the backing and gently pull on the side of the mold. The mold should release from the backing. If the mold does not release, apply more pressure. Only use enough pressure to get the mold to separate from the backing, too much may damage the mold.

Once the mold has been removed from the backing you can remove it from the dam. If you are using a reusable plastic dam, turn the mold upside down and gently bang around the edges until the mold comes free of the dam.

Removing mold from plastic dam

If you are using a one-time dam, such as a styrofoam cup or bowl, just peel off the dam and throw away.

Removing the Prototype from the Plaster

Now that the mold is free of the dam the next step is to get your prototype out of the mold. It is best to leave the prototype inside the mold and let the mold dry. You can dry the finished mold in a warm room or use a small heater to help it along. If you try to release the prototype from the mold too soon, there is a good chance that the mold or the prototype or both will be damaged.

This part of the procedure takes time and patience. If you rush it you can quickly destroy all of your hard work. The mold still has a lot of moisture in it and the moisture will keep the prototype and mold sealed together. Once the mold has dried for a while gently try and remove the prototype. This can be done by turning the mold over and gently tapping it against a piece

of plywood. It may take a few taps to get it to release. Do not keep tapping the mold against another surface until you damage it.

Another method is to use an air compressor. Put the mold on a hard backing like a table with the prototype facing upwards. Attach an air gun to the compressor hose; place your hand over the prototype. Aim the air gun at the gap between the mold and prototype. Use a quick puff of air from the air gun. If the prototype releases from the mold it will pop up slightly. Turn the mold upside down and gently tap it and the prototype should fall out.

Using air gun to remove prototype

If neither of these methods work, put the mold aside and let it dry some more before you attempt another removal.

Do not despair. They will eventually come apart. As I said before, this part takes some patience. I have found that the more complicated the mold, the more detail you have, the harder it is to get it to release from the mold. But be aware that no matter what you do, sometimes, for whatever reason, the units will not come apart. This may be due to an undercut that was missed, not enough sealing of the prototype, or maybe the gods were angry with you that day.

Slip Casting

The development of plaster molds and slip casting in Europe in the 18th and 19th century revolutionized the ceramic industry by allowing for the mass production of identical high quality forms.

Slip casting is the best and probably the simplest way to create glass casting molds from found objects or prototypes. We have to this point found the object of our innermost desires, cleaned it, sealed it, and poured the plaster, possibly screwed it up, threw it across the shop, sulked, vowed never to try anything so foolish again, and finally managed to create the mother mold from which we created our slip cast mold. You may want to keep your first few failures and mount them in a prominent place in your home and tell your friends they are modern art. Hopefully, they are more gullible than my friends, whose only response was a loud snort, but I digress. Now that we have a mold ready to slip cast we can begin the final few stages of making a reusable ceramic casting mold.

Slip is a liquid clay formulation which has a chemical added to it called **Deflocculant.** This chemical keeps the clay in suspension so it does not settle out and end up on the bottom of the bucket. Clay particles carry an electrical charge which causes them to act like magnets. Regular clay particles when added to water act like sheep and **Flock** together, which simply means they bind together and sink to the bottom in a large mass. This is why a **Deflocculant** chemical is added to the mixture to keep all of the clay particles suspended in the water. If you are planning on making huge amounts of molds, then you may want to mix your own slip; otherwise, it is easier to buy premixed slip from a pottery supply company. If you do wish to mix your own you can find formulas and instructions on the net.

The plaster mold will hereafter be referred to as the **Mother mold**, (cool language “EH”?). I once knew a lawyer and he taught me to sound smart, well, tried to anyway. Now the mother mold you created with such fanfare and sweat, not to mention X rated language, is the key to why slip casting works. Plaster is like a massive, ridged sponge filled with billions of evenly sized pores. When slip is poured into the mold the tiny pores

wick the water from the slip using a capillary action and transfer it to the outside of the mother mold. The mother mold will continue to draw water from the slip until the extra slip is drained from the mold.

As you watch the mother mold you will see a solid layer of clay building up around the edges. Once the desired thickness of clay is reached the excess slip can be poured off and used again. Because the pores in the plaster are much smaller than the clay particles the clay will not embed into them, but remain on the surface of the mother mold. The mother mold will continue to draw water from the clay and the clay begins to dry and shrink, releasing itself from the mother mold.

Now that what slip is and how it works is out of the way, I am hoping that you are still awake and did not break your nose if you fell asleep at the desk. I always used to fidget in my basic engineering classes in the Navy because I always wanted to get to the good stuff, you know, the sexy stuff to impress the girls with. But as in all of life if you know the basics you can usually figure out what went wrong if you run into a problem.

Preparing the Slip for Pouring

When you are ready to start pouring the slip there are some steps to take to prepare the slip for use. Even though you can get premixed slips from the pottery shops they are all different unless they are all from the same batch. Every time you get a bucket of slip it must be mixed as some of the clay will have settled. The majority is still in suspension but there will always be the malcontents in the bucket which insist on sitting on the bottom. To mix a bucket of slip you can use a simple paint stirring attachment that can fit on the end of your electric drill. If you plan on using a lot of slip, a ½" drill will do the job better than a smaller one, as a smaller one may burn out under the load.

½" drill with paint mixing attachment

Mix the slip thoroughly to ensure all of the clay is back in suspension. Now is the time you will need to test the **Speed** of the slip. Okay, about now you are trembling with childish anticipation and getting ready to just fill that mother mold sucker up with slip and watch it dry. Well there are a couple of more steps before you can do that.

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by Dan Jenkins

Mixing full bucket of slip

The **Speed** of the slip refers to how thin it is now. If I were to put my engineering hat on I would refer to this as its viscosity. A slip can be fast or slow, runny or thick. If a slip is too runny, it has more water in it which means the plaster will have to absorb more water to get the clay to the thickness you need. If the slip is too thick, that means there is less water in it and you will have trouble with a skin forming on the surface of the slip when in the mold. Runny is okay unless you notice that someone forgot to put any clay in the mix at which time you may want to find another supplier. What I use to test my slip is a stainless steel spatula from a restaurant supply house. It has a rectangular hole in the handle and I use this to time the slip. If you have ever mixed paint for cars you will recognize this as a crude sort of viscosity cup.

Slip speed tester

Testing speed of slip

Some people use their hands and time the slip running off the hand, this to me is an incredibly messy way to do it and slip tends to dry out my baby-like skin. Once the slip is mixed, dip the handle of the tool you have found with a hole in it into the slip, stir it around for a second then withdraw it. As soon as the tool is out of the slip you will need to start counting. I use one one thousand, two one thousand as a counting measure. Stop counting as soon as the hole is clear of slip. I like my slip to be between four one thousand and seven one thousand as this gives me a nice finished product.

If the slip is too slow, as it sits in the mold a skin will start to form on the surface of the slip similar to the skin you get in your half empty paint can. As you know that skin is messy and a pain in the butt. The skin on the slip is the same; when you empty the mold it will glob up and leave behind

chunks of clay on the inner surface of your mold. This will make the mold dry unevenly and make the recovered slip almost impossible to reuse.

If you find the speed to be below four one thousand on your timing it is not a big problem, this just means it will take a little longer for the correct thickness of clay to form on the side of the mother mold. It also means you will need to dry the mother mold a little longer before the next use. If the slip is above seven or eight one thousand on your count you can add a small amount of water to the mix and re-stir it and re-test. The amount of water you add to the mix is very small, about one ounce at a time. It does not take much to thin it out.

The next step before you pour slip into the mother mold is to strain it. Pour the mixed slip from one bucket to another clean bucket through a strainer; I use a stainless steel deep fry strainer (this is not a deep fry basket but a conical strainer for emptying the deep fryer) from the same restaurant supply house as the spatula. This straining will eliminate any chunks created by the mixing and give you a smooth slip to work with. Smooth debris-free slip is essential to the high quality of the finished product. Now after all of the rigmarole of mixing, timing and straining you are finally at the stage where you can pour the slip into the plaster mold.

Filling the Mold

Make sure the mother mold is on a level surface, or if the surface is not level make sure the mold is by using shims. Inspect the mother mold for dust or debris and also ensure the mother mold is dry. A plaster mother mold can be used several times before it needs to be dried, but if the plaster is too wet it takes longer for the slip to cure and you risk the possibility that the plaster will start to disintegrate and you will lose detail. I usually do a pour then clean the mother mold with a clean damp cloth and let it sit in a dry place for a day to let it air dry. This means the mother mold will be productive for quite a while.

I decant slip from the main bucket into a smaller container, such as a beer jug. The beer jug is a great container to use as it has a large handle and a built in spout. When you have the slip in the smaller container it is much easier to control the pour and not as hard on the back as trying to lift a 5 gallon bucket of mud.

Containers for decanting and pouring slip

Decanting slip from bucket to pouring jug

The next trick I learned from a friend who had taken her degree in fine arts and had worked with plaster in many forms. You need a good quality artist's paintbrush, one that no bristles will come out of. Pour a small amount of slip into the mother mold but do not fill it right up, take the brush and make sure the entire inside of the mold is coated in slip, leave no bare plaster showing, cover all of the details. This ensures the surface of the finished casting mold will be

flawless as you have made sure there are no voids or air bubbles present. Once the inside of the mother mold is coated then you can fill it up the rest of the way with slip. Make sure to fill the mother mold to the top to allow for the shrinkage of the slip as the water is removed by the plaster.

Painting slip onto mold details

All details covered

Finish filling mold with slip

Now that the mother mold is full of slip it is time to let it sit for a while. This is a good time to clean up your tools and jugs, etc. If you allow the slip to dry on the tools or jugs it becomes a lot harder job to clean up. It is pretty important for you to start each new pour with clean tools as any leftover dry residue of slip can be dislodged and end up as a hard chunk in your finished product effectively ruining it.

Keep a close eye on your mold and the thickness of the clay buildup around the edge. You may have to tilt the mold a little to see the buildup. Depending on the size of the mold the thickness you are looking for varies. If the mold is 12” by 12” you are going to want a good ¼” of wall thickness, if the mold is smaller you can get by with about 1/8” to 3/16”. The wall thickness provides strength to the finished casting or slumping mold.

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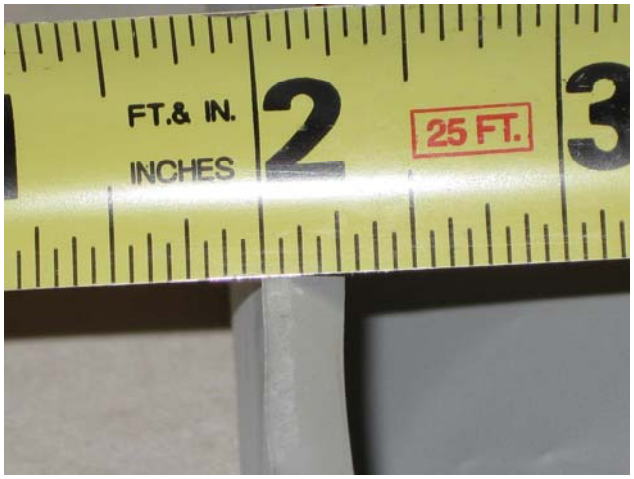
3/16" wall thickness for smaller molds



1/4 " wall thickness for larger molds

Be aware that as the clay dries it shrinks thus the final wall thickness will be less than when the clay was wet. When the desired wall thickness is reached you now must pour off the excess slip.

Draining the Mold

Set up a bucket with a strainer over it to receive the excess slip from the mold. When you pick up the mold be very careful as it is much heavier than when you first placed it on the table. Do not slop it over anything, especially not the dog. I dropped a not inconsiderable amount on poor old Mac, my Rough Collie, which entailed a bath, which in his world is akin to torture. The big sad eyes and hangdog looks haunted me for weeks. I am, evidently, a very bad man. Carefully pour off the excess slip into the bucket through the strainer, this will stop any surface film (remember the paint can) that might have formed and any small chunks of loose plaster from entering the slip supply.

Pour excess slip back into bucket through a strainer

Leave the mold over the bucket until the slip has stopped dripping from the mold, then return the mold to its level position.

Leave mold in strainer to drain until slip stops dripping

Now comes some more waiting. The plaster will continue to absorb water from the slip and as the slip dries it will shrink and will start to detach itself from the side of the mold. On the flat edge that surrounds the mold there will be a skim of

slip, you can remove this with a plastic putty knife. Be sure to keep the knife square to the mold edge as you clean the slip off. **Do not use a metal knife as it will dig big scratches in the soft plaster.** Cleaning this slip off will also leave a nice flat bottom to your piece.

Carefully trim off excess slip from mold edge

Removing Your Piece From the Mold

Keep an eye on the drying process and test the side wall of the slip to see how dry it is getting. The slip should feel leathery when it is ready to be taken from the mold. You can turn the mold upside down and gently tap the edge of the plaster against the tabletop. This method is not the best way to remove the dry slip from the mother mold as the plaster will chip, and there is a possibility the mold will break if you are a bit too forceful. If the mother mold does not break you will still have chipping which eventually destroys the mold. I use a small air compressor to pop the slip from the mold. A small compressor can be picked up at the local hardware or auto store fairly cheap as you do not need one with big tanks or lots of pressure. About 40 psi is all you will need to pop the slip loose.

To use the compressor to remove the slip you need to do the following: First plug in the compressor. This is vital as you look like a right twit when you complain to your friend that the stupid thing you just purchased does not work. The smug look on your ex-friend's face when he strolls over and slowly plugs it in will haunt you for years to come. Make sure that you have an air gun attachment to go on the end of the air hose. Next, place your hand over the top of the mold; this is to ensure that the dried slip does not fly out of the mold. Put the nozzle of the air gun close to the gap between the slip and the mold side, then give a short blast of air into the gap. This should pop the slip free from the mold. Then you can turn the mold upside down and the dry slip should come out easily.

Using the air method to remove the slip is quick and easy. If when you use the air blast and the slip does not release but the sidewalls bulge inward, it just means that the slip is not dry enough to be removed. Pat the slip back into shape then just let it dry some more.

You will find that the more detailed the mold the harder it is to get the slip out. The air blast really helps with this. It may take more than one blast but it will release from the mold. Make sure that the casting mold is dry enough to be able to stand up under its own weight. If it is not that dry, just leave it in the mother mold until it is dry enough to stand on its own. Now that the casting mold is out of the mother mold you must treat it gently as it is very fragile at this point. Place the damp casting mold, (at this stage it is now referred to as Greenware), on a flat board or surface where it can sit and dry for 3 to 4 days depending on the heat and humidity where you are. If the casting mold is still very damp you may want to place it face down on the board to let it dry as sometimes the center of the casting mold will settle under its own weight distorting the casting surface.

Cracking and Surface Imperfections and How to Fix Them

When you are checking the slip for dryness check the inside of the slip for cracks; the more detailed the mother mold the more chance there is of cracking. As the slip dries it shrinks and squeezes against the detail in the mold. Most times as it shrinks it will ride up over the detail

as it releases itself. Sometimes however the slip will catch and cracks will start to appear at some corners. If you start to see a crack do not panic as these can be repaired. As soon as the cracking is found try to remove the casting mold from the mother mold. With a blast of air it should release from the mother mold fairly easily. If at this time you figure that the casting mold is still too soft to stand up under its own weight, leave it in the mother mold until it dries enough to safely remove it. Once the casting mold has released from the mother mold it should be able to sit in the mother mold without further cracking.

When the casting mold is out of the mother mold turn it over and repair the crack with some liquid slip. An artist's paintbrush is really good for this application; just make sure the brush is small enough to fit into the area to be repaired. Dip the brush into the liquid slip and fill the crack with it, as the slip in the casting mold is not totally dry it is easy to smooth and work the surface. Be gentle, as the casting mold is very fragile and easily crushed.

Earlier in the article I mentioned that painting the inside of the mother mold with slip will help eliminate surface imperfections on the casting mold. Pouring slip into the mold without taking the time to paint the mold interior first leaves a high probability you will end up with voids in the surface of the finished piece. Now if you forget to paint the inside of the mold and you do end up with some small voids do not panic or throw the piece against the nearest wall or your partner. This makes the piece unusable and your life expectancy may be reduced considerably. These voids or imperfections can be repaired with liquid slip, a wet brush or smoothed with a wet finger.

Some Molds Always Crack

I have found that some of the molds I made usually crack in certain places. This I found is because there is a lot of detail in that area and also some sharp corners. This does not mean the mother mold is no good, it just means you need to treat it a bit differently than the others. If you have a mold that cracks there are several things you can do. The first thing to do is remove the casting mold from the mother mold when the slip is not totally leathery. This usually gets the casting mold out before the cracking starts. The slip must be dry enough to be able to stand up under its own weight.

When the casting mold is out, treat it very carefully and check for problems on the surface. Place the casting mold face down on a flat surface. This will ensure the top of the mold does not settle under its own weight. Keep an eye on the drying facedown casting mold as you may need to reshape the sidewalls before they dry totally. The other thing you can do is gently sand down the offending corner in your mother mold to ease the sharp edge. Be very careful with this fix as it is very easy to go too far and ruin the mother mold.

Drying the Greenware Casting and Slumping Molds

Clay that has not been fired in a kiln is called greenware. Greenware is very delicate and it is easy to crush a mold with very little pressure. If any repairs have to be done do it at this stage but, again, be gentle. Put the greenware on a shelf and allow it to dry for up to 5 days, depending on the conditions of your drying area. Drying times are affected by temperature, humidity and airflow. You will have to determine the best times for drying in your particular area.

When the greenware is dry it is fired in a kiln and becomes bisque. Before it is fired, one final step is needed. Check over each dry casting or slumping mold for any imperfection, rough edges, or bumps that have appeared during the drying phase. If there are any problems use fine sandpaper and smooth out the molds and just generally clean them up. You still must be very careful of the molds at this point because although they are dry they are still very delicate. It is only once they have been bisque fired are they strong enough to handle freely.

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by Dan Jenkins

Cleaning Up the Tools and Mother Mold

It is important that you clean up all of the tools you have used before the slip can dry on them. Once the slip dries on the surface of a tool it becomes much harder to clean. The best way I have found to clean the tools is done in several steps. There is probably going to be a good thickness of slip adhering to the inside of your pouring jug, you do not want to waste this. To recover the slip, hold the jug over the strainer in the large slip bucket, and using your hand, scrape out the slip from the jug into the bucket. There will still be some slip adhering to the inside of the jug so wipe this out with paper towel and dispose of it in a garbage can.

Fill a bucket with clean water, warm it up a bit or your hands will freeze during the next step. Immerse the jug in the bucket and wash clean and set aside to dry. Now take all of the other tools you have used and wipe them down with paper towel and dispose of this in the garbage can. Wash these tools in the bucket of water and set aside to dry. Once all of the tools are clean let the bucket of dirty water sit until the majority of the clay settles to the bottom. The clay will mostly settle out as it is now too diluted for the deflocculant to work effectively. When the clay has settled to the bottom of the bucket gently pour off the water, taking care not to disturb the clay on the bottom too much. Once you have removed as much water as you can this way pour the rest of the water and clay into the garbage can. Wipe out the bucket and set aside to dry.

Never dump liquid clay down your drains as it will settle in your sink traps and build up in your pipes and cause a very nasty expensive clog. It is also not good for your septic field.

Mother Mold Care

When the tools are clean the last thing to do is gently wipe out the mother mold with a clean damp cloth. Ensure you remove as much of the residual clay in the mold as possible. Be very gentle with the mother mold because when the plaster is wet it is very soft and easily damaged. Wiping too hard or with a rough cloth or paper towel will remove some of the detail and greatly reduce the useful life of the mother mold. I like to let the mother mold dry for a day between pours. If the room is warm and dry, a day is more than enough to remove the water; if the room is cold it may take a little longer to dry the mold. A fan on low blowing air across the molds also will speed up the drying process. You will have to figure out the best method for your area as drying time is affected by temperature, airflow and humidity.

The following Firing Schedule is for Bisque Firing your greenware:

Segment	Ramp	Temperature	Hold
1	200 dph	1100F	0
2	400 dph	1900F	10 min

Mold Making with Latex

Using Liquid Latex

Liquid latex is an easy substance to use for reproducing a found object. The advantages of latex in making molds are that it is very elastic and can be removed from a found object easily. It is extremely tough, very flexible, and resistant to tearing. There is a downside to it however, and that is that because of its elasticity, the mold is weak. This means without proper backing the mold will deform under the weight of the casting material poured into it.

Getting Started

Liquid latex can be purchased through most pottery supply dealers and is relatively inexpensive. A little liquid latex goes a long way.

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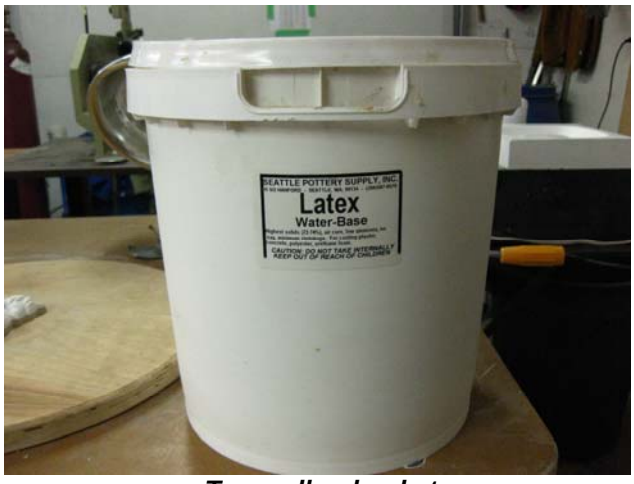

Two gallon bucket

A good place to start is to choose a prototype from which to make a mold. There are many suitable materials which lend themselves to mold making in latex. Latex dries in the air and does not generate heat while setting so it does not ruin your prototype. The porosity of the prototype is a factor, in that a porous material will wick moisture from the latex. While that aids in the drying of the latex, it also means that the prototype may be stained a light beige color. If in the case of a plaster prototype you have made yourself, the staining may not matter to you. If you are concerned about the staining of a prototype then you should seal it before applying any latex.

The first step in making a mold using latex is to consider the found object you wish to mold. You do this the same way as you would for a plaster mold. There can be no undercuts. While the latex is flexible enough to be removed from an object with undercuts, the casting you end up with will not work for open face glass casting.

Find a suitable backing material, glass, smooth plywood or a piece of old countertop will do. Place your prototype on the backing and make sure there is at least three inches of clearance on all sides. The three inch clearance is needed so you can add a flange to the latex mold. The flange will make the mold easier to handle when it is dry.

Clearance needed for flange on mold

Now that you have found a suitable backing material it is time to fix the prototype to the backing. The prototype needs to be fixed to the backing for several reasons that I have found. Number one reason is to hold the prototype in place. Number two is so no latex leaks under it. Any leakage of latex under the prototype will leave a flange around the inside edge of the finished mold and ruin any casting poured into it.

Mounting the Prototype to the Backing

Place the wide piece of clay onto the nonporous backing, and then place your prototype on top of the clay. Gently press the prototype into the clay using the palm of your hand. Be very gentle and apply an even pressure as it is very easy to break a thin piece of plaster. You only need to make sure that the prototype will stick to the clay and not move around when you start to work on it.

Now that the prototype is fixed to the clay it is time to seal the edges to ensure no liquid plaster can leak under it during the pour. Take your clay tool and gently start to push the clay towards the sides of the prototype. Be careful not to push too hard as the prototype is only gently stuck to the clay. Go all around the outside and also do any inside details present.

Gently push clay towards sides

When you have completed this task it is time to remove the excess clay. Peel any large amounts of clay away first.

Prototype ready for trimming

Now you need to use an Xacto knife or other sharp object to finish the trim job. When cutting the clay around the edges, make sure not to create any undercuts. Try to slope the clay gently out from the side of the prototype. This prevents undercuts and also creates more space for the frit.

Use knife to trim clay

Applying the Latex

Once the trimming is complete it is finally time to start applying the latex. A word of caution here, latex is sticky stuff; you may want to wear gloves to keep it off of your hands. Latex is also just about impossible to remove from clothing so wear old stuff or maybe an apron.

Do not, repeat, do not borrow the one from the kitchen and then try and sneak it back. I am usually pretty good at digging myself out of trouble but this time words failed me. They did not, however, fail the chief cook. But you, I can sense by the wandering attention, are not interested in my troubles. So back to the subject.

To apply the liquid latex you will need a soft paintbrush made for water-based paints. The brush should be of good quality as you do not want bristles from the brush ending up in the latex.
The first coat should be applied thinly, and make sure it is even and smooth all over. This is the layer that will form the inside of the mold so it must be ultrasmooth.

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Applying the first coat of latex

When you apply the first coat make sure that you add a three to four inch flange around the outside. This flange will aid in the removal and handling of the finished mold. The flange also provides a lip for the support backing that will be added later. After each coat the brush should be cleaned in warm water or wrapped in a plastic bag. The plastic bag will keep the latex on the brush moist so you can use the brush again. Even when the brushes are cleaned, a small amount of latex will always stick. This builds up over time and you begin to get small balls of dry latex appearing in your coatings. When that happens chuck the brush and get a new one.

This is where the tedious part of the plan starts. Each layer must be allowed to dry about one hour before the next layer is applied. Latex air dries like paint, so if you put it on too thick the underlying latex will stay wet, Add a strip of masking tape to the backing board so you can record the number of layers you apply.

Mark tape each time a new layer is applied

Preparing for Support Backing

When you have the first one or two layers down it is time to figure out what kind of support backing you want. At the start of the article I mentioned that latex is strong but that its elasticity makes it weak. The finished mold will not tear but will deform when anything is poured into it.

To make the mold usable you need to add an extra backing which must be flexible enough to be removable. If the backing is not flexible enough then you will not be able to get the dried casting out of the mold. There are probably as many types of backings as there are people with opinions. I will only mention two types which I have had personal success with.

Backing Method One

The first type is easy to use on small castings; it is also edible in times of famine or flood. Tree huggers will love this one. I am going to keep you in suspense so you will have to read on to find out what I am talking about.

To prepare the mold for the first type of backing you will need to start to strengthen the mold after about five or six coats of latex. You will need a roll of gauze cut into small strips; these will be used like fiberglass. Lay the strips on the backing board and, using your brush saturate

them with latex. When the strip is soaked apply it to the mold, making sure that it sticks then smooth it out over the surface. Make sure that all of the details, dips and curves are covered. If you leave a hollow space the mold may distort into it when it is filled with plaster.

Soak gauze with latex before applying

This procedure is not as easy as it sounds as latex is really sticky stuff. So it may take a bit of patience on your part to get it right. Remember to let each layer dry for at least an hour before applying the next one. Do not, however let the mold sit for more than 24 hours before applying another coat. If the latex is left to dry for over 24 hours a subsequent coat may not stick.

For very small molds you may only need a couple of layers of gauze, for bigger ones as many as four. Do not apply too many layers of gauze as you do not want to make the mold so stiff that it no longer bends. After the layers of gauze are applied, put on more layers of just straight latex. Altogether you will need about fifteen coats. Make sure to record each coat on the tape on your backing board.

When the final coat of latex is dry you can remove the mold from the backing board. Start by dusting the outside of the mold with a very light coat of talcum powder. Latex will not stick to anything but itself, and it sticks really well to itself, believe me. If it does stick to itself you may end up tearing the mold to get it apart.

Removing mold from backing board

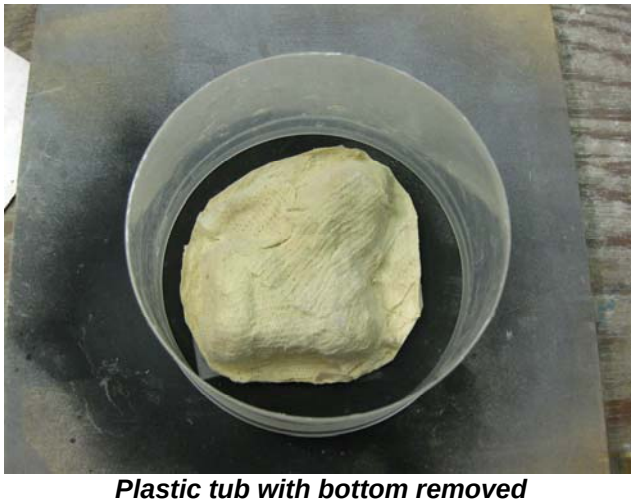
Mold removed, notice the large flange

Now that the mold has been removed from the backing you can cut down the flange to a manageable size.

Back of mold with gauze backing

Once the flange has been cut down it is time to construct the backing. It is essential to support the mold with some type of backing or it can distort when the casting material is poured into it.

Find a suitable sized container. I like to use old plastic food tubs; they are cheap, light and easy to cut down. Place the empty mold face down on a backing board that is larger than the mold. The backing board should not be so heavy that you cannot pick it up. Place the cut down plastic container over top of the mold. Now is the time to reveal to you the green solution to backing material. Are you ready for this? It's rice. Yep, plain old rice, white, brown or whatever color tickles your fancy.



Plastic tub with bottom removed

Now that the mold is on the backing board and the plastic dam is in place it is time to fill the dam with rice. With this type of dam you do not glue it to the backing board or you will not be able to access the mold to pour the casting material.

Gently pour the rice into the container

Gently pour the rice into the container. When it is full, gently level off the rice so it is level with the top of the container. Now you need to place a second board on top of the container.

Second backing board placed on top of filled container

Now holding the two backing boards tightly together flip the whole assembly over and rest it back on the table.

Container flipped over

Remove the top board and the mold is ready to pour.

Mold resting on rice backing

You can now go ahead and pour your casting material into the mold without fear of the mold distorting under the weight. The nice thing about this type of backing is that it can be reused and when stored it does not take up much space. The one downside is that you pretty well have to redo the backing after every pour. So it is not really efficient for volume or production pours. This type of latex mold should be stored with a casting inside it to ensure the mold retains its shape.

Backing Method Two

The second method is for use with larger molds or small molds you plan on pouring repeatedly. This method involves using a plaster backing. The plaster backing takes longer to make, is heavier than rice, and takes up more storage space. On the other hand it is stronger, so it can take larger volumes of casting material and it does not need to be rebuilt after every casting pour.

With the plaster backing method, the latex mold needs to have at least 20 to 25 coats of latex. The gauze backing that was applied to the mold in the first method is not needed as the plaster will provide all the strength needed.

Twenty coats of latex with no gauze added

The placing of the prototype on the backing board and the application of the latex is exactly the same as with the first method. The only difference is the gauze reinforcement is not required. When the latex is of adequate thickness it is time to make the plaster backing. Do not remove the latex mold from the backing board leave it firmly attached. Mix up a batch of plaster as per the instructions in the Plaster Mixing and Pouring section. You will need a fair amount of plaster as the entire mold must be covered. This method does not require that a dam be built to contain the plaster.

Once the plaster is mixed let it sit for a few minutes until it is the consistency of heavy

cream. The plaster should not be runny but should still be workable. When the plaster is ready start placing it on top of the mold.

Placing thickened plaster on top of mold

Make sure that the entire mold is covered with plaster and fairly thick for strength. Smooth the outside of the wet plaster with your hand. Before the plaster dries, place a flat board on top of the plaster and using a level make a base for the backing to sit on when it is flipped over.

Leveling the plaster to make a base

Once the base of the plaster is level, let it dry for at least four hours. This will ensure the backing is strong enough to be removed without damaging it.

Removing the plaster backing

To remove the plaster backing from the mold, firmly anchor the mold backing board to the table with one hand. Take your free hand and grip the edge of the plaster and pull towards you. The plaster backing should come away quite easily as the plaster will not stick to the latex.

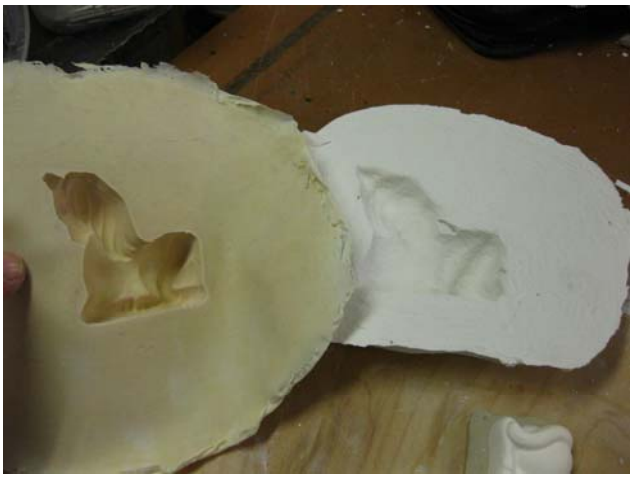
Set the plaster backing aside and let it dry for a day or two to ensure maximum strength. Clean up any plaster residue that is left on the latex mold, and then sprinkle lightly with talcum powder. Remember latex sticks very well to itself. Remove the latex mold from the backing board.

Removing latex mold from backing board

Leave the casting inside the latex mold and gently place the mold into the plaster backing. This will tell you if you have a good fit. When you

are satisfied with the fit you can remove the casting from the latex mold.

Latex mold sitting in plaster backing



Latex mold and plaster backing separate

Your mold is now ready for multiple castings. Store this type of latex mold in the backing with a casting set inside the latex. This ensures the mold does not distort and maintains it's shape.

Making Larger Molds

All of the previous sections dealt with making small-sized molds. This section is going to involve making a mold of much larger proportions. The object I will attempt to amaze and astound you with is, wait for it, a bowl from the dollar store.

Incredibly expensive bowl from the Dollar store

You can buy bowl molds from various distributors but they are pretty much all the same no matter who sells them. Most of the bowl, plate, or platter molds sold today are basically ceramic castings with no glazing. They were never designed to be used as glass molds, and you can tell this by looking at them because they look just like a bowl you would find in your kitchen.

Looks like your table ware

Every now and then you will be cruising through the discount store and an odd, or unique-shaped bowl or plate will catch your eye. You say, wow I would like to make that out of green glass or red if you are an action person, the big problem you now have is:

- no one sells a mold shaped like that.
- if they did it would not be odd or unique
- you can not use the one from the store as is, because they only have one and it is in the ugliest colors known to the mind of man.

But of course you went ahead and bought the item anyway. You did this because you thought, one day I may be able to make one for myself and, do it in a color that will not offend the delicate sensibilities of 90% of the human population.

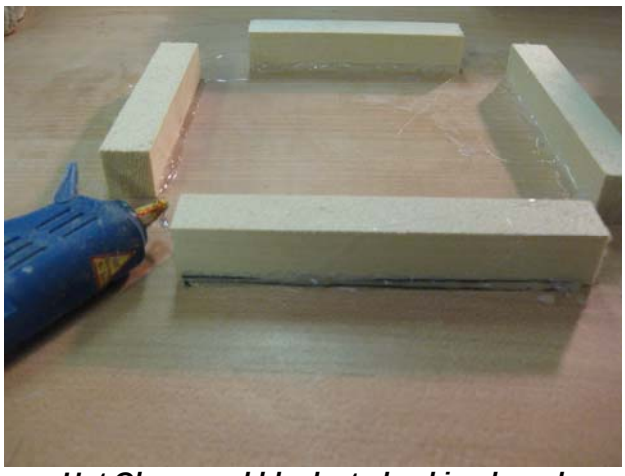
It is now time to blow the dust off of some of these impulse buys and see if you can make your wish come true.

The first thing you need to do is inspect the item to make sure that it is actually feasible for a piece of glass to form into that shape. Some bowls may be too deep and when the glass is slumped into them you will loose all the edge detail. Some may be of a shape that is impracticable to reproduce in glass.

Now that you have decided which ones you think will work, get started. A nonporous backing board is the first item you will need. Make sure the board is big enough to hold the mold with about six inches of clearance on all sides.

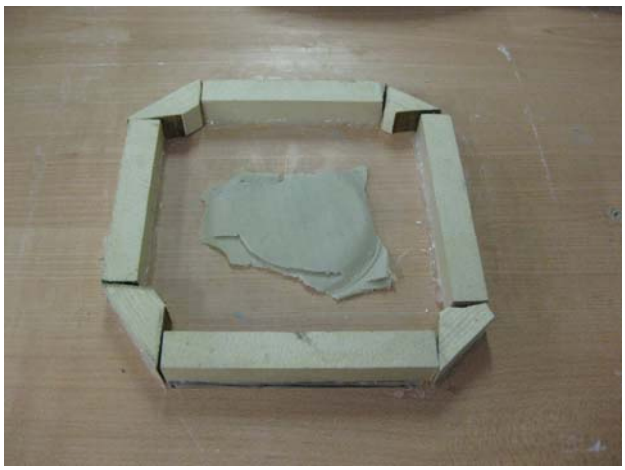
To make a mold from the dish the next step is mount it to the backing board so it will not move. The bottom of the bowl is of no use in the mold making process and must be closed in, all you are interested in is the inside details.

Measure the bowl and determine how high it is. You will want your mold to be slightly higher to allow for the shrinkage that will occur when the bowl is finally cast in slip. Cut some small wooden blocks which will form the base of the mold. Measure out the outline of a base for the bowl to sit in. Mount the wooden blocks to the backing board with hot glue



Hot Glue wood blocks to backing board

Add some non-hardening clay in the center of the blocks and fill the corners with small pieces of wood.



Corners filled, clay in the center

The clay in the center will help securely anchor and level the bowl.

Level the bowl

Now start to fill in the space under the bowl with clay.

Filling under the bowl with clay

Fill in all of the space under the dish with clay. This provides the base for the final layer of finishing clay.

Final clay layer added

When the space under the dish is filled it is now time to put the final layer of clay on the outside. Using the clay roller roll long pieces of clay and cut them into strips. Fit the strips around the outside of the dish, slowly building up a smooth final layer. The final layer of clay should slope slightly outward to give the mold a good stable base. The sloped outside also makes it easier to release the dish from the final mold.

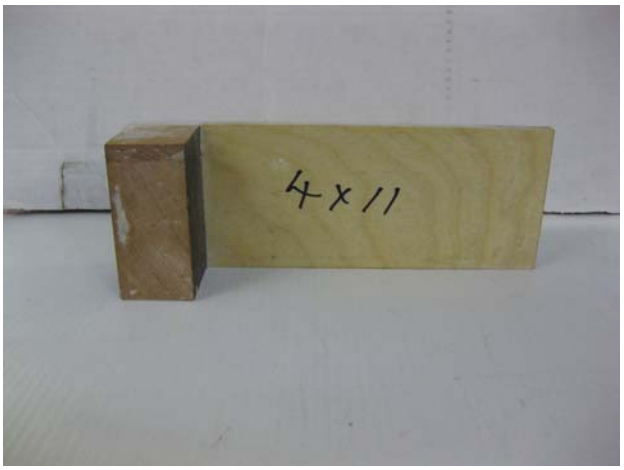
Finished prototype mold

Try to get the clay around the outside as smooth as possible. You will not be able to get it glass smooth, but do not worry. When the prototype has been cast in plaster you will be able to sand and smooth the plaster much easier than the clay. You may want to apply some mold release agent to the prototype, but in this case, because the plaster will not stick to the clay and the bowl

is sealed with glaze, it is really not required. Each mold must be evaluated on its makeup to see if a release agent is required.

Now that the prototype mold is ready, you can proceed with the preparations for molding in plaster. To pour a mold of this size you need to create a large removable dam. The small plastic and styrofoam dams work well with the smaller molds but are not sturdy enough for the bigger ones. Something else is needed, and that is what is referred to as a COTTLE. Do not ask me why because I have no idea. Somewhere back in the Old World they thought this was a good name. Who am I to argue?

I am going to refer to them from now on as mold boards. Mold boards are used to form the outside shape of the mold. They can be made in any size you need and you will need at least four of each size. The boards can be made from ¾" marine plywood or standard plywood. All surfaces of the wood should be sealed to make them waterproof. There are many different styles of mold boards and many ways to hold them together. The one shape I have had most success with work with standard C clamps available at any hardware store. The boards are cut to whatever size you think you need and a 2" by 2" block of wood is glued and screwed at one end. The blocks must be placed so the boards stand perfectly upright and so that the end of the board is perfectly flush with the 2" by 2" block.



Mold Board four inches by eleven inches


Clamps for mold boards

The mold boards will be clamped together to make the outside shape of the mold.

Mold Board with two inch by two inch block


Mold boards clamped to form outside of mold

The prototype is mounted on the backing board and it is time to enclose it with the mold boards. Make sure there is at least one and a half inches of clearance between the prototype and the mold boards. This clearance allows enough plaster thickness to work with the slip, but keeps the weight of the final slipcast mold down.

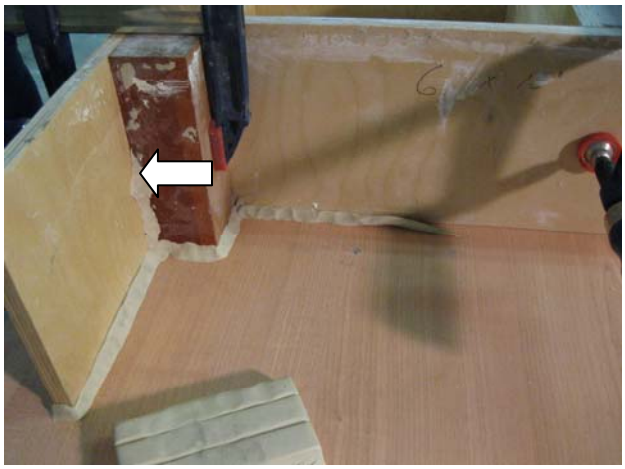
The larger the prototype the larger the plaster slipcast mold will be. You need to allow for the fact that the plaster slipcast mold is going to be filled with liquid slip. The combined weight of the plaster mold and liquid slip can make it very hard to lift the mold to empty it. Remember that water weighs about 12 lbs a gallon, liquid slip will weigh quite a bit more.

Place the mold boards around the prototype and ensure you have the clearance you want. Clamp the mold boards tightly together. Put the clamps as close to the bottom of the mold boards as your clamps will allow. The greatest amount of pressure from the liquid plaster in the mold will be at the bottom of the boards. When you have the clamps good and tight take a soft hammer and tap around the top edge of the mold boards to ensure they are firmly seated on the backing board.

Mold boards clamped and prototype centered

The next step is to seal the mold boards to the backing board. The sealing is done with nonhardening clay. Hot glue might work (I have never tried it) but I would not trust the glue with the amount of pressure the plaster would put on it.

Take the clay and roll it into strips and apply all along the bottom outside perimeter of the mold boards. Take your time and do a good job because, if your seal is not tight, you will have a lot of liquid plaster leaking out all your shoes.



Seal mold boards with clay around entire perimeter.

Seal mold boards with clay around entire perimeter. When you are using the clay to seal the mold boards make sure it is pressed in tight. Also, seal the seam where the clamping block and second mold board meet (see arrow). Clay at this seam must be at least as high as the level of plaster inside the mold. When you first start sealing the bottom of the mold boards keep an eye on your inside clearances. The pressure of you pushing clay on the first side will tend to move the mold boards. So check on the inside clearances while you seal.

You are now ready to mix and pour your plaster. Measure the inside dimensions of the mold. Using the formula in the Plaster Mixing and Pouring section determine the amount of plaster you will need to fill your mold. It is important to remember that the mold does not have to be filled to the top of the mold boards. A good one and a half inches to two inches above the top of the prototype is enough plaster to make the mold strong and allow the slip to work. Plaster is heavy, so remember, it is a balance between strength and weight. Too heavy and you will not

be able to pick up the mold when it is full of liquid slip.

I know I have said this before, but the first few large molds I made ended up being two-person lifts. Okay if you have lots of friends but not so good when you are on your own. We are told that all true artists must suffer for their art, but slipping a disk is a little too much to ask.

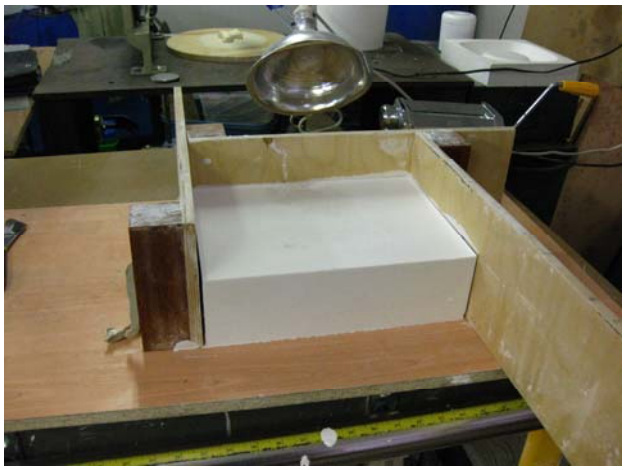
Pour the plaster into the mold using a pour ramp.

Pour ramp used to fill mold

When the mold is full of plaster, tap on the outside of the mold boards with a soft hammer to release any trapped air. You can also gently bang the backing board against the table. Be careful not to bang too hard or the liquid plaster will splash and pick up more air. Watch the bottom of the mold boards for any seepage of plaster. There usually will be a bit here and there. Not a panic. Just place a piece of paper towel over the seep and that will seal it. The seepage will only last until the plaster starts to set up.

Plaster seepage

Let the plaster set up until it is past its heat cycle. The longer you can stand to leave the mold alone the better. When the plaster is very wet it is also very weak. The next step is to remove the mold boards from around the mold. Strip all of the clay off. Be careful to clean off any plaster that has stuck to the clay. The clay is reusable but if there are too many dry plaster bits embedded in it the clay rapidly becomes unusable.



Removing mold boards

When the mold boards are fully removed, gently release the plaster block from the backing board. Some prototypes will fall out of the mold at this stage, but not many. Put the mold aside to dry and do not attempt to remove the prototype until the plaster has been allowed to dry. A mold this size will take a few days to dry in warm air, but if you have a fan the drying can

be speeded up. The moisture in the wet plaster sets up a very strong suction on the surface of the prototype. So if you attempt to force the prototype and the mold apart too soon you will damage both pieces.

Finished mold with prototype removed

You can now use this mold to slip cast a slumping mold.

Plaster Mixing Ratios

The chart below lists the amounts of water and dry plaster required for commonly mixed volumes of plaster. The consistencies are calculated using a ratio of 66 pounds (29.9 kg) of water to 100 pounds (45.4 kg) of plaster

WATER Quarts (Liters)	PLASTER Lbs (Kg)	VOLUME Cu In (Liters)
0.5 (0.47)	1.5 (0.68)	40 (0.66)
1 (0.95)	3 (1.4)	80 (1.3)
2 (1.9)	6 (2.7)	160 (1.6)
3 (2.9)	9 (4.1)	240 (3.9)
4 (3.8)	12 (5.4)	320 (5.2)
5 (4.8)	15 (6.8)	400 (6.6)
6 (5.7)	18 (8.2)	480 (7.8)
7 (6.6)	21 (9.5)	560 (9.2)
8 (7.6)	24 (10.9)	640 (10.5)
9 (8.5)	27 (12.3)	720 (11.8)
10 (9.5)	30 (13.6)	800 (13.1)