



HOW TO MAKE FLEXIBLE URETHANE MOLDS

PRODUCT BULLETIN 90-03

This data sheet will provide the beginner with the essential steps and procedures in making flexible urethane molds with Por-A-Mold.

The great advantage of flexible urethane molds is their ability to record the most intricate details of the master model and the ease with which they can be removed from master models with complex undercuts.

Flexible molds are most often used to make wax patterns, which are exact duplicates of the original master models. These wax patterns are essential to techniques. Por-A-Mold allows sculptors, craftsmen and artisans to make copies of master models that can then be cast in other materials such as resins, epoxies, cement, gypsum, etc. Por-A-Mold permits the production of large editions with little appreciable wear or deterioration of the mold from repeated use.

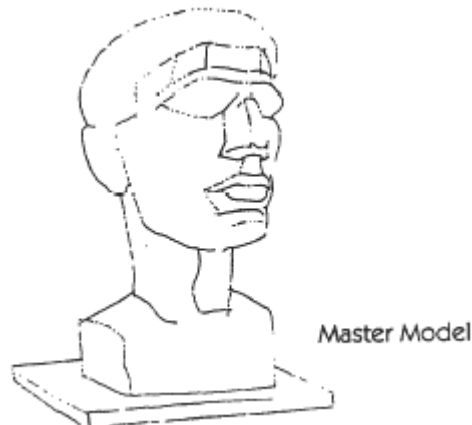
There are two basic mold-making strategies. One approach requires the mold making material be poured over the master model, which is then encapsulated by a two-part plaster backing commonly, referred to as a "mother mold".

The other approach requires that the mold making urethane be painted and then troweled onto the master model surface, after which a two part "mother mold" is built over the cured urethane to provide additional support.

In either case, whether the molding material was poured or painted and troweled, the plaster mother mold acts as a backing or rigid support to the flexible urethane, keeping it in proper register once the master model has been removed.

Molds that are poured generally require less time to complete but do take more material than molds that are made by painting and troweling. Both approaches produce excellent results. The choice is one of time versus cost.

Por-A-Mold systems can be applied to practically any master model material. Often master models are made of plaster or other porous material. It is necessary to lacquer a plaster master model with at least two coats of clear lacquer to seal the surface. Excess lacquer buildup should be avoided; excess buildup will cause a loss of detail. Allow the lacquer to adequately dry before applying the second coat.



After the lacquer is thoroughly dried, a very thin film of Synlube 531 release agent is applied to the surface in the form of an aerosol spray. Synlube 531 is a release agent that has been specifically formulated for use with Por-A-Mold/Por-A-Kast systems.

Where the master model is made of metal, glass or other dense material, sealing is not necessary and the Synlube 531 release agent can be applied directly in a very thin film. This will result in a good release of the flexible urethane from the master model without loss of fine detail.

There are essentially four different types of molds that can be made by pouring or troweling; each having minor variations of construction:

- The simple one piece one sided flat back mold contained in a mold box
- The split one piece mold without a mother mold backing
- The one piece mold with a one piece mother mold backing
- The two piece mold with a two piece mother mold backing

The above data was obtained under laboratory conditions and to the best of our knowledge is accurate. Each user must determine the suitability of this product for the purpose intended and the conditions under which parts are made.

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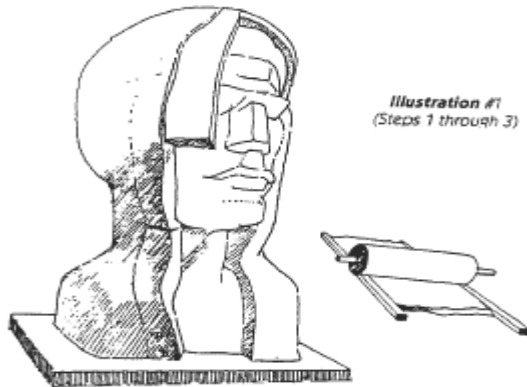
The most difficult of the four types is the fabrication of a poured flexible urethane mold from a sculpture in the round, which requires a two-part or multi-piece mold, depending on the complexity of the master mold.

Should the master model to be molded be free standing, follow this approach after you have correctly prepared the master model surface.

1. With a rolling pin, roll out a sheet of clay to a thickness of 3/8 of an inch.
2. Lightly dust the surface with talc.

Talc absorbs some of the moisture from the clay and acts as a separator between the master model and the clay. It is recommended that a layer of polyvinyl wrap be placed over the master model to protect its surface. If no difficulty is foreseen in cleaning the clay from the master model surface, the wrap may be omitted.
3. Cut the clay slab into strips and cover the entire master model surface with a 3/8 inch layer of clay.

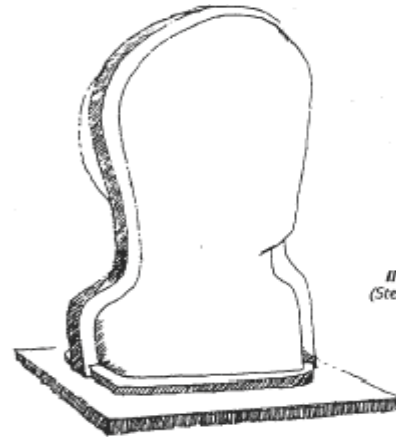
Work the clay smooth to eliminate any undercut on this layer of clay. (See illustration #1)



Determine where the draft or parting line should be. The parting line is that place where the mold will be divided and separated into sections.

1. Lay a clay strip one inch wide and 1-1/2 inches high along the entire length of the selected parting line.
2. Build up a border of clay 1/2 by 1/2 inches wide along the base of the sculpture.

These strips of clay will provide extra reinforcement to the mold at its border. (See illustration # 2)



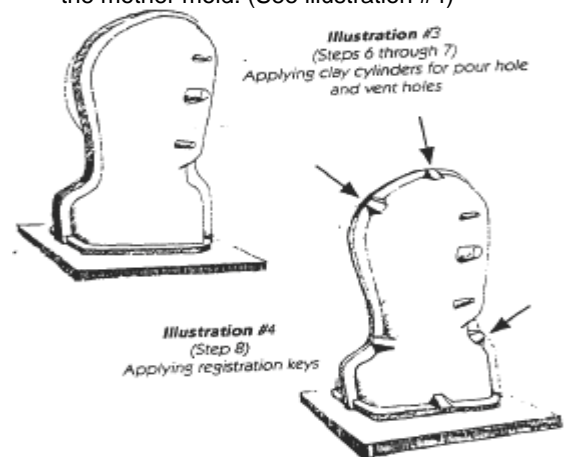
3. Determine the place at which the Por-A-Mold will be poured. At this pre-selected spot on the clay surface, place a 1-1/2 inch diameter cylinder by approximately 1-3/4 inch high.

The Por-A-Mold should be poured into a pour hole at the highest point on the master model.

4. Place at least two smaller diameter clay cylinders of the same height on the clay surface, which will act as air vents.

The pour hole and the vent holes should be placed at the high points of the clay surface. (See illustration #3)

5. Build up some raised registration keys in the clay cover that surround the master model so that the flexible urethane mold will be keyed to the mother mold. (See illustration #4)



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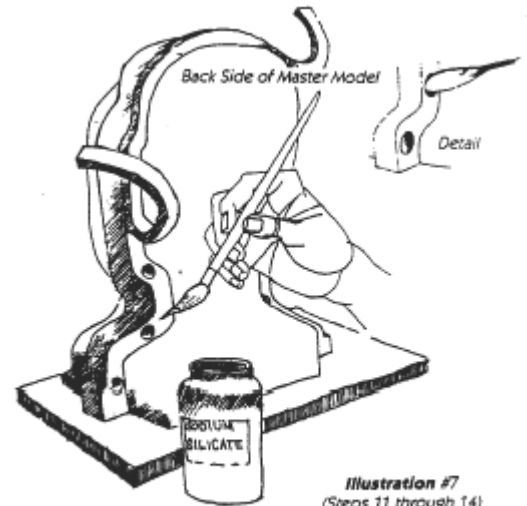
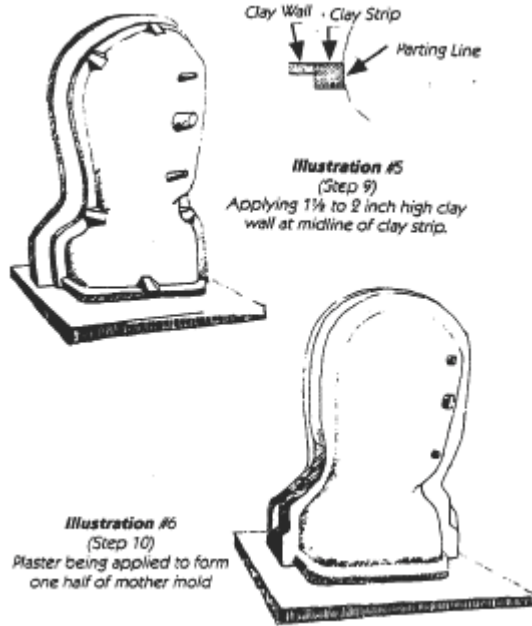
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- Build a clay wall 1-1/2 to 2 inches high along the center of the raised clay strip that was positioned on the parting line.

This will serve as the border for the first half of the mother mold, which you will now make. (See illustration #6)

- Apply plaster reinforced with hemp fiber over one half of the prepared clay that covers the master model, to a thickness of about 1-1/2 inches.

Be careful not to cover the vent hole and pour hole plugs with plaster (See illustration #6)



- Allow the plaster to set.
- Remove the clay wall that acted to separate the first half of the mother mold from the second half to be formed.
- Cut registration keys into the first half of the mother mold.
- Apply sodium silicate as a plaster separator to the plaster edge that will mate with the second half of the mother mold. (See illustration #7)
- Build the second half of the mother mold with plaster reinforced with hemp. Fabricate the second half the same thickness as the first half.
- After the plaster has been set, place the mold bottom up in a vertical position.
- Build a mold cap for the bottom of the mold. (See illustration #8)
- Cut registration keys into the bottom edge of the mold.

- Apply sodium silicate to the mating surface.
- Build up the bottom cap with hemp fiber-reinforced plaster.

The mother mold now completely encapsulates the clay covered master model. (See illustration #9)

- When the mold cap has set, pry it free at the edge and set it aside.
- Pry one half of the mother mold from the other exposing the clay beneath.

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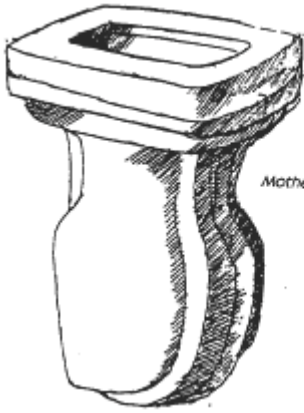


Illustration #9
(Steps 18 through 20)
Mother mold complete with end cap.

The other half of the mother mold should be left in place in contact with the clay and the mold.

23. Remove all the exposed clay that covers the master model, carefully.
24. Remove the polyvinyl wrap film from the one half portion of the master model that is exposed. (See illustration #10)



Illustration #10
(Steps 21 through 24)
Disassembling the mother mold

25. With a tool, smooth out the clay between the master model and the mother mold where it is flush with the mold border.

Take care to eliminate any opening that would allow Por-A-Mold to seep into the encapsulated half of the mold.

26. Carefully cut a number of registration keys into the exposed clay.

These keys will assure that the two molded urethane halves will be perfectly aligned. (See illustration #11)

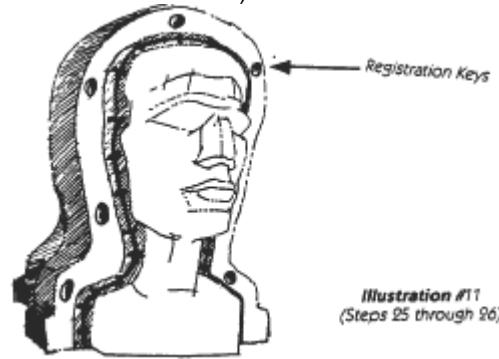


Illustration #11
(Steps 25 through 26)

27. Apply two coats of lacquer to the exposed clay and the exposed edge of the mother mold. Allow the lacquer to dry thoroughly.
28. Apply Synlube 531 mold release to the lacquered surface and the master model.
29. Clean the inner surface of the mother mold that had been previously removed.
30. Apply two applications of lacquer. Allow the lacquer to dry completely.
31. Spray a coat of Synlube 531 release agent to the lacquered surface.

Since reproduction of fine detail is not required on this surface, a light film of Vaseline should be applied to the inside of the mother mold surface to facilitate the removal of the cured urethane from the mother mold.

32. Seal and apply Synlube 531 to the mold cap. (See illustration #12) Allow to dry thoroughly (approximately 15 minutes).



Illustration #12
(Steps 27 through 32)
Sealing the plaster and coating the DRIED lacquer with mold release agent.

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33. Assemble the parts of the mother mold and the end cap.

Secure the parts with rubber bands, plaster and hemp or metal cleats.

34. Position the mold such that the pour holes and vents are in a vertical position.
35. Take a small amount of clay and run it along the mother mold and end cap seams.

The pieces are now properly in place and the mold is securely closed. A 3/8 inch space now exists between one half the mother mold and the master model surface.

36. Cut some medium gauge acetate and fashion three funnels which will fit the pour hole and the two vent holes. Affix these funnels in place with clay. (See illustration #13)

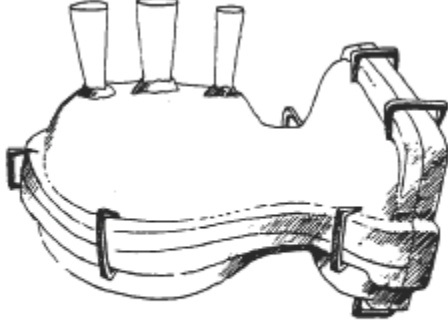


Illustration #13
(Steps 33 through 36)
Preparing mother mold to receive liquid Por-A-Mold.

37. You are now ready to mix and pour Por-A-Mold. Calculate the amount of Por-A-Mold you will need. Properly measure and mix it. (See Product Bulletin #90-01) When the Por-A-Mold mixture is a uniform color, slowly pour the blend into the mold pour hole until the liquid rises to fill the mold cavity.

Place the mold in a warm location and let the Por-A-Mold cure overnight.

38. Remove the mold restraints.
39. Pry loose the end cap and part the mold such that the master model and the cured urethane remain attached to its section of the mother mold. (See illustration #14).
40. Remove the clay from remaining half of the mother mold.
41. Repeat the entire cleanup and sealing procedure per the instructions above for the untreated half of the mother mold. (Steps 29, 30, 31)
42. After the lacquer has dried, spray all exposed surfaces with Synlube 531, including the master model and the exposed edge of the

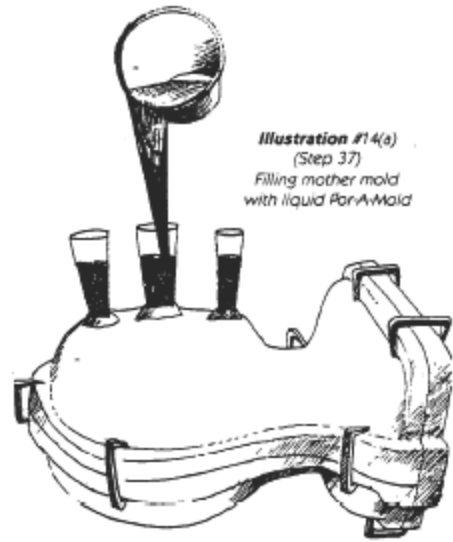


Illustration #14(a)
(Step 37)
Filling mother mold with liquid Por-A-Mold

Cured Por-A-Mold mold against which the new mixture will cure.

43. Assemble the parts of the mold with the master model registered in the cured urethane portion.
44. Secure the parts and the seams as described above. (Step 33)
45. Stand the mold in a vertical position and pour the second batch of Por-A-Mold.

When the Por-A-Mold has cured, demold the master model.

46. Remove the end cap and gently pry the mother mold apart.
47. Peel the urethane from the master model and wipe the surface to remove any excess release agent.
48. Reinsert the flexible urethane mold sections into the mother mold.

The mold is now ready to use.



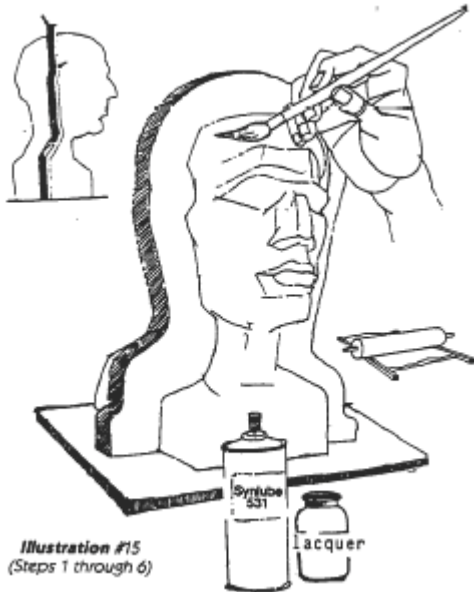
Illustration #14(b)
(Steps 38 through 48)
Disassembling the finished mold

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To make a flexible urethane mold by the paint and trowel method follow these instructions:

1. Affix the sculpture to a wooden board.
2. Prepare the master model surface with sealants and parting agents. See instructions above.
3. Determine the position of the parting line that will divide the mold in two sections.
4. With a rolling pin roll out a clay slab ½ inch thick.
5. Cut two inch strips of clay.
6. With the clay strips in a vertical position to the master model surface, build a clay border along the entire length of the parting line. (See illustration #15)



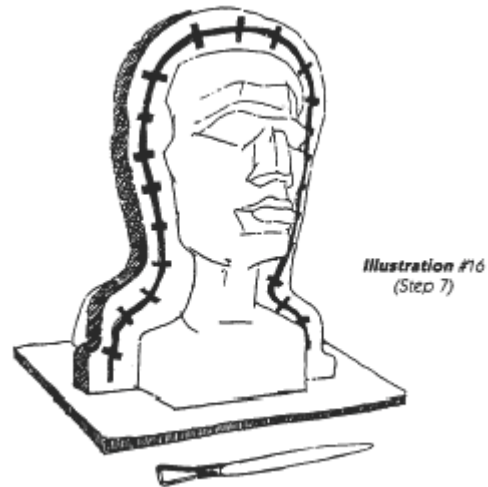
7. With a modeling tool, cut a number of registration keys into the clay border. (See illustration #16)
8. Carefully apply two coats of clear lacquer to the clay wall up to the edge of the master model on the side to which you have cut the registration keys.

Avoid additional lacquer build up on the master model, which has already been lacquered.

9. Spray the clay wall and master model with Synlube 531 release agent. Allow release agent to dry thoroughly (approximately 15 minutes).

The master model and clay border are now ready for Por-A-Mold.

10. Mix an amount of Por-A-Mold sufficient to paint the surface of the master model.
11. Paint the blended Por-A-Mold over the entire surface of the master model and over the surface of the surrounding clay border with the incised registration keys.



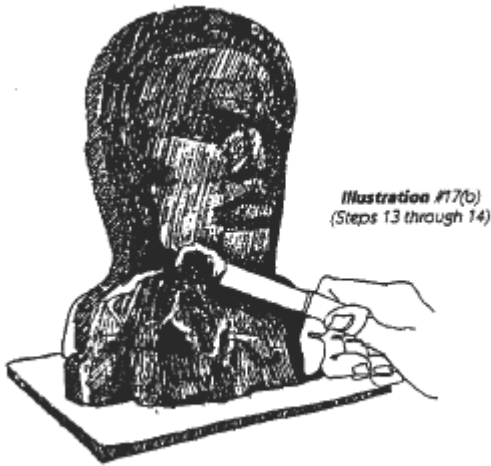
Avoid vigorous brush movements as this may generate and entrap small air bubbles at the surface. Look for and remove any bristles from the master model surface that may have come loose from the brush.

12. Allow this painted coat of Por-A-Mold to set up.
13. Mix an adequate amount of thixotropic Por-A-Mold. (See Product Bulletin #90-02)



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14. With a small trowel or putty knife, carefully build up the mold to a thickness of approximately $\frac{1}{4}$ of an inch.

It is not necessary but if you wish to reinforce the mold, a layer of dry gauze or a layer of open weave fiber glass cloth can be placed over the first application of thixotropic material.

Work the material evenly outward to the edge of the mold border. If needed add an additional amount of thixotropic Por-A-Mold to areas that appear to be too thin.

NOTE!! Apply the thixotropic mix within one hour after the painted coat sets firm to the touch to insure the best chemical bonding between the two layers. (See illustration #17)

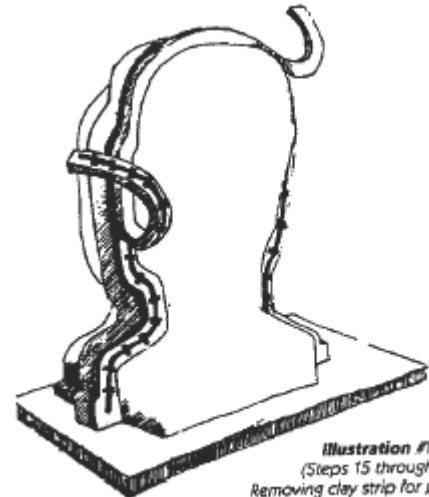
15. When the thixotropic layer has set up (overnight), coat the urethane with a light film of Vaseline.
16. Mix a batch of molding or casting plaster and with hemp fiber guild the plaster back up mother mold over the Por-A-Mold.

Build the mother mold to a thickness of 1-1/2 to 2 inches.

17. After the plaster has set, peel away the clay border from the first half of the molded rubber.

Make certain that all the clay has been removed from the plaster and that the plaster is dry. (See illustration #18)

18. Spray Synlube 531 over the exposed master model and the surrounding Por-A-Mold border.
19. Now mix and apply liquid and then thixotropic Por-A-Mold as previously discussed and allow to cure.
20. Build the second half of the mother mold.



21. After the plaster has set, gently pry each half of the mother mold from the urethane below.
22. Clean and set aside.
23. Peel back, one at a time, each of the two molded rubber sections.
24. Clean and replace the urethane sections in their respective mother molds.

When storing flexible urethane molds, it is good practice to store the molds face up with a thin layer of plaster on the mold surface to keep it from sagging or distorting.
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