Mold-Making and Casting Basics

Forensic Anthropology Workshop
05/12/2012
2 Most Common Types of Molds

- **Block Molds** (One Piece and Two Piece Block Molds): Block molds are made by forming a mold support around the master. The molding silicone or rubber is then poured so it covers the master and fills the mold support. After curing and removing the master, the mold cavity is used for casting.

- **Skin Mold**: Skin molds can be either poured or applied by brush. When a skin mold is poured, the master is covered with a layer of clay then surrounded by a mold support. The mold support is then filled with plaster and split. Next, the clay is removed and the resultant gap between the master and the plaster is filled with silicone/rubber to form the mold. Brush applied skin molds use layers of silicone/rubber and are reinforced with cloth which adds strength and extra tear resistance. Brush application speeds up mold making because a fast curing catalyst can be used. (From Curbell “Types of Molds and Applications)
Materials

- Econosil 25 A/B
- Ultra Cal 30
- Vaseline
- Popsicle sticks
- Mask
- Scale
- Sifter
- Foam Core
- Art knife/Exact-o knife
- Duct tape
- Modeling clay
- Hot glue gun (optional)
Econosil 25 A/B
Scale
Modeling Clay

MODELING CLAY
(PLASTALINA • PÂTE À MODELER)
NEVER HARDENS • NON-TOXIC
For sculptors, animators,
and artists of all ages.
NET WEIGHT 1 lb. (453g)
VAN AKEN
MADE IN U.S.A.
VAN AKEN INTERNATIONAL, RANCHO CUCAMONGA, CA 91739

KLEAN CLAY
Reusable Oil Based Tooling and Sculpting Clay.
Compatible with Platinum
Silicone RTV and Epoxy Resins
HARDNESS: Soft (Gray) or Firm (Tan)

SILPAK, Inc.
www.silpak.com
909-625-0856
Box for Mold

• You can use a tupperware container or build one to fit your original.
• Make sure that whatever you use, that it fits the bone as close possible so as not waste materials.
• You want about an inch of mold all the way around.
Build Box for Mold

• Measure the skull (width, length, height)
  o Need at least ¼” on every side for mold
• Draw box outline on foam core and cut out
• Cut out flaps and score the sides
• Duct tape the sides
• Make sure there are no holes!!!
• Use hot glue gun to fill in all holes or reinforce weak sides.
Mold Box
Covering all Foramina and Sutures

- Cover your original with a sealant to so the silicone will release easy from the bone material. Bone is porous, so the rubber will seep in the skull cavities if you’re not careful.
- Sealants you can use include shellac, paste wax, and or vaseline.
- Make sure to cover all exposed foramena, sutures, etc with clay or dental wax. If you don’t the rubber will seep into your skull, making the mold almost impossible to remove.
Prep Skull for Mold

• Add clay to ½ the skull
• Place skull inside box
• Build clay around skull so that the bottom ½ of the box is covered in clay.
• Again, makes you’ve added vaseline to the exposed ½ of skull (so molding material does not stick to skull).
Prep Skull for Mold
Prep Skull for Mold
Mix Rubber for Mold

- **ECONOSIL-25 A/B** Two-Part, Tin RTV (Condensation Cure) silicone rubber intended primarily as a **LOW COST**, general purpose system for making short run production molds.

**Features:**
* Excellent Physical Properties
* Low Viscosity for ease of pouring
* Low Cost Moldmaking Material

**Mix Instructions:**
Adding the curing agent Econosil-25 B processes Econosil-25 A. The addition of 10% catalyst (by weight) has a pot life of 40 minutes and is ready for de-molding after 15 to 24 hours. After the mold has been removed from the master, it should be left for 24 hours in order to develop its maximum mechanical strength.

Pro-Tip

• To ensure thorough mixing of rubber after you mix the two ingredients together, pour rubber into another container to continue mixing.

• You want the rubber to be blue throughout, with no white streaks.

• Air holes are bad, make sure there are no bubbles.
Building 1\textsuperscript{st} ½ of Mold

- Weigh Econosil 25 A (white material) on food scale
- Calculate 10\% of weight of Econosil 25 A
- Add 10\% of the catalyst, Econosil 25 B, by weight
- Mix with popsicle sticks
- Add 1 thin layer of the Econosil molding material to the exposed ½ of the skull with the popsicle sticks or paintbrushes
  - Adding a thin layer of molding material to skull 1\textsuperscript{st} prevents the weight of the entire mold from seeping in to the skulls
  - Makes pulling the skull out of the mold easier
- When the 1\textsuperscript{st} thin layer dries add another thin layer (mix material enough for thin layer each time because it takes so long to dry).
- Once both layers dry, pour a thick batch of rubber to fill the top ½ of the mold.
- Give each thin layer a few hours to dry. Allow about 12 hours for your thick pour to dry. The better your rubber is mixed the less time it needs to dry.
Building 2\textsuperscript{nd} ½ of Mold

- Pull away all clay around the bottom ½ of the mold
- Place the skull and mold upside down, so the top ½ of your mold is in the bottom of the box
- You can use PAM as a release agent. Spray the PAM on the 1\textsuperscript{st} ½ of the mold and the exposed surfaces of your skull. Blot excess.
- Add 2 thin layers of Econosil as before, then add the rubber for the bottom ½ of the mold.
Building 2nd ½ of Mold
Casting

• Pull both ½ of the molds from the box
• Pull skull from the mold
• Place mold back in box
• Cut a small hole in the top of the mold to apply the casting material

**ULTRA CAL 30** is a plaster cement tooling material, which creates a hard, uniform and dimensionally accurate piece.

**Features:**
- Low Expansion Rate
- Close Tolerance Tooling
Mixing Ultra Cal

- Use a mask when mixing this material! It’s plaster and not good to breath in.
- Mix casting material with water
- Use a sifter to prevent air holes and clumps
- Manufacturer suggests mixing 38 parts of water to 100 Ultra Cal
- Make sure there is no separation of the Ultra Cal from the water
  - If try to pour the cast add the material is too thin then the material will separate in the mold, creating an unfinished cast.
- Consistency of a thin pudding
- Takes about 20-30 minutes to set
Mixing Ultra Cal
Adding Ultra Cal to Mold

- Add Ultra Cal to small hole added to the top of the mold
- Pour slowly
- You will have leaks but the excess will break away pretty easy.
- Will take a few hours to dry
What I Learned For Next Time

- Your cast is only as good as your mold; experiment with way to pour mold more carefully around zygomatic arches
- Experiment with sealers to prevent rubber sticking to model
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