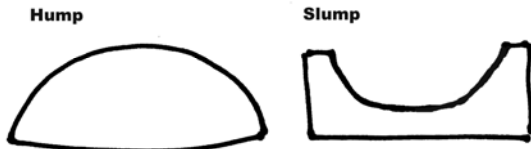


PLASTER MIXING AND MOLDS

As pottery slip-caster Andrew Martin points out:

Plaster comes from gypsum, a naturally occurring mineral. It is mined, ground, calcined (heated) and processed to perform in a vast array of applications, from pottery to the medical and construction fields.

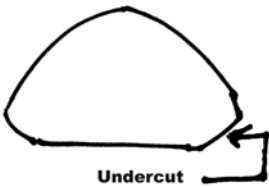
Plaster makes a detailed rendition of whatever it is poured into, onto, or around. Because plaster is absorbent, plaster molds speed drying time of wet clay pieces. They may be used for slip casting shapes, press-molding, hump (molding on top of a convex form) or slump (molding inside a concave form) molding.



Using a plaster slump or hump mold, you can quickly make a number of identical forms to which you can then add parts (handles, spouts, lids, feet, sculptural additions) to research design ideas. Having multiples of the same form allows for exploration of detail decisions with a basis for comparison of the design impact of those choices on the finished works.

Slump molds offer the advantage of the clay shrinking into the hollow part of the mold as it dries. The down side is that you cannot add feet, etc. until the form is stiff enough to support itself outside the mold.

Clay on a hump mold will begin to dry and shrink. If the clay is not removed before advanced shrinkage happens, the clay may split from trying to shrink around an inflexible mold. The advantage of hump molds is that you may add feet and appendages to soft clay while the piece is still on the mold.



Choice of a form to mold is very important. Your selected item must not have any undercuts, or the clay will not release from the form.

Items with specific shape content of their own may be visually “filled” and not leave you many options for personal exploration (e.g. a dish in the form of a fish).

Students will be paying for plaster at the bookstore in the same method clay is purchased.

Once you pay, give the receipt to one of the clay monitors.

Dry, powdered plaster comes in a number of forms, the finished results varying in hardness and absorbency. Plaster of Paris is too soft to be useful for our purposes. **U.S. Gypsum No. 1 Pottery Plaster** or **Molding Plaster** are often used for slip casting mold making because of its strength and appropriate porosity. Both are mixed 100 parts of plaster by weight to 70 parts water by weight. Other types of plaster may require different ratios.

The powdered plaster is mixed w/water according to directions. It sets up quickly, so the mold you are making or form you are coating with plaster should be prepared beforehand. Please work carefully in the designated plaster area. **Plaster contamination in clay or glaze materials causes serious problems with calcium spit-outs or other defects. Plaster poured down drains can cause severe drain blocks. Clean up after working.** Have a stand-buck of water waiting to clean hands, tools, and buckets. Dry plaster can be put in the trash. Clay used for plaster work (puttying molds, etc.) should not be used for firing purposes later, nor recycled with class clay.

Plaster is mixed by weight, the ratio for No. 1 Pottery Plaster in parts by weight is 100 parts plaster to 70 parts water. The more plaster used per weight of water, the faster it sets, and the harder and less absorbent the product becomes. To determine the appropriate amounts of water and plaster, see below.

1. Determine the approximate volume of plaster needed.

rectangles	Volume = length x width x height
cylinders	Volume = $\pi \times \text{radius}^2 \times \text{height}$ (π (pi) = 3.14)

Use inches as your measurement. Your volume will be in cubic inches. It is a good idea to mix 10%-20% more plaster to allow for spills, leaks, etc.

For casing a Styrofoam form in plaster, try approximating the volume of plaster by calculating the area (length x width) x .5 inches in thickness (height) = cubic inches. For a domed form, this will not be entirely accurate, as it has more area than a flat form.

One quart of water weighs 2 pounds. A quart of water plus 2.85 lbs. of plaster = about 80 cubic inches of mixed plaster.

$$\frac{\text{cu.in. of plaster needed}}{80} = \text{no. quarts of } H_2O \text{ required}$$

Add the appropriate amount of plaster (2.85 pounds of plaster per quart (2 pounds) of water.

Example of calculating the amount of plaster for 2 quarts of water:

$$\frac{100 \text{ ratio wt. plaster}}{70 \text{ ratio wt. water}} = \frac{X \text{ wt. of plaster}}{2 \text{ lb. } H_2O}$$

$$X = \frac{100 \times 2}{70}$$

X = 2.85 lbs. Plaster is needed for 2 lbs. (1 quart) water

OR you can refer to the chart at the end of this handout.

2. Prepare the proper amount of plaster and water to be mixed

Cold water will give increased expansion (possibly making mold removal difficult) and slower setting time. Do not use water below 65°F. Warm water will give less expansion and faster setting. About 70° is ideal, although you can use water up to about 100° without problems.

All mixing equipment should be clean. Bits of plaster on your equipment can cause premature setting around those lumps.

3. Prepare your molds or forms. Make molds on a level, smooth surface (Formica, marble, glass, linoleum). To pour plaster into a mold or over a removable form you must "size" the mold with mold soap (available from Ceramics suppliers) or several layers of a water-soluble release like Murphy's Oil Soap (actually water-soluble) or Palmolive dish liquid. Porous items should be sized several times. Do not size too far in advance, as the effect may be lost over time. Plaster releases well from leather-hard clay and does not need a release agent. Using an oil-based release like Vaseline will release, but the oils can block the mold pores and decrease absorbency of the mold.

If you are casing a Styrofoam form, find some supports to elevate your form that do not extend beyond the edge of the form, for example, soft drink cans.

Before you begin mixing, arrange your containers for clean-up, molds or forms, and a container or cardboard box to dispose of excess plaster before it hardens in your bucket.

BEFORE mixing, please note: cottle boards to hold in plaster for making a mold over a removable form may be made from wood, linoleum (heat before bending into a cylinder), tar paper, clay, plastic, etc. The cottle must be able to hold the WEIGHT of the plaster, or be reinforced. All seams should be puttied in with soft clay. Cottles may be held together w/large elastic mold bands, clamps, etc.

If you are casing a Styrofoam form with plaster, put plaster or several layers of newspaper down to make clean-up of run-off plaster easier.

4. Gently sift plaster onto the water, allowing it to float on the surface, soak up water, and settle (if done too quickly it sinks and forms lumps).



Everson Museum of Art

Richard Notkin, slipcast
"Cube Skull Teapot"

5. Let the plaster soak 2 or 3 minutes after all is added to the water. Generally, it is a good idea to begin mixing not longer than 5 min. from when you began to sift.

6. Mix by hand for 3-5 minutes or with a drill paddle for 1-2½ minutes. Andrew Martin recommends mixing with a drill for several minutes and doing the last minute by hand. The plaster should begin to set, and you will be able to see a faint trail if you drag your finger across the surface of the plaster. Tap the bucket several times to bring trapped bubbles of air to the surface. Plaster is setting and ready to pour.

7. Pour plaster slowly into your mold to avoid air bubbles or splashing. Tap the container or jiggle the table gently to release bubbles. Pour excess plaster into a trash bag, onto newspaper, etc. and quickly rinse the bucket in the clean-up water bucket. Pouring too early will allow the water in the plaster to degrade the mold soap and may cause release problems. Pouring too late may result in uneven plaster pours because the plaster is too thick. If you are casing a Styrofoam form, pour plaster over the top of your form evenly, then tap the form supports gently on the table to level and plaster.

Plaster heats as it sets, and reaches maximum expansion in about 20 minutes, then contracts slightly. It is a good idea, according to Richard Notkin, to wait at least an hour before taking molds apart.

8. Clean up the mold. Use a metal rib or Sur-form to round sharp edges that may flake plaster into your work.

9. Dry your mold before using. *Do not exceed 120° while drying,* or the mold will become soft and chalky, and it will crumble easily.

References:

Frith, Donald, *Mold Making for Ceramics*

Martin, Andrew, *The Essential Guide to Mold Making & Slip Casting*

Peterson, Susan, *The Craft and Art of Clay*, pp. 87-97

An internet search on “plaster mixing” may give you further information.

PLASTER MIXING AND SETTING SCHEDULE							
Step description	Add plaster	Soak	Mix	Liquid	Thixotropic	Plastic	Done
Time per step	1 minute	3	3	3	2	3	0
Total time elapsed	1 minute	4	7	10	12	15	15

Table from Andrew Martin			
WATER (quarts)	PLASTER Wt. (70)	PLASTER Wt. (66)	VOLUME CREATED (cu. in.)
0.5	1.40	1.5	40
1	2.85	3	80
2	5.70	6	160
3	8.55	9	240
4	11.40	12	320
5	14.25	15	400
6	17.10	18	480
7	19.95	21	560
8	22.80	24	640
9	25.65	27	720
10	28.50	30	800

Liquid	plaster flows like heavy cream
Thixotropic	plaster stands on its own but returns to liquid when shaken
Plastic	plaster has the ability to be modeled like clay

