



## CLAY/SAND/DUNG MOULD HINTS AND TIPS

### Processes

#### Pattern and Sprue Design

Sprue the pattern horizontally rather than vertically thus reducing pressure lower down.  
Add three standing lugs or feet (small wax rods) to keep the dipped pattern off the ground.  
Have wax/bronze reservoirs at strategic and thin sections of the pattern.  
Use hollow sprues if possible to allow wax expansion.  
Write the weight of the wax pattern into the pouring cup in negative  
Don't forget core pins (3/4" copper tacks are ideal) and core vents if a core is present.  
Add shitbuds at the bottom of pattern and the ends of runners to collect any dirt.  
Add risers where needed and at least one major air vent at the highest point.  
Connect all the risers to the top of the pouring cup.  
Add two hanging loops in the cup (bent copper nails) to assist handling while dipping and for drying.  
Use two openings to let mould mix flow through hollow pattern instead of a core.

#### Dipping

Break surface tension of the wax by brushing on fine ash mixed with powdered charcoal.  
Dip into fine coat at least 2 times.  
Dip into coarse coat 4-5 times.  
Brush out any fine bubbles in the first three to four dips (**very important**).  
Brush out any bubbles under the pouring cup and around the runners.  
Brush out any accumulation of mix in hollows to ensure even thickness and crack-free drying.  
Brush mix carefully into deep cavities and undercuts, releasing any trapped air.  
Reinforce larger mould with hessian dipped in mix, then apply one or two more dips after.  
Cavities and hollow moulds can be speed-dried, using coarse salt, rice or silica  
With the second last coat wrap hessian around the pouring cup as a support in the burn-out.

#### Burn-Out

Melt out the cup with a hand-held burner into a water-filled tray.  
Melt out wax in the kiln into a tray of water, remove after 30 minutes and recycle.  
Clean out the edges of the pouring cup carefully.  
Use a tray with strong mesh or drilled metal sheet to support the moulds upside-down.  
Fire the empty moulds upright at around 600°C until all flames die out.  
After firing reinforce the still very warm mould with hessian dipped in coarse mix.  
Heat the moulds again to 150°C max. to drive out any moisture but don't burn the hessian; alternatively, dry in the sun for a day.

#### Pouring

Bury moulds in kiln-dried sand and fill any cavities with kiln dried sand  
Pour metal at 1,040°C to 1,080°C max. (clay/sand moulds seem to prefer cooler pours!)  
Add borax (or cream of tartar), a bit of salt and a bit of charcoal to the crucible before heating up  
De-gas/de-oxidise the metal with a willow rods (salicic acid) before pouring (old bell-founder's technique)  
Use cold moulds, avoid pre-heating (against common sense)  
Don't quench the moulds but leave to cool in the open air for about 1-2 hours  
Remove hessian wrapping, tap the cup hard with a hammer to shatter mould away from the pattern.  
Crush mould material, sift through mesh and recycle all materials



### Troubleshooting

- Bubbles in the mixes can create surface quality problems, particularly at the bottom of bigger moulds. Keep manipulating the mixes to a minimum to avoid trapping air and don't add detergents. Add a small amount of vegetable oil in the mix as a degassing agent/anti-foam if bubbles are excessive. If the reason is fermentation of the mix (natural yeast and warm weather) add a good few Camden tablets (sulphur tablets from any home-brew kit or store or from Ebay). Always use a very soft brush (pastry brushes are ideal) to break any surface bubbles and to improve cohesion of first coats. Repeat brushing for at least the first three coats
- Flat moulds tend to crack along the seams through expansion of wax. Reinforce with hessian before the second last coat and again after firing.
- Surface impurities can be reduced by pouring the moulds cold and with a cooler alloy. Around 1,050-1,080°C appears to be ideal. It seems that the quicker solidifying of the bronze avoids the metal being pushed into tiny cavities and bubble-holes. The longer it stays hot and the higher the pressure, the higher the risk of poor surface quality.
- Broken or cracked pouring cups and holes can be fixed with hessian dipped in mould mix



*Flashing and surface problems (bottom) due to insufficient adherence of the first coats – pattern was dipped but not brushed.*

### Materials

Dusting: Fine ash mixed with powdered charcoal and some graphite

Fine Mould Mix: A cream-like dip of 20% fine clay, 30% very fine silica sand, 30% fine molochite or ground-up moulds, 10% fine ash and ground-up charcoal or graphite, 10% mashed egg boxes. Scarva's grogged flax crank clay is ideal as a base for this mix as it has a lot of fine fibres but any clay will do.

Coarse Mould Mix: A slightly thicker dip of 20% clay, 30% builders sand, 30% coarse (30-80 grid) molochite or ground-up moulds, 20% horsedung. Over time all crushed and ground moulds are getting recycled back into this mix. Occasionally extra clay and dung need to be added to keep the right proportions.

Patination: Solution of vinegar, salt and milk applied to cold or slightly hot bronze. Alternatively use household ammonia

All measurements are approximates and by volume.



### **Good Environmental Practice**

Fully recycle moulds back into dip (about 90%)

Retrieve wax before burn out (up to 70%)

Use of recycled bronze

Charcoal pit furnaces are carbon-neutral if local charcoal is used

Smaller moulds can be burnt out in a stove, range or fireplace – double use of the energy!

Use local clay pits for clay – no need to buy.

Replace toxic patination chemicals with domestic products

A 1:1 charcoal fuel to metal ratio by weight is achievable

The method described here has been tested a lot and gives predictable results for hollow casts up to 12kg in weight and c. 18” in height although larger objects could be achieved by increasing mould thickness and hessian reinforcement. The surface quality should be good enough to make out fingerprints in the waxes.