NYSCC @ Alfred University's

Raw Materials cookbook 2007

"No turning back"
-2007 Raw Materials class-

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Name: Margaret Angelo
Type: Underglaze/Overglaze
Color: Various
Texture: n/a
Cone: 6

Recipe: (NOTE: Some recipes are not out of 100%!!!)

Mamo	
Neph Sy	52.0%
Whiting	3.0%
EPK	22.0%
Dolomite	18.0%
Flint	5.0%
Add Tin Ox.	8.0

MLA	
Custer	53.9
Frit 3124	13.2
Whiting	10.0
Dolomite	18.0
EPK	.8
Flint	22.1
Veegum	.5
Tin	8.0

Dragon White	
Kona F-4	42
Cornwall Stone	22
Whiting	18
EPK	5
Zinc	8
Titnium Dioxide	4

R-1000	
Neph Sy	34.65%
Wollastonite	13.61%
Strontium Carb.	13.61%
EPK	9.13%
Laguna Borate	9.13%
Flint	9.13%
Whiting	10.74%

Final Overglaze recipe	
Colorant	40%
Neph Sy	40%
Tennessee #10	20%
Add: CMC	1

Colorants Used
Pemco Blue #618
Mason Deep Crimson #6006
Cerdec Yellow #239416
Mason Dark Red #K5987
Mason Tangerine #6027
Mason Evergreen #6200

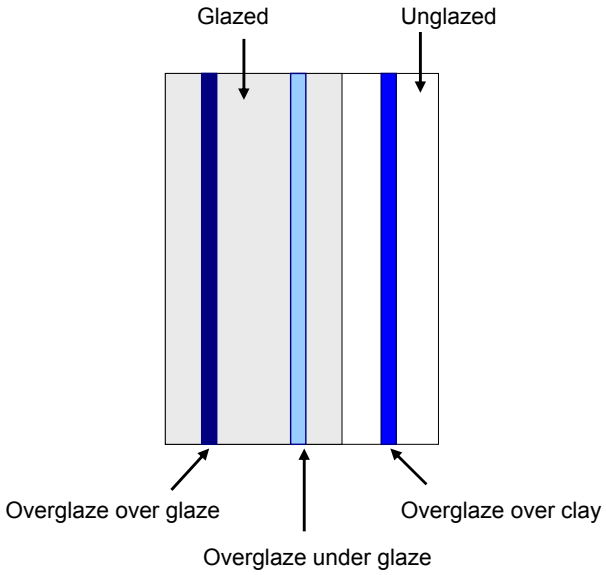
Development Process: The purpose of this research was to develop an overglaze for cone 6 firings.

I started my research by doing a line blend to figure out the percentage of colorant needed to produce the qualities I was after.

All points had 20% ball clay and 1% CMC. At the first point (1.1), I started with 70% colorant and 10% Neph Syenite. The last point on this line blend (1.7) reversed the colorant and Neph Syenite quantities.

I painted stripes using each of these points on bare clay, overtop of a glaze and under a glaze.

This line blend set was applied over top of the MAMO glaze.



1.1 1.2 1.3 1.4

1.5 1.6 1.7

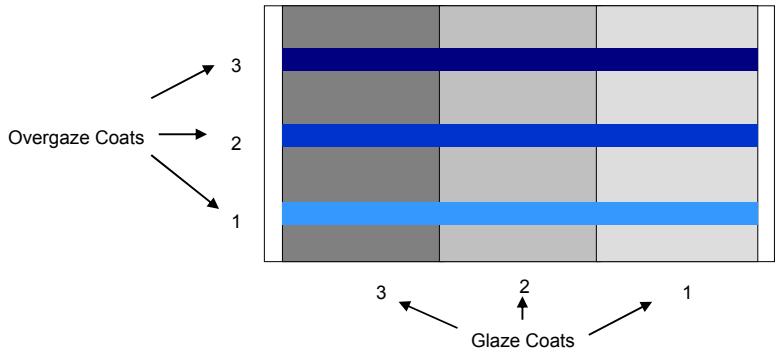
I chose 1.4 as the ratio of flux to stain that worked best (the number after the decimal refers to the percentage of stain)

Overglaze 1.4

Colorant	40%
Neph Sy	40%
Ball Clay	20%
CMC	1%

(20 gram dry batches with 30 grams water)

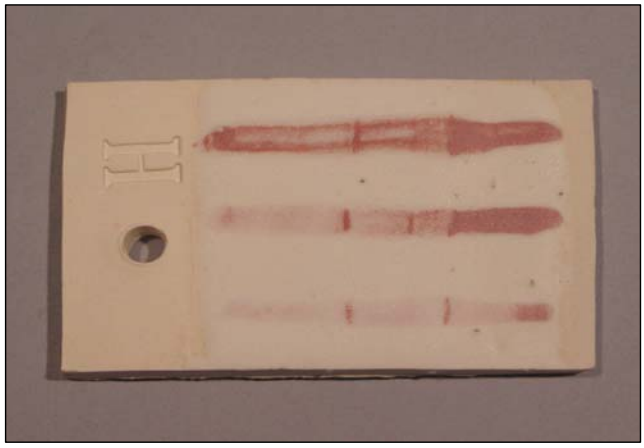
I then tested this with 3 different stains and over 4 different glazes. Each glaze was applied in thin, medium and thick coats. The underglaze was applied over top of this up to three coats thick.



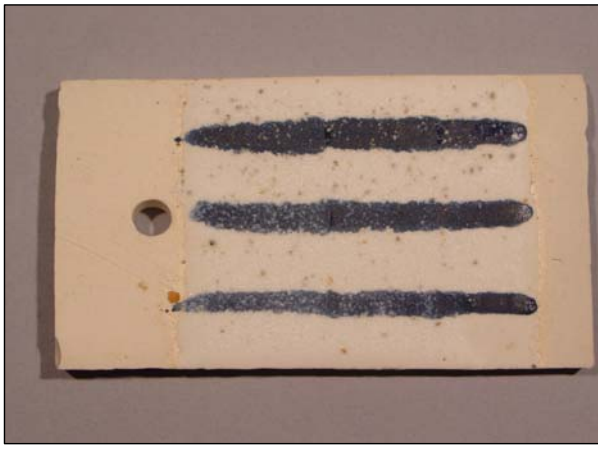
The colorants used were Pemco blue, Cerdec yellow and Mason Deep Crimson

MAMO base glaze
1.4 overglaze

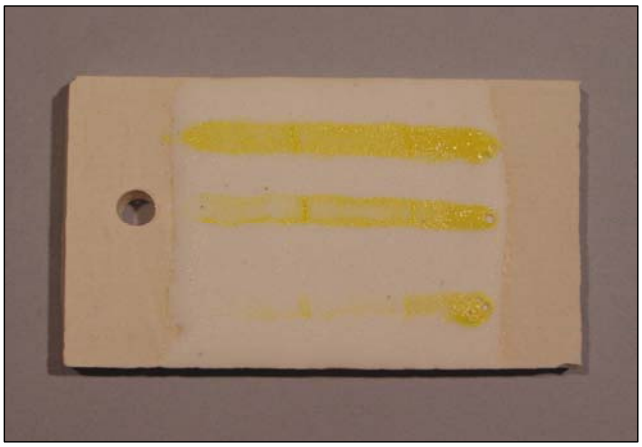
Deep Crimson



Pemco Blue



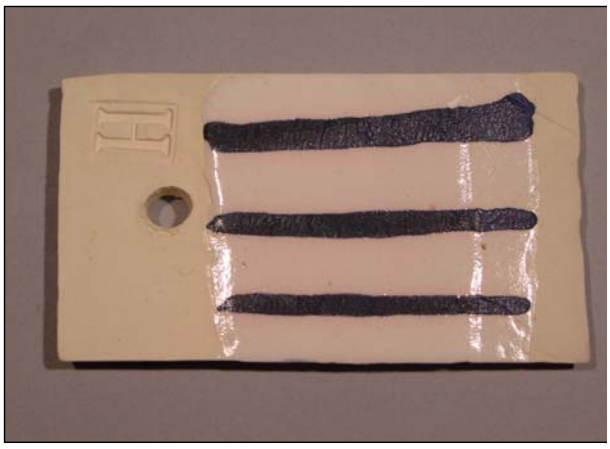
Cerdec Yellow



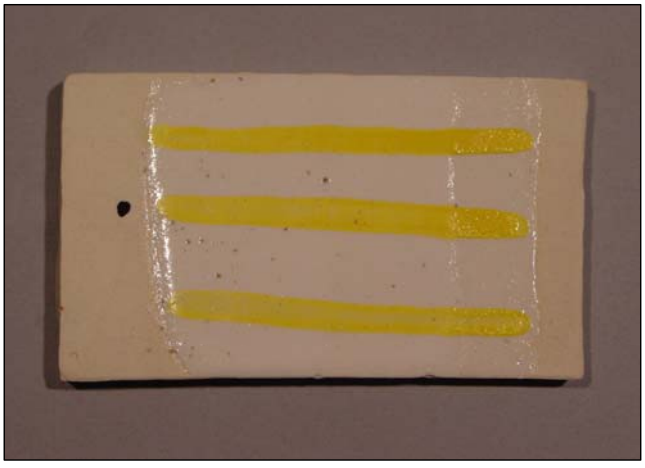
MLA base glaze
1.4 overglaze

Deep Crimson

Pemco Blue

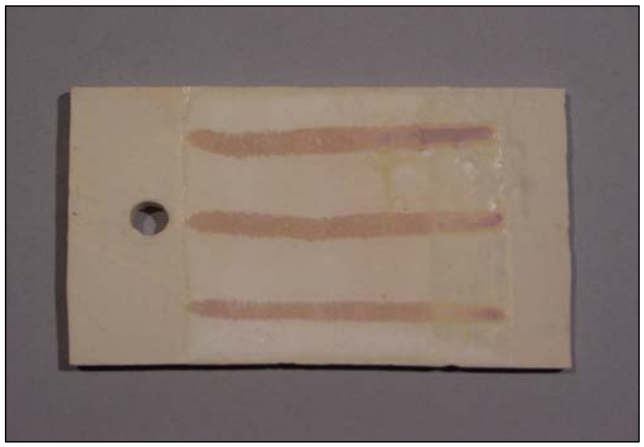


Cerdec Yellow

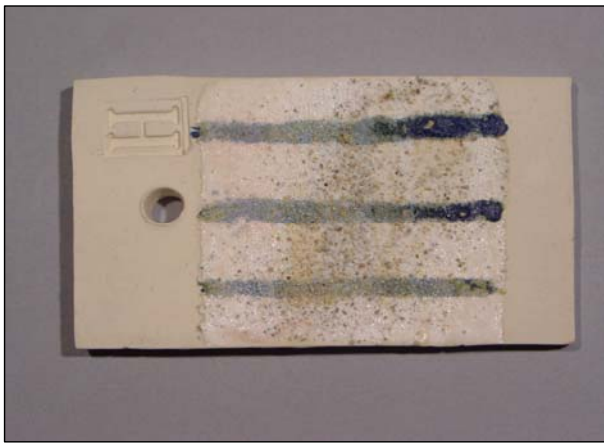


Dragon White base glaze
1.4 overglaze

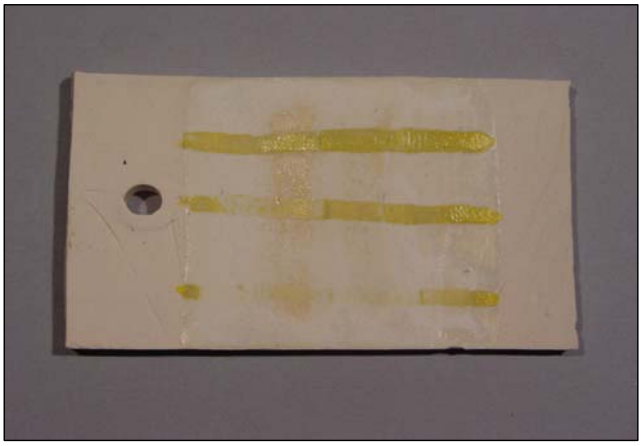
Deep Crimson



Pemco Blue

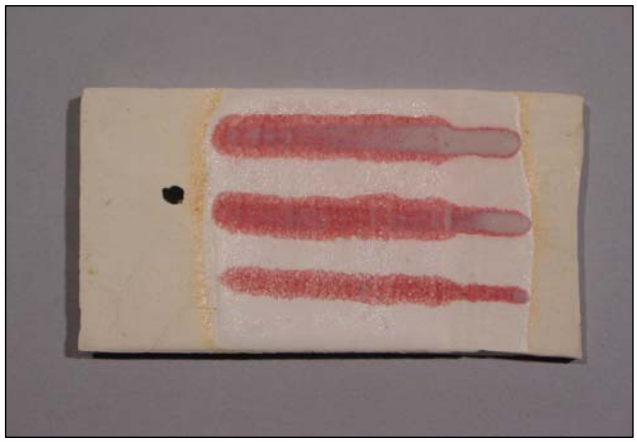


Cerdec Yellow

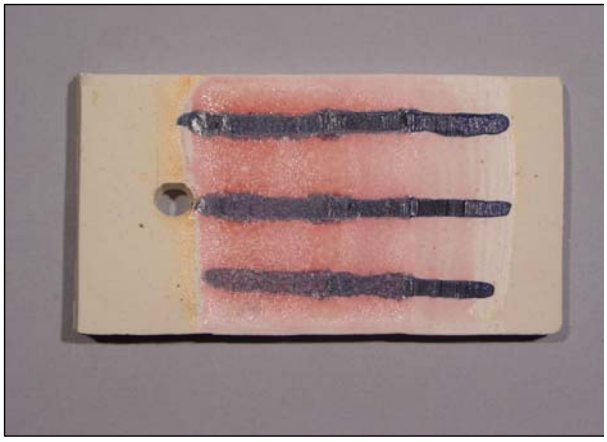


R-1000 glaze
1.4 overglaze

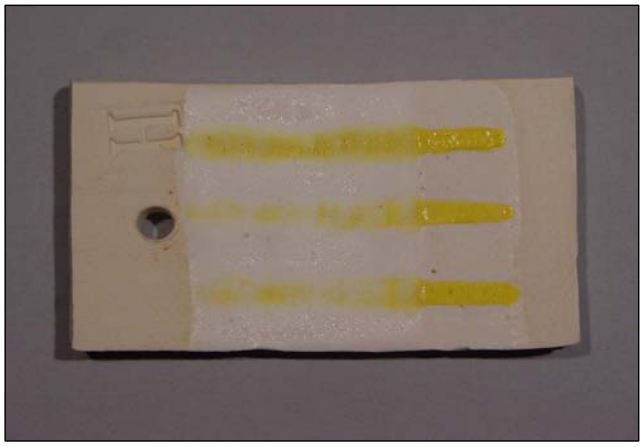
Deep Crimson



Pemco Blue



Cerdec Yellow



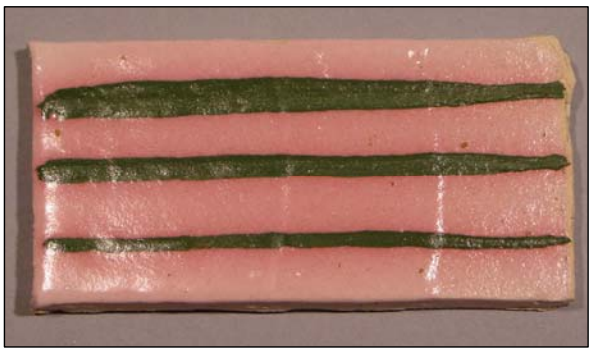
For my final test, I chose one glaze (MLA) and retested some of the earlier colors, while also trying out new colors...

MLA with Mason Tangerine overglaze

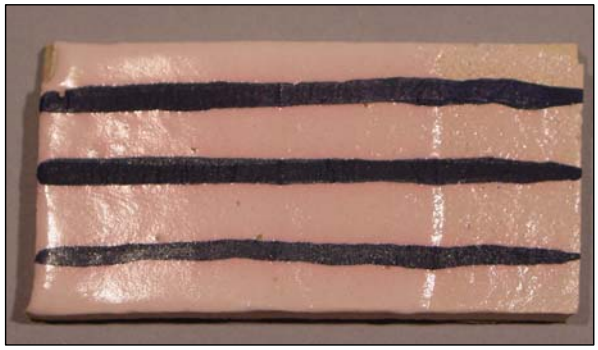
MLA with Cerdec Yellow overglaze

MLA with Mason Dark Red overglaze

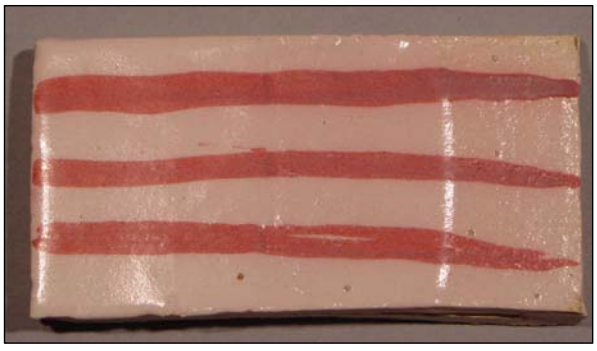
MLA with Mason Evergreen overglaze



MLA with Pemco Blue overglaze



MLA with Mason Deep Crimson overglaze



Name: Ryan Coplin
Type: Kiln Casting
Color: Various
Texture: Various
Cone: 04, 6, 10

Recipe: See below

Development Process:

In kiln casting, a technique often used in the glass studio, a mold is filled with glass or other materials that will melt and fill the mold during the firing. My goal was to emulate this technique using materials common to the ceramics lab. These included various raw materials, mixtures, and glazes. My hope, with further research, is to be able to find a few good materials that I can use to cast sculpture with.

The difficuty lay in finding a material that would be fluid enough to fill the mould and take its shape yet remain innert enough to not eat through the mold during firing. I began by making small one piece plaster silica moulds. The moulds were 1 part plaster to 2 parts silica (flint) by volume. I made them by taking plastic drinking cups and filing the bottom half with oil clay. I then glued individual medicine cups, bought from the drugstore, to a thin strip of wood. The plaster mix was mixed and poured into the drinking cup and I quickly stuck the medicine cup into the plaster. They were glued to the stick so the stick would rest on top of the drinking cups and I could set something heavy on top of them to prevent the medicine cup from sliding around. Once set, the cups were cut in half and the mould was released. I reused the drinking cups by simply duct taping them back together. The moulds were further dried out inside the chimney of an unfinished kiln. They were dried with air currents and not heat (so as to not break down the plaster). They were packed in sand and surrounded by bricks while being fired.

I filled a few of these moulds with dry materials and packed them as tight as possible. The first tests were with frits and fluxes at cone 6. These just ate right through the molds. I then tried materials that didn't melt so much and these proved to be better, but they started to seep into a thin layer of the mold. The next step was trying mixtures of fluxes and clay and other fillers at different temperatures. Along with this next series of tests, I started adding fiberglass cloth dipped in plaster around the molds. This was to prevent the hairline fractures in the moulds. It seemed to work a little bit, but cracks should be expected when firing any plaster based material in a kiln. Although these moulds went through a regular ceramic firing, they really did not need to be exposed to this much heat for that long. They really only needed to be brought up to the melting temperature of the material, held for a short while, and then cooled. A raku kiln would be ideal for this purpose. After finding some promising materials, I switched to a two part mould. This mould had a funnel on the top to act as a self feeding hopper to provide extra material to the lower portion of the mold as the materials melted, condensed, and shrank. With these moulds, the funnel worked and the mould filled, but after filling, the material then shrank. This may be due to the nature of the material itself and not the design of the mould.

In the end, I found a few good materials that casted well, Frit 3124 fired at cone 04 having the best results and the next to best being a mix of 85% Kona F-4 and 15% Barnard at cone 10. Although the frit did seem a little stiff and could be mixed with another more fluid flux, it filled the mould perfectly and popped right out of the mould with no color change what so ever. The main problem was that while many of the materials showed acceptable fluidity and casting abilities, they began to eat through a thin layer of the mould. This could be remedied by using a face coat of a harder, less porous material and using the plaster mix as a back up. Much research is left to do.

Sample #	Casting Materials	Cone #	Notes
1	n/a		
2	n/a		
3	Kona F-4 + RIO	10 ox	shrank horribly and didn't take shape too well
4			
5	neph sy + RIO + yellow ochre	10 ox	filled mould but still shrank even with funnel
6	Borax	6 ox	cracked and ate through mould
7	Gerstley Borate	6 ox	cracked and ate through mould
8	80--frit 3403 20--albany slip	6 ox	cracked and ate through mould
9	barnard substitute	10 red	shrank slightly, ate into thin layer of mold
10	nc-4	10 ox	filled mould great, some parts stuck to the mould
11	frit 3124	04 ox	filled perfectly, didn't eat mould. PERFECT
12	60--frit 3110 40--grolleg	6 ox	filled well, but showed some color change where it touched the mould
13	85--kona F-4 15--barnard	10 ox	filled great but had color change
14	temmoku	10 ox	overflowed, shrank, and had a hard shell
15	R-1000 *	6 ox	filled well but has a slight texture to it
16	75--alberta 25--frit 3124	6 ox	filled well with a color change
17	50--alberta 50--frit 3124		shrank and penetrated the mould
18	60--neph sy 20--shefeild slip 20--alberta	10 ox	shrank and penetrated the mould

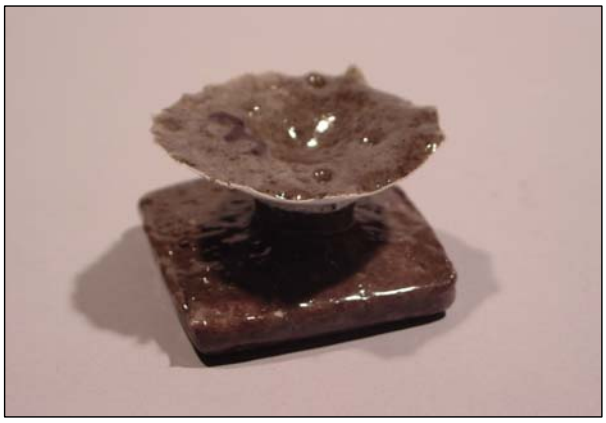
Moulds 1-8 were the two part moulds with a funnel
Moulds 9-18 were the small cup moulds

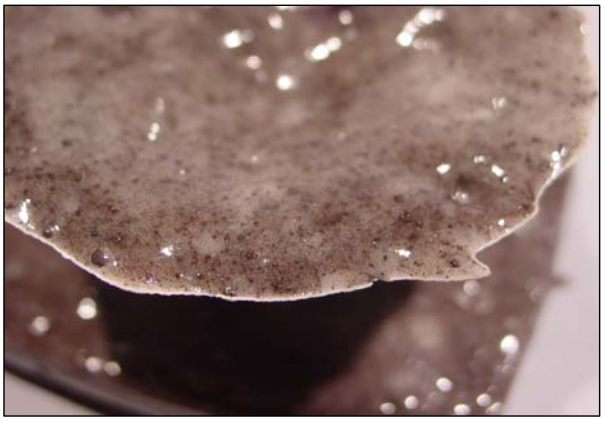
* R-1000 (Temmoku formula from Val Cushing's handbook)

Neph Sy	38.7
Wollastonite	15.2
Strontium	15.2
EPK	10.2
Laguna Borate	10.2
Flint	10.2
Whiting	12

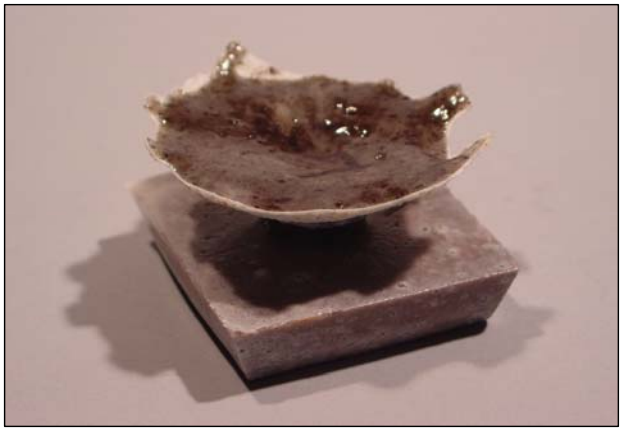
Two-Part mold results

Sample #3





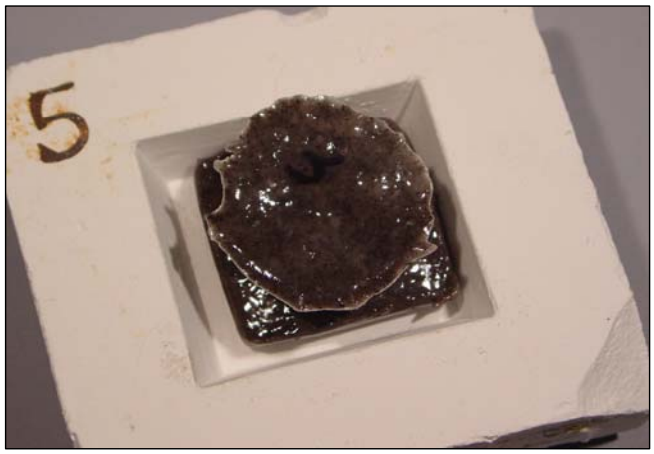
Sample #5



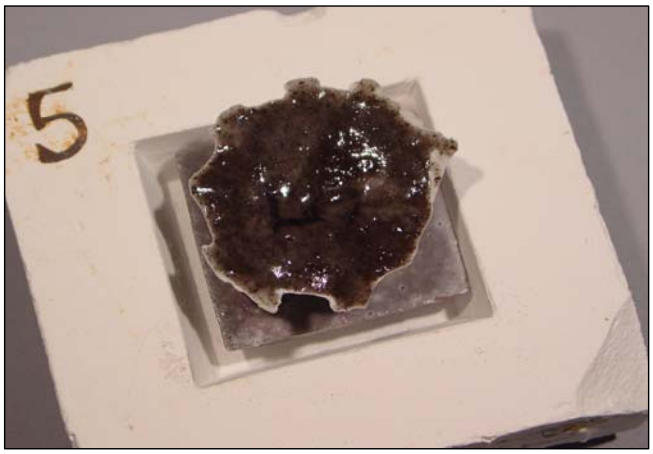
Underside view

Sample #3 shrunk considerably more than sample #5

Sample #3

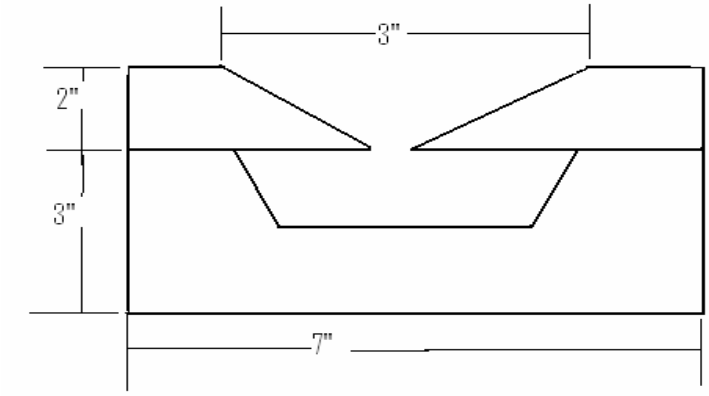


Sample #5



The master model from which molds were made. The top section of the model was made from a plaster cylinder. The bottom was made from laminated sheets of corian (courtesy of the RePo). The two were then screwed together...

Dimensions of the model

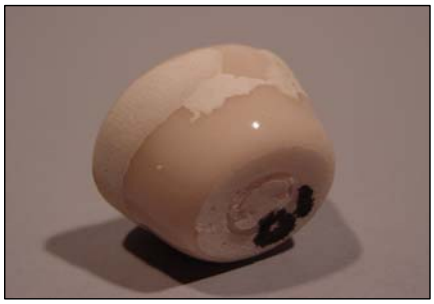


Cup-mold results

9

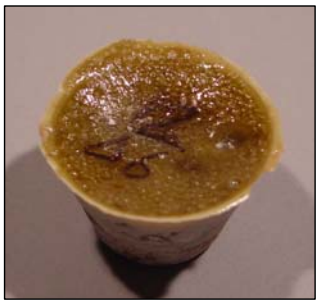


10



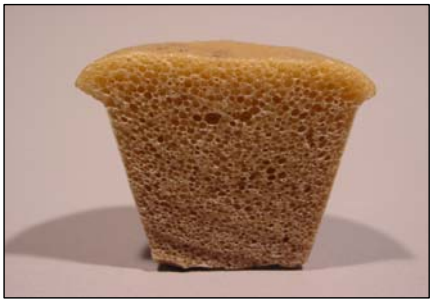

11


12

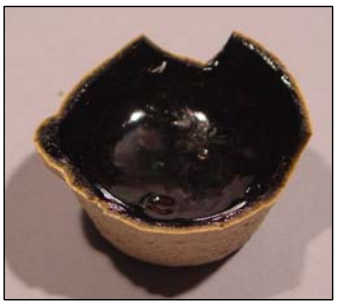


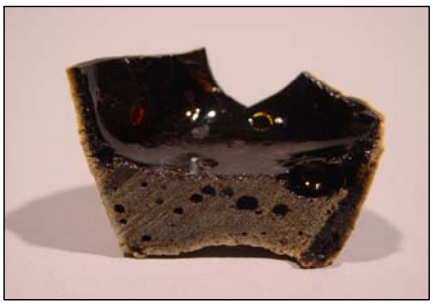
13





14





15


16


17

18

Sample #14 sprayed with WD-40 on the left and without on the right

Making a cup mold

Clay was packed at the bottom of the cup to take up some space (the mold doesn't have to be the full height of the cup). Note The cup is cut along the side to allow for easy release. This can be taped with duct tape and re-used.

Casting in progress...

After the plaster/silica has set, the top part is removed. This top part consists of a small 2 ounce cup glued to a piece of wood.

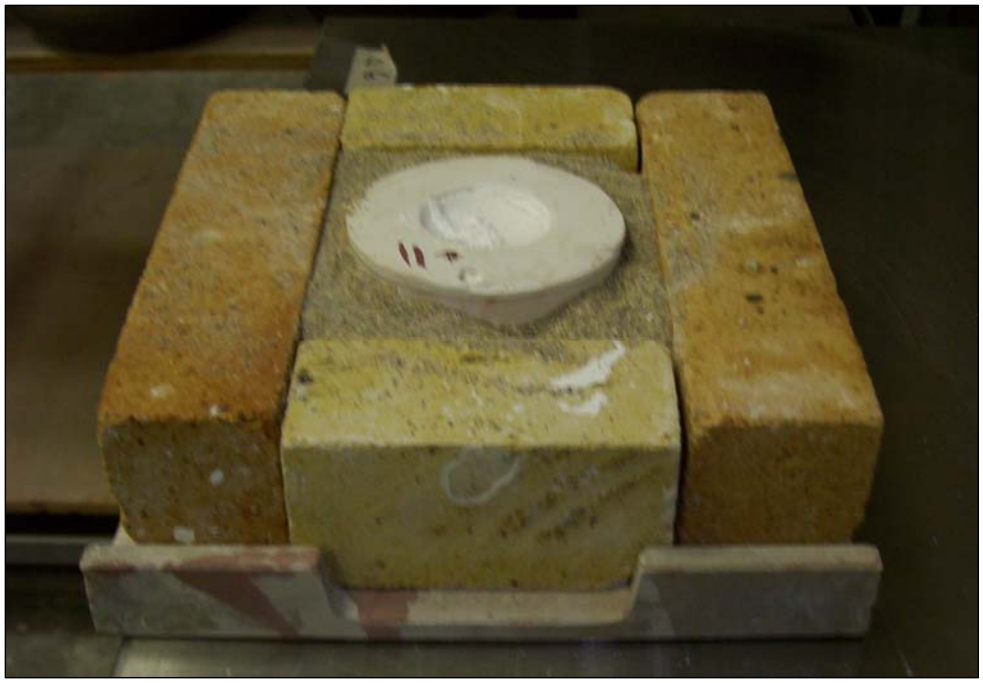
The mold and its product after firing

I found that often the molds would crak apart during firing. I was able to minimize this by reinforcing the outside of the mold using fiberglass cloth dipped in plaster...

After removing from cup

After bandaging

After the mold has been packed with the ceramic material, it is isolated in sand. The sand ensures that even if the mold cracks during firing, It will hold its shape. It also protects the kiln from blowouts during the firing.



Name: Mark Cousino
Type: Glaze Buttons for sprig application
Color: Various
Texture: Smooth
Cone: 6 Ox. and Red.

Recipe: See below…

Development Process:

For my final project I decided to create buttons by dry-pressing ceramic powder in the arbor press. These pre-fired buttons could then be placed on the sides of vessels, allowing them to fuse and accentuate the volume of the form during firing.

I began by doing three separate line blends in order to get an idea for the ratio of clay to frit necessary for the desired melt. The line blends were as follows:

	Point1	Point 2	Point 3	Point 4	Point 5
Redart	50%	45%	40%	35%	30%
Frit 3110	50%	55%	60%	65%	70%

	Point1	Point 2	Point 3	Point 4	Point 5
Tile 6	50%	45%	40%	35%	30%
Frit 3124	50%	55%	60%	65%	70%

	Point1	Point 2	Point 3	Point 4	Point 5
Grolleg	50%	45%	40%	35%	30%
Frit 3134	50%	55%	60%	65%	70%

I suggest placing all tests on some surface that will provide information as to the viscosity of the melt.

These tests, although they did not melt in cone 6 oxidation, provided valuable information. From there I knew I needed a third ingredient to get the needed eutectic. So for my next test I added percentages (12% increments from 24-60% and an 85% addition) of fluxes at cone 6 (talc, gerstley borate and whiting). If one were to pursue this method of working, I suggest doing more comprehensive testing of different materials.

I found that the best mixture that has a complete melt yet still remains slightly viscous is as follows

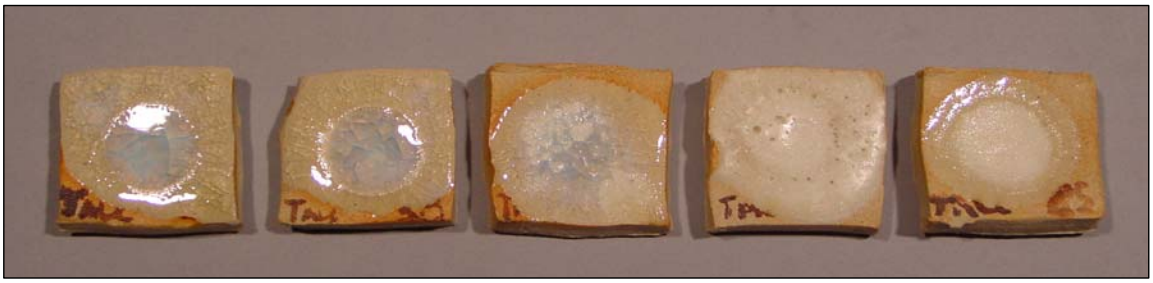
Grolleg 14.71%
Frit 3134 58.82%
Whiting 26.47%

From here I tested various oxides to achieve different desired colors.

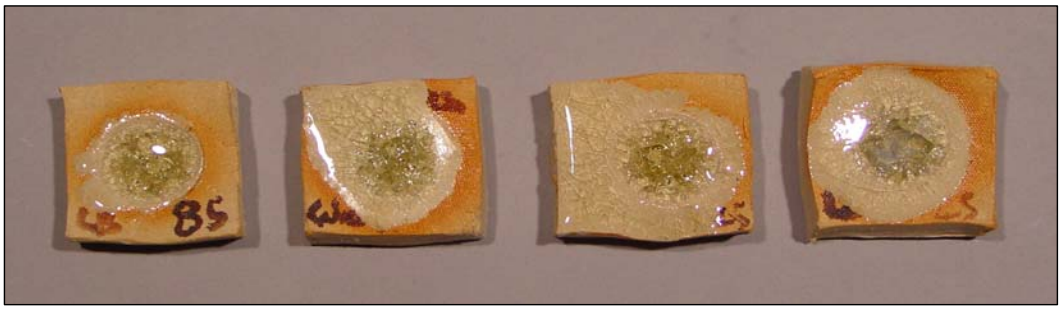
Using the Arbor press to create the buttons is laborious. Another way to go about obtaining these buttons would be to create a plaster mold with multiple buttons impressed in the surface. Then make your desired mixture into a slip and pour it into the mold. Take a squeegee and wipe of the excess slip leaving the buttons full of slip. Once the slip has dried, you will easily obtain many buttons with little effort.

In the following line-blends, a ratio of 20 groleg to 80 Frit 3134 was blended with individual materials (Talc, Gerstley Borate or Whiting). Exact amounts of these individual materials is a mystery, although they most likely ranged bewteen 24 and 85%.

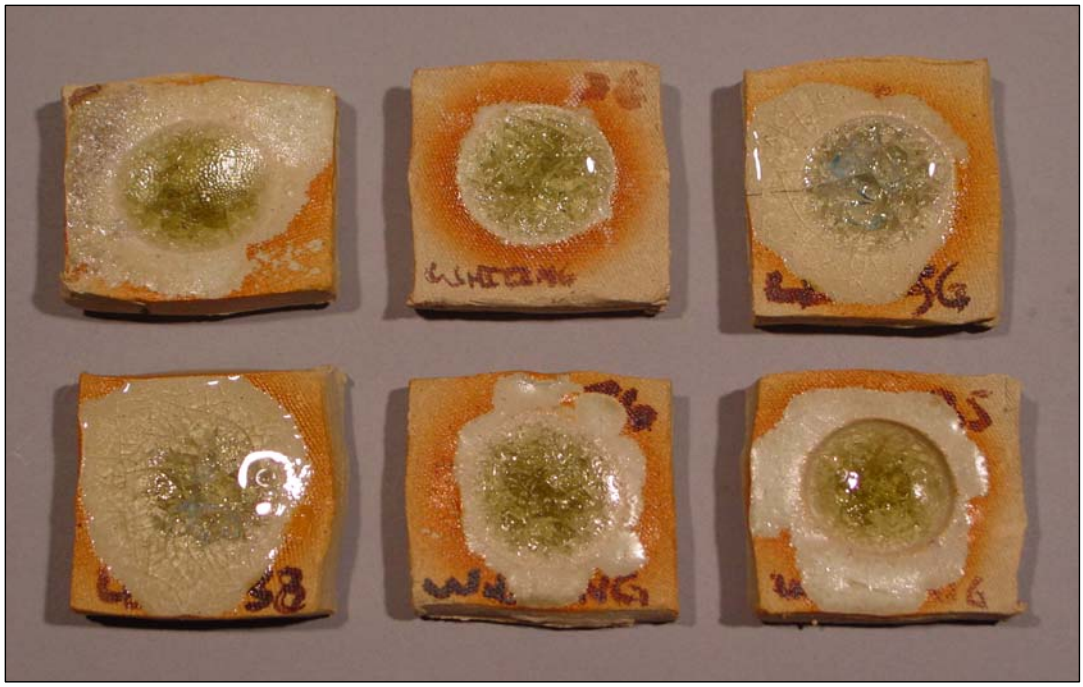
Grolleg/Frit base blended with Talc



Grolleg/Frit base blended with Gerstley Borate

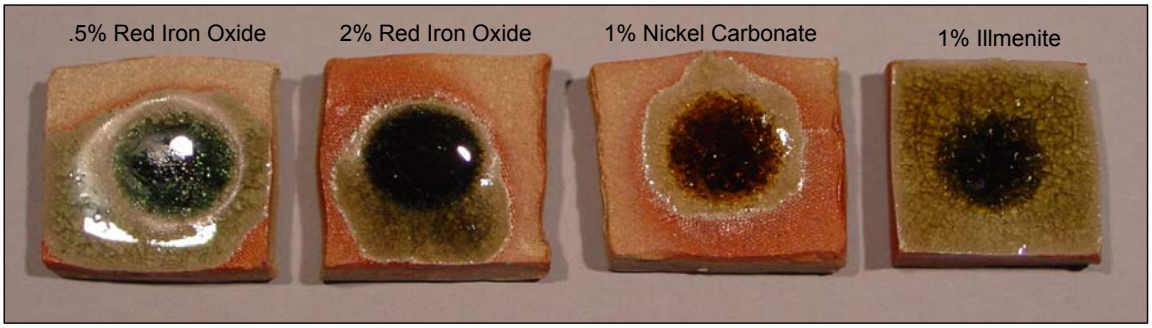


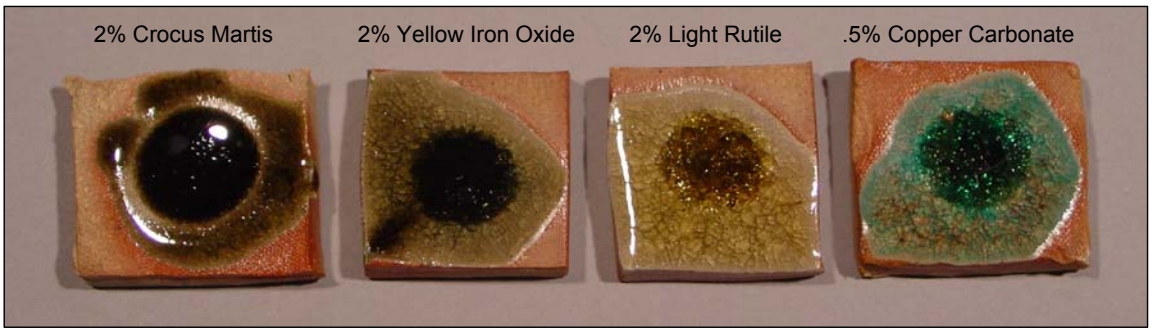
Grolleg/Frit base blended with Whiting

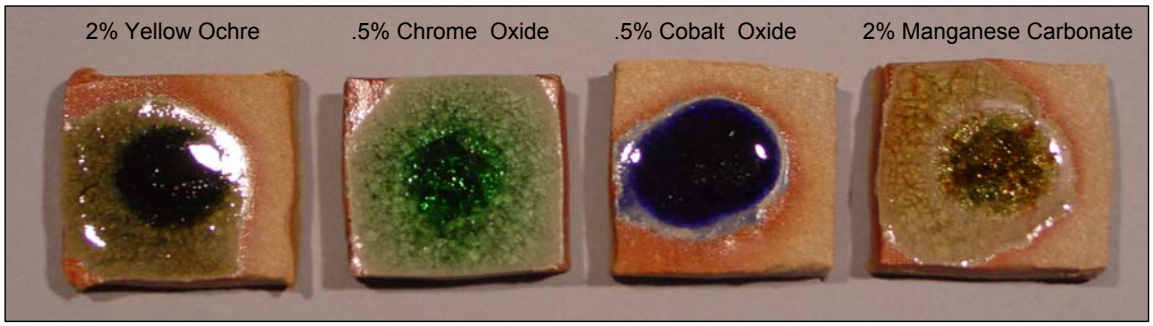


The samples below were fired in reduction and used various differnet colorants in the following base:

Grolleg	14.71%
Frit 3134	58.82%
Whiting	26.47%

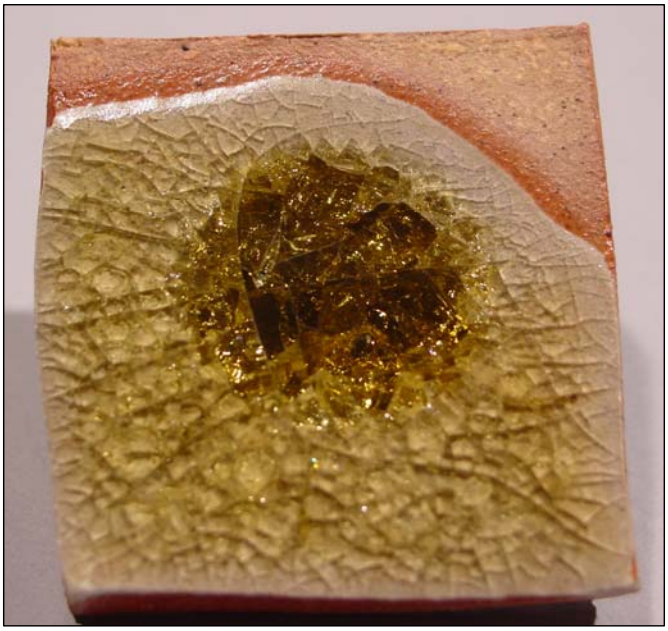




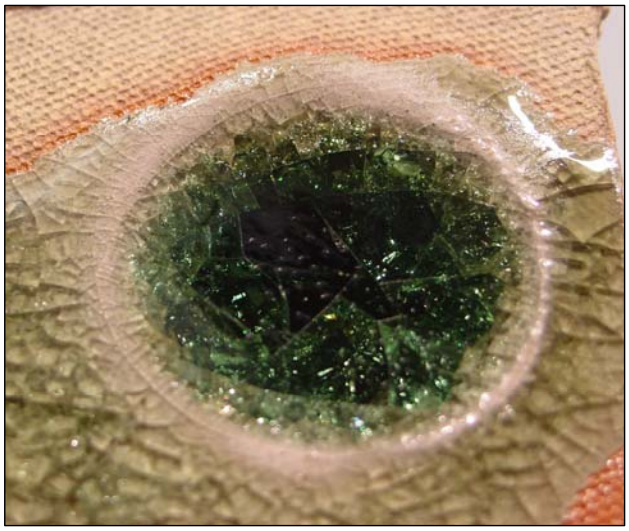


Closeups

2% Light Rutile

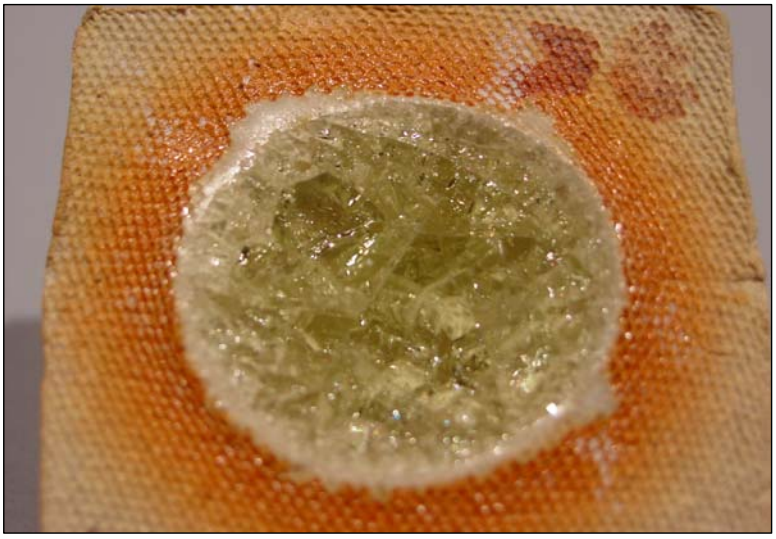


2% Red Iron Oxide

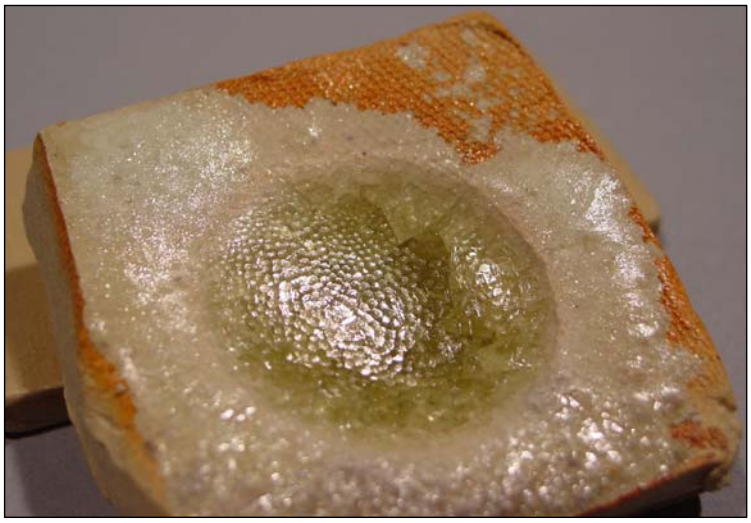


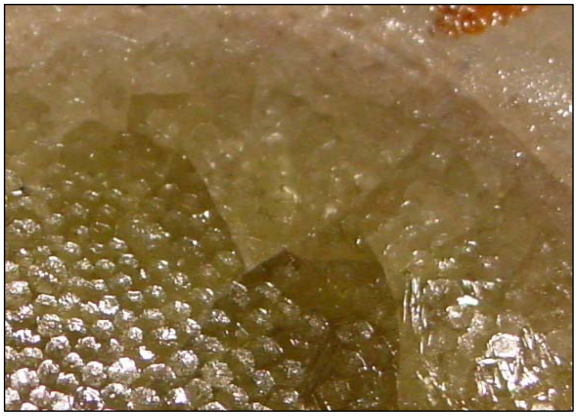
From Talc series (note crystallization)

From Whiting series



(Note the odd dimpled surface)





Name: Ross Edwards
Type: Throwing/casting body
Color: White
Texture: Smooth
Cone: 10

Recipe: #747 boxed porcelain

Grolleg		55.56
Custer		18.18
Flint		15.15
Pyrax		5.05
Molochite (200 mesh)		3.03
Bentonite		3.03
	Total	100%

For casting add:

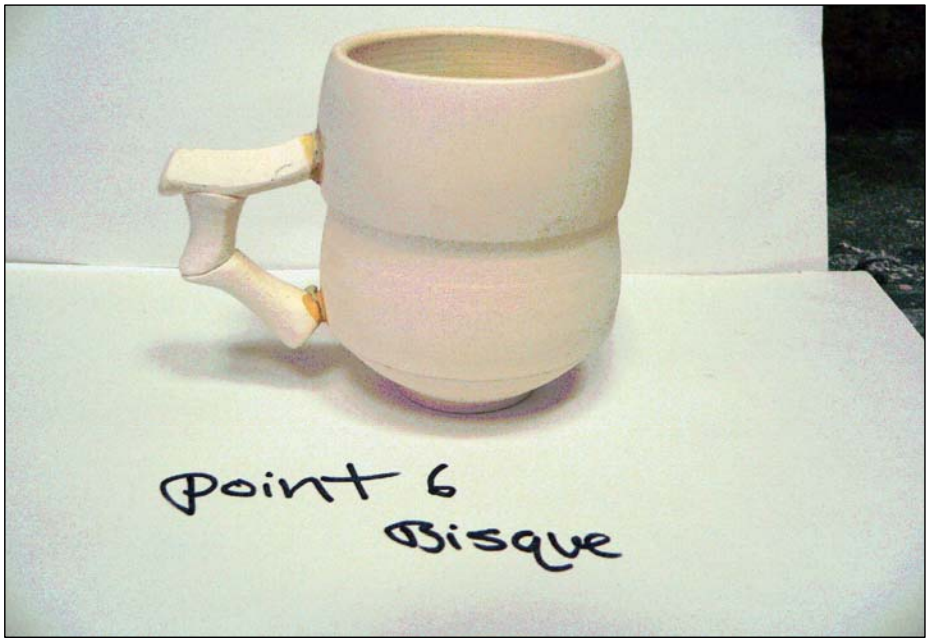
Darvan #7	.1812%
Water	60% (see below!)

Development Process: I have been working on integrating different methods of attaching handles and spouts to my wheel thrown work. I use Linda Sikora's porcelain body when I throw so I decided that it would be beneficial to defloculate the body in order to cast with it. Before I did this, I was actually using another body to cast with and it would usually crack or shrink too fast. Being able to cast the same body I am throwing with will enable me to have cleaner attachments. The drying rate along with the body's color will be equal after bisque.

I went about this test by creating a 2000 gram batch of the clay body. Once I dry mixed the material I then distributed 75 grams (37.5%) of water throughout ten quart containers. Next, I distributed 200 grams of the clay body into each container and mixed with the drill. I then added drops of darvan #7 in incremental amounts to each container untill I found the most fluid point. I started at the first container and added 2 drops, then 4, then 6, and so on until I reached the 10th container. I found that containers 6-10 were the best for casting (they seemed fully deflocculated). In the next step I casted several handles to see how the shrinkage would effect the piece. Every piece went through the bisque well so I decided glaze several and fire them to cone 10.

I eventually settled on the fith container (10 drops of Darvan for 200 gram dry batch or .1812%) because it used the least amount of darvan while gving me the desired viscosity for casting. I ended up bringing the water up to 60% (editors note: This is WAY too much. Should not require more than 40%. Redo the test and add more darvan!)

Bisqued test



After glaze firing

Name: Jessie Lampack
Type: Tape Casting
Color: Off white
Texture: Smooth
Cone: 6

Recipe:

For all variations…

Ceramic recipe 34.04%
Glue mix 62.96% (Elmer's Glue to Glycerin ratio: 80/20)

Recipe #1: (Porcelain #3)		Recipe #2 (Reeves Porcelain)		Recipe #3: (Variation on Silverman's 503R matte glaze cone 6)	
Tile 6	30%	Grolleg	40%		
EPK	25%	Custer	34%		
C&C	5%	Flint	26%	G-200	51%
KonaF-4	20%			Whiting	7%
Flint	10%			Flint	7%
Pyrax	10%			Barium Carb	35%

Development Process: I began by testing three different recipes with the same ratio of glue mix to ceramic material at cone 04. I ended with choosing one recipe and firing to cone 6.

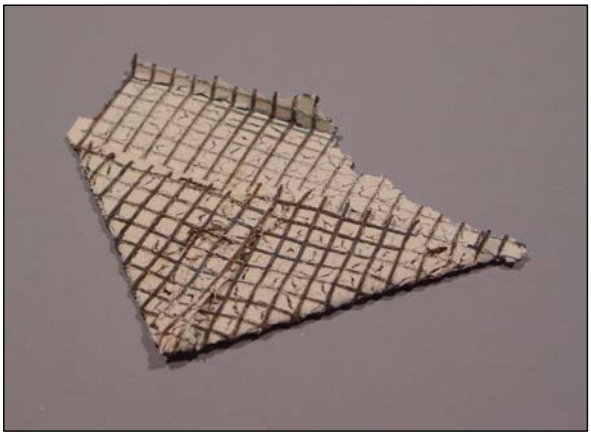
The first test that I tried involved all three recipes and was fired to cone 04. I dry mixed the ceramic and then separately mixed the glue and glycerin; I then combined the two by slowly mixing the dry into the Elmer's and glycerin. I kept the rpm's low, in an effort to limit the amount of bubbles created. Immediately following the mixing I poured the mixture onto Mylar. The Mylar had previously been mounted to a flat surface with spray glue and had been lightly sprayed with silicon to help loosen the tape after it dried. I cast the tape to a little over 1mm in thickness and let it dry over night. All three recipes were cut into shapes and fired. Cone 04 did not work however: all the pieces were incredibly fragile, and almost impossible to handle without breaking.

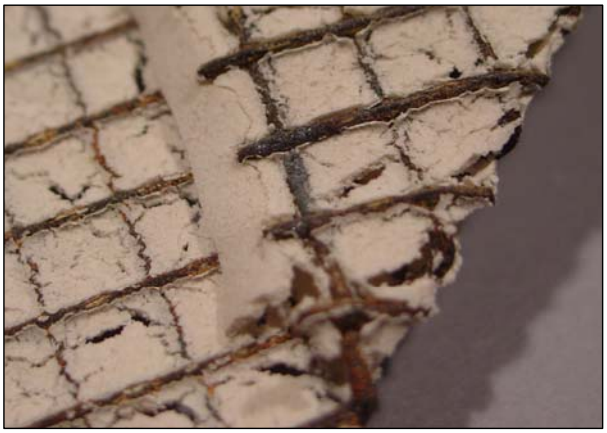
The next test continued with all three recipes but fired to cone 6. The first and second recipes hardened and worked great, but the third recipe melted away due to it being a glaze I suppose (surface tension?). Also during this test I tried embedding various materials into the tape while it was wet in order to try to create a fold. None of these turned out, most likely due to shrinkage issues with firing. Some of the tested materials were hardware cloth, fiberglass mesh, and window screen.

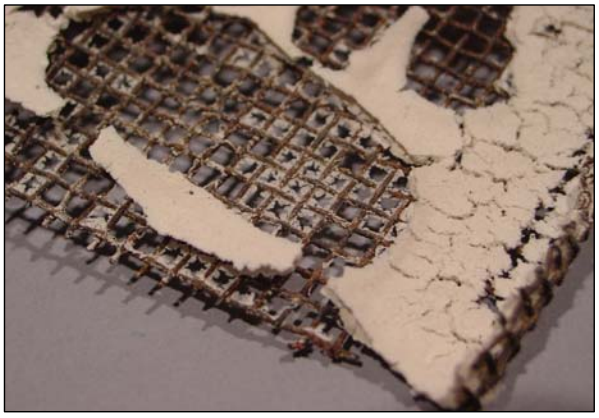
The third test only involved the first and second recipes and was fired to cone 6. For this test I cast various thicknesses of the mixtures. I tried one layer (approx. 1.25mm), a double layer (approx. 2.5mm), and a single layer cast and dried and then a second layer cast on top of that. After drying I cut them into strips and looped them to create short cylinders. I made a cylinder for each thickness and also double and triple layered the tape to see which thickness would resist slumping the best. I could test this by setting the cylinders on their sides. I found that recipe one worked best and had the least amount of slumping was the version that was cast to a single thickness, dried, then cast again the next day (i.e. double thickness).

My final firing was to cone 6 and I simply cast a double thick tape of recipes one and two. After drying I made two large cylinders from recipe one, and used recipe two for added decoration. The tape connects to itself and other tape with just water. These cylinders turned out fine, but honestly I did not find the results I had originally desired. I wanted to develop a recipe that could be folded without breaking and hold the edge during the firing. I did find that you can connect strips of recipe one to other strips perpendicular and it will hold. This may be the next starting point for research to continue.

Fired examples of hardware cloth imbedded into tape during casting



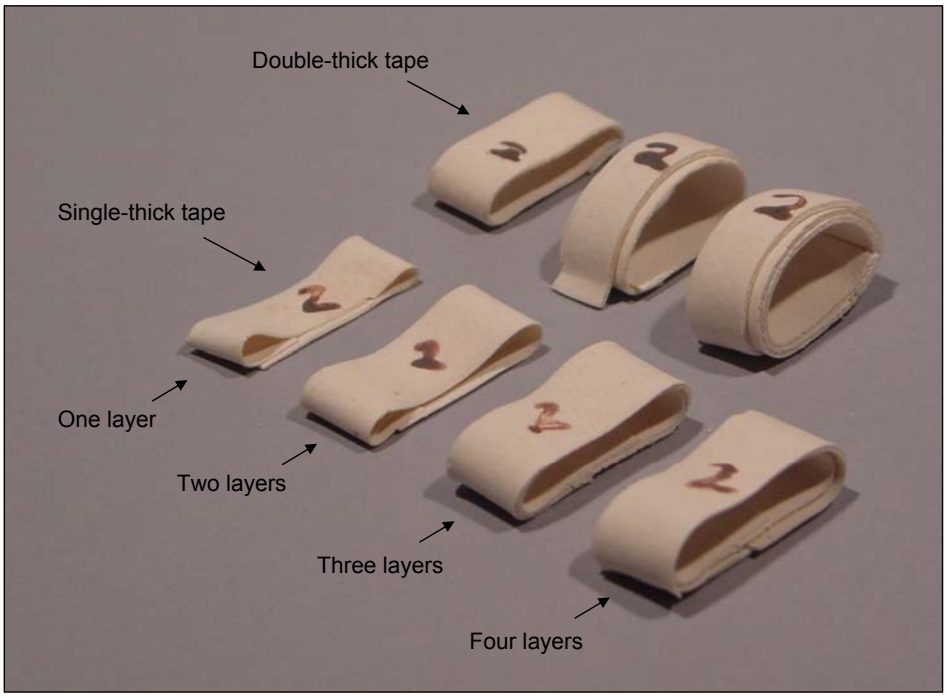




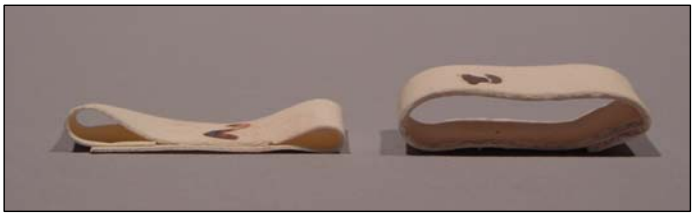
Fired example of window screen imbedded into tape during casting

Note: A single layer of tape at the time of casting is the thickness of galvanized sheet metal (aproximately 1.5 mm)

Recipe #2 (Reeves Porcelain)

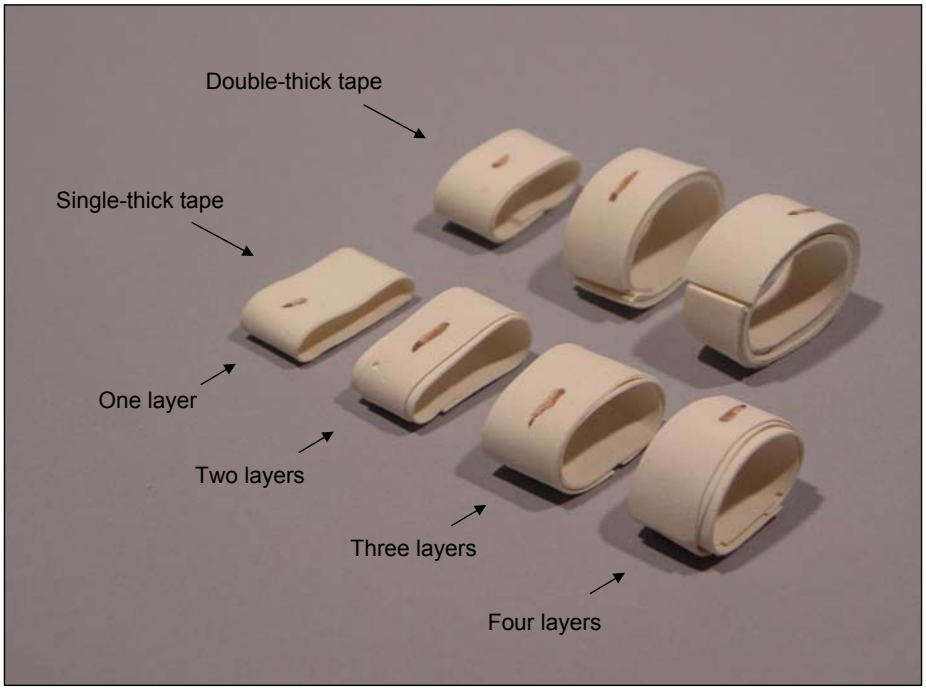


Comparisson of single-thick (left) and double-thick (right) tapes. The extra material in the double-thick version gives it much better support during firing.



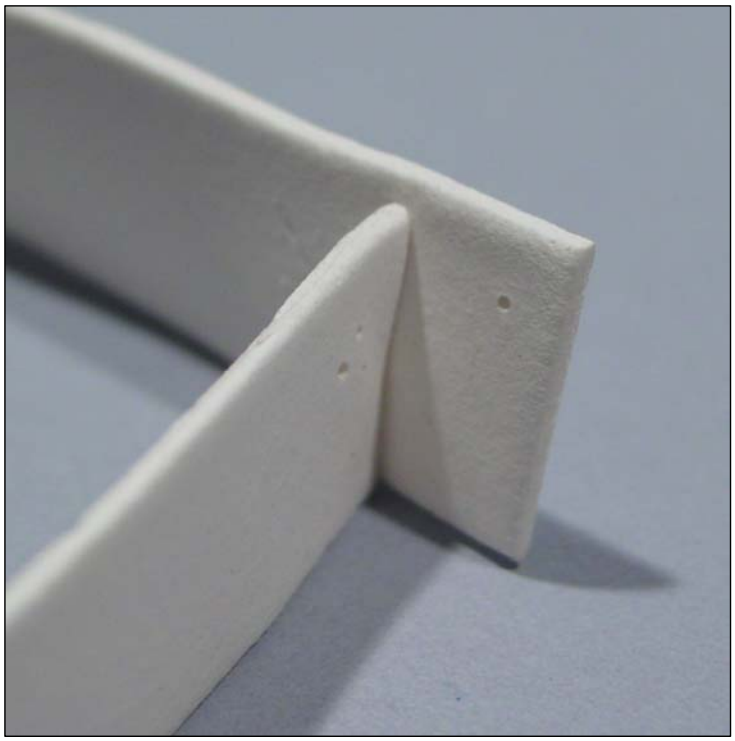
Single-thick tape (left) is aproximately half the thickness of double-thick tape (right).

Recipe #1



Close-up of single-thick tape laminated four layers thick

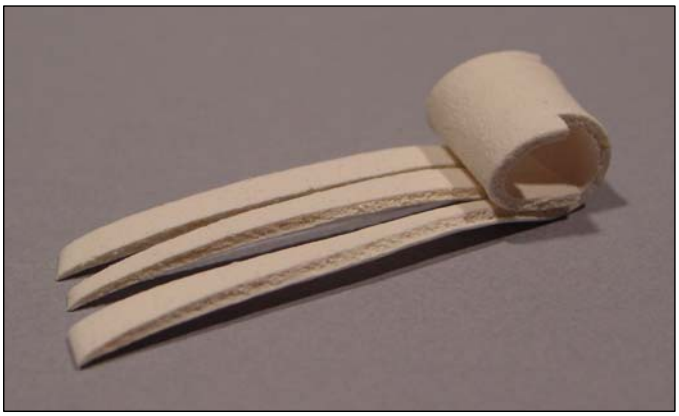
Form made by attaching strips with water (Recipe #1)

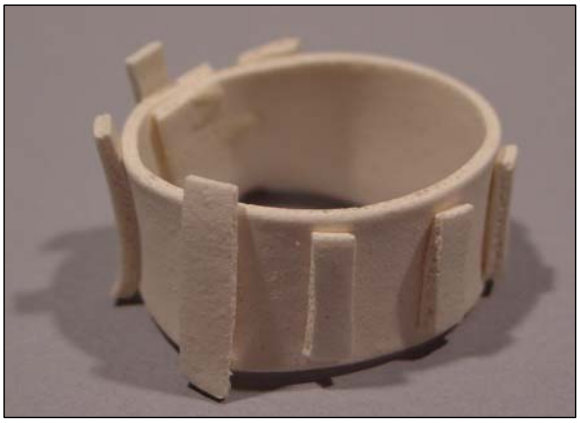


Recipe #3. Object is made by laminating many different layers.

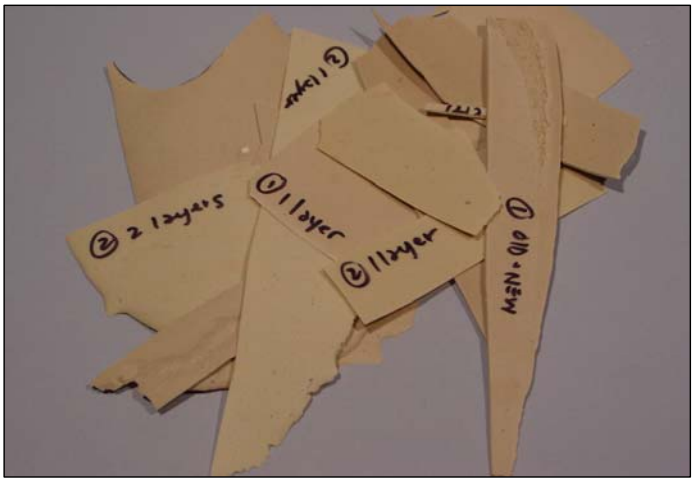
Backside of above

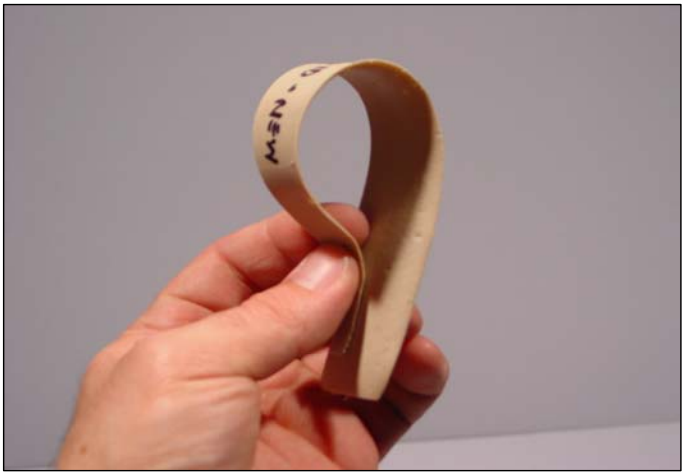
The following were made using Recipe #1 for the body and Recipe #2 for the straps (aproximately 6 inches tall)





Various tapes before firing





Name: Amy LeFever
Type: Slumping bodies
Color: Red and white
Texture: Very glassy and smooth
Cone: 6

Recipe: Various/See below

Development Process: The goal for this research was to develop both light and dark colored bodies with a high degree of flux. The flux would be strong enough so that objects placed on top of each other would stick to each other during firing. This would allow me to compose clusters of objects without having to attach them when wet. The fluxing should be enough to soften the edges of a cut slab without completely loosing its structure.

Test 1 (Red variation)

	1	2	3	4	5	6	7	8
Red Art	85	75	65	55	45	35	25	15
Neph Sy	15	25	35	45	55	65	75	85

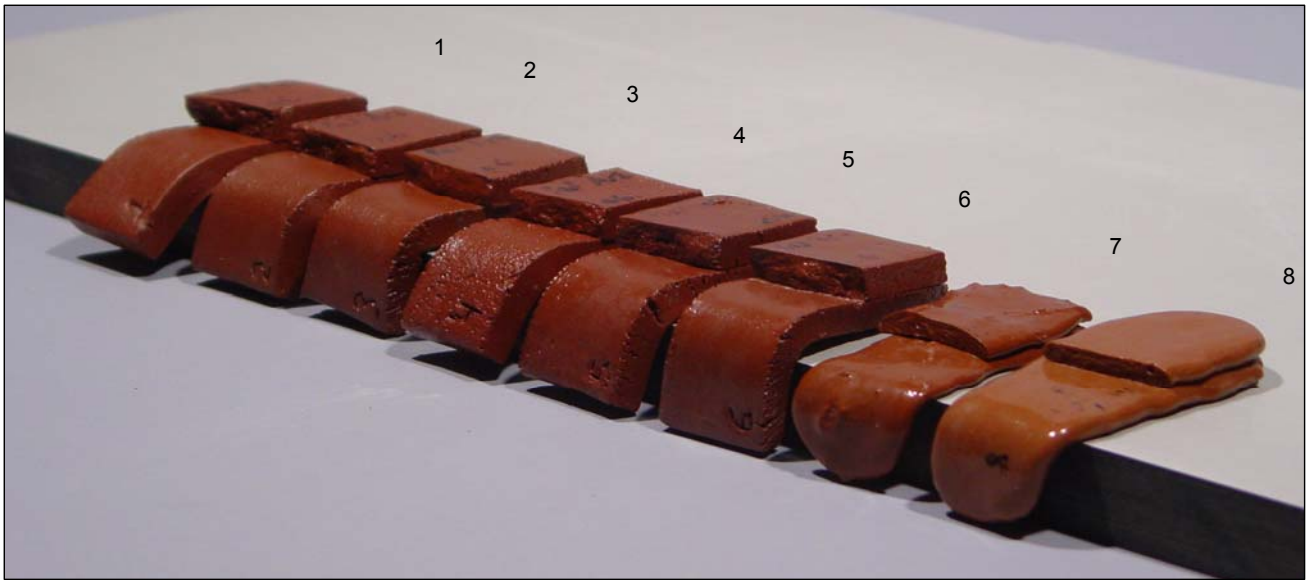
Procedure:

Mixed water with ingredients until a plastic state was reached. Test tiles were then made and placed on a tile setter covered with ¼ inch of alumina hydrate. The tiles were positioned with approximately 40 % of the tile cantilevered. Another section of tile, created from the same body, was placed over the back portion of the first tile in order to see how well the body would adhere to itself. The tiles were then fired to cone 6 oxidation.

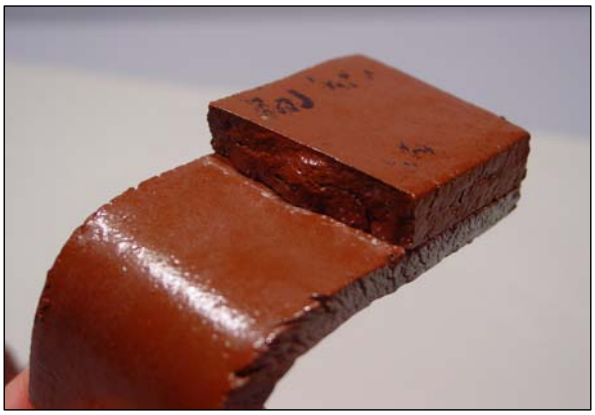
Results:

Bodies 7 and 8 were impossible to work with as a clay body; they were very thixotropic. The tiles had to be poured, not cut from a slab. All eight tests slumped (90 degree angles except for body 1) and fused, although the edges of the tiles did not even seem to be very soft. The surface of each was very rich and glossy.

Red Art and Neph Sy blend (Test 1)



Detail of 7



Detail of 8

Test 1 (White variation)

	1	2	3	4	5	6	7	8
Grolleg	85	75	65	55	45	35	25	15
Neph Sy	15	25	35	45	55	65	75	85

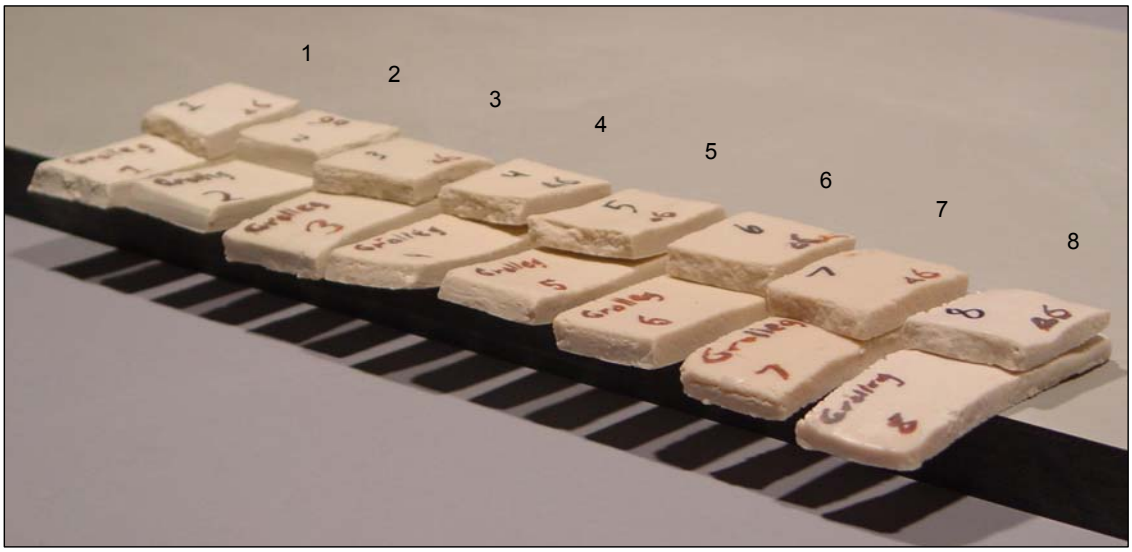
Procedure:

Mixed water with ingredients until a plastic state was reached. Test tiles were then made and placed on a tile setter covered with ¼ inch of alumina hydrate. The tiles were positioned with approximately 40 % of the tile cantilevered. Another section of tile, created from the same body, was placed over the back portion of the first tile in order to see how well the body would adhere to itself. The tiles were then fired to cone 6 oxidation.

Results:

Only body 8 slumped a little. Bodies 7 and 8 both looked glassy on the surface. None of the bodies really fused, though the higher numbers (6-8) seemed to have gotten tacky. They joined slightly, but could be tapped apart pretty easily.

Grolleg and Neph Sy blend (Test 1)



Detail of 8 (starting to sheen)

Test 2

	1	2	3	4	5	6
Grolleg	90	80	70	60	50	40
Frit 3110	10	20	30	40	50	60

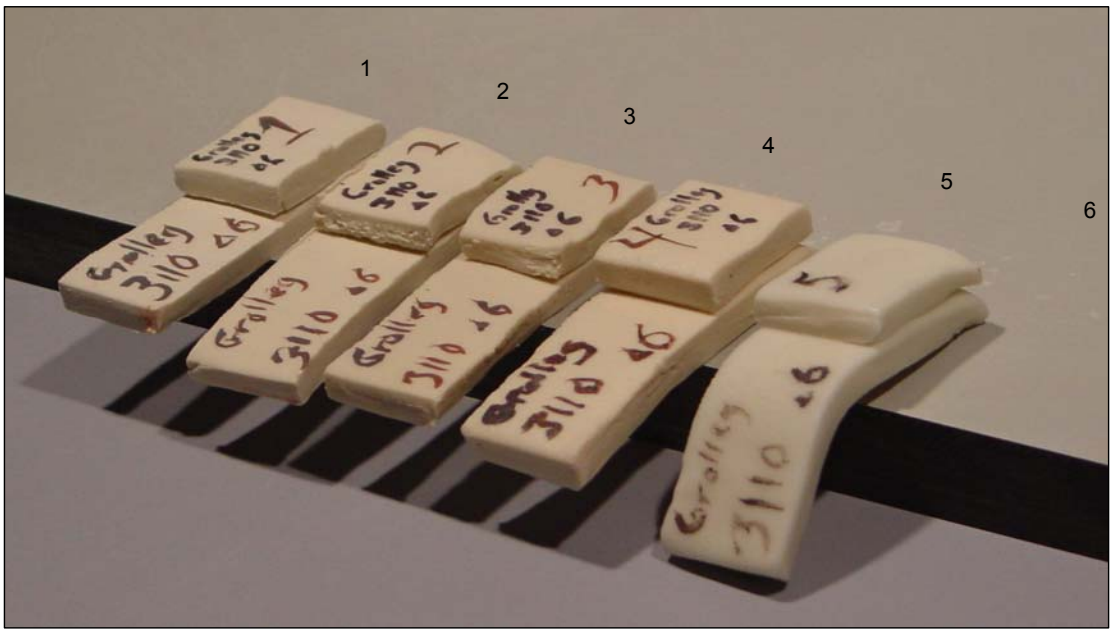
Procedure:

Mixed water with ingredients until a plastic state was reached. Test tiles were then made and placed on a tile setter covered with ¼ inch of alumina hydrate. The tiles were positioned with approximately 40 % of the tile cantilevered. Another section of tile, created from the same body, was placed over the back portion of the first tile in order to see how well the body would adhere to itself. The tiles were then fired to cone 6 oxidation.

Results:

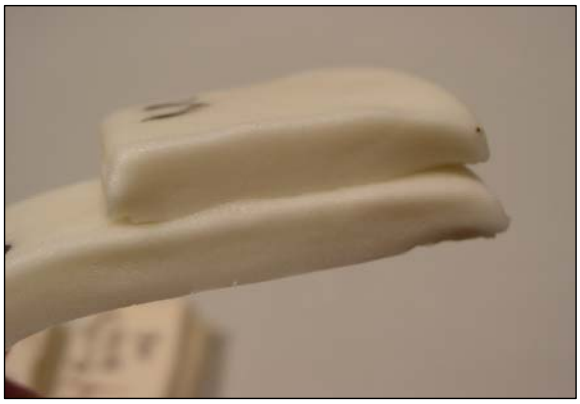
Bodies 1-3, no slumping. Bodies 2 and 3 tacky, could tap layers apart easily. Body 4 slumped slightly and fused. Body 5 slumped to a 45 degree angle, fused very well (with edges softened as well), had the appearance of a crystal matte surface. Body 6 (not in the picture) melted completely, forming a puddle of glaze on the tile setter as well as on the kiln shelf.

Grolleg and frit 3110 blend (Test 2)



Detail of 4

Detail of 5



Test 3

Procedure:

Coated bowls that had been fired to cone 10 with two or three layers of kiln wash.
Mixed body 6 of Red Art test (35 Red Art, 65 Neph Sy) with approximately 22.4% water. This mixture was then squeezed out of a plastic condiment bottle into the bowl forms, to create a somewhat lacy pattern.

Results:

Bowl 1 having the steepest sides and bowl 3 being the shallowest.

Wet:
- Bowl 1: difficult to get the clay to stay on the sides, wanted to tear and fall down
- Bowl 2: a little difficulty staying in place at rim where steeper
- Bowl 3: not much trouble at all

Dry:
- Bowl 1: lots of cracking apart of the clay “strings”, especially at joints and steep sides
- Bowl 2: not as much cracking as 1, but more than 3
- Bowl 3: very minimal cracking

Fired:
- Each stuck to the bowl/kiln wash and had to be chipped out of the mold. Cracks occurred in cooling as a result of not being able to shrink as much as it needed. However, the cracks that occurred during drying seemed to have healed and fused back together during the firing.

Problems:

It was difficult to squeeze out of the bottle because of dilatancy: the harder I squeezed, the more the clay “froze” and wouldn’t move at all. Also, the clay stuck to the kiln wash, which did not allow the object to contract stress-free upon cooling. This resulted in cracking. Furthermore, it was difficult to release the object due to cohesion to the kiln wash.

Also in this round of tests, I worked with the Grolleg body again.

This series was done between point 5 and 6 of the last series...

	1	2	3	4	5	6
Grolleg	50	48	46	44	42	40
Frit 3110	50	52	54	56	58	60

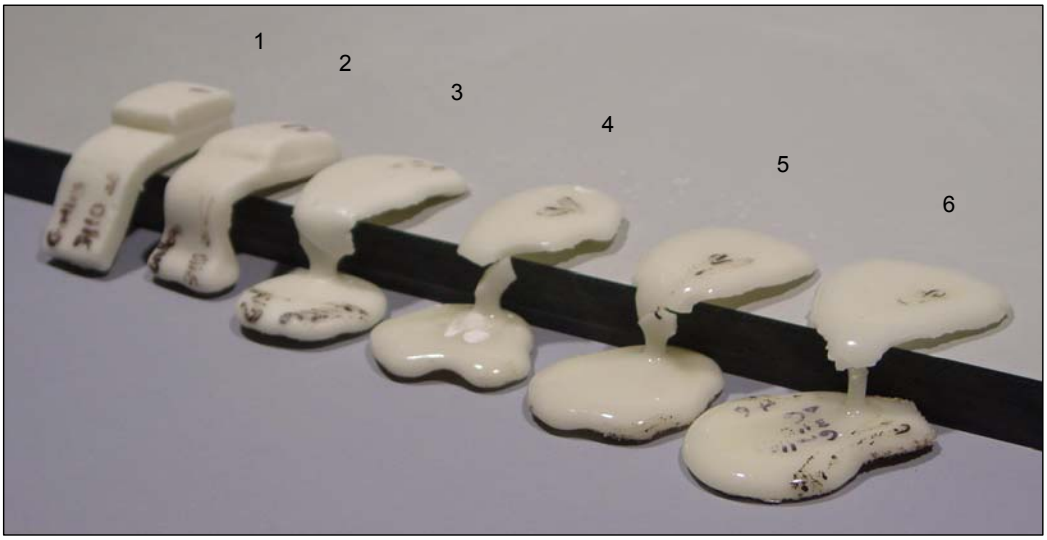
Procedure:

Mixed water with ingredients until a plastic state was reached. Test tiles were then made and placed on a tile setter covered with ¼ inch of alumina hydrate. The tiles were positioned with approximately 40 % of the tile cantilevered. Another section of tile, created from the same body, was placed over the back portion of the first tile in order to see how well the body would adhere to itself. The tiles were then fired to cone 7 oxidation (kiln over-fired).

Results:

Body 2 slumped a lot, at a 90 degree angle and a slight bulge at the bottom where it began to move, but it did not turn into a glaze puddle. The rest of the bodies—3 through 6—were basically very stiff glazes. Bodies 2 and 3 were very translucent even at a thickness of approximately ¼ inch.

Grolleg and frit 3110 blend (Test 3)



Detail of 1 and 2

Detail of 2

Test 4

This series of tests was done with approximately ¼ inch of alumina oxide coating the bowls (which were all shallow this time), instead of kiln wash. The alumina was mixed into a thick slurry with water, and then poured into the inside of each bowl.

Each bowl contains a different clay body, the variables being amount of water, Darvan 811, Epsom salt, and paper. The goal was to find the clay body that had the best workability for this procedure.

1)

Red Art	105
Neph Sy	195
Water	84 (22% of 100 g batch)
Darvan 811	8 drops
Epsom Salt	7 drops

Results: Seemed fairly easy to squeeze out of the bottle, did not have much trouble with getting the "string" of clay/slip to stay on the walls of the bowl. The string retained its shape and did not completely puddle together at joints and where it overlapped. Fired nicely—no cracks (unless in drying and then healed in firing), and came right out of the mold. Beautiful definition of line and nice glossy surface.

2)

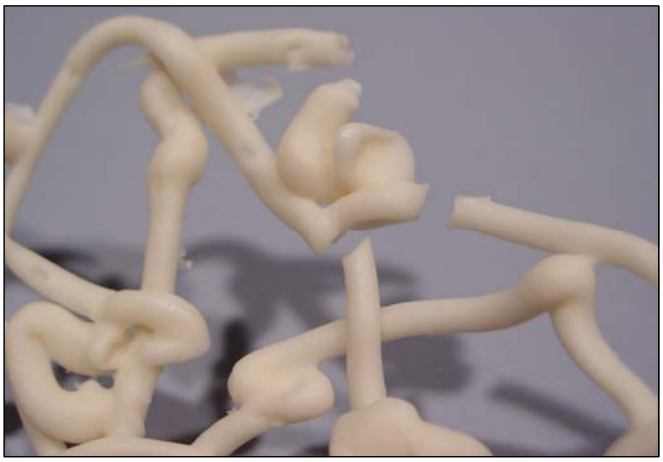
Red Art	105
Neph Sy	195
Water	96 (24 % of 100g batch)
Darvan 811	10 drops
Paper	3 grams (1% of 100 g batch)

Results: Was difficult to squeeze out of the bottle. Also, the surface texture of the string was lumpy—you could see the paper fibers. After being fired, the paper texture still remained. No apparent cracks, unless they healed. Did not stick to mold at all.

3)

Grolleg	144
Frit 3110	156
Water	135 (31 % of 100 g batch)

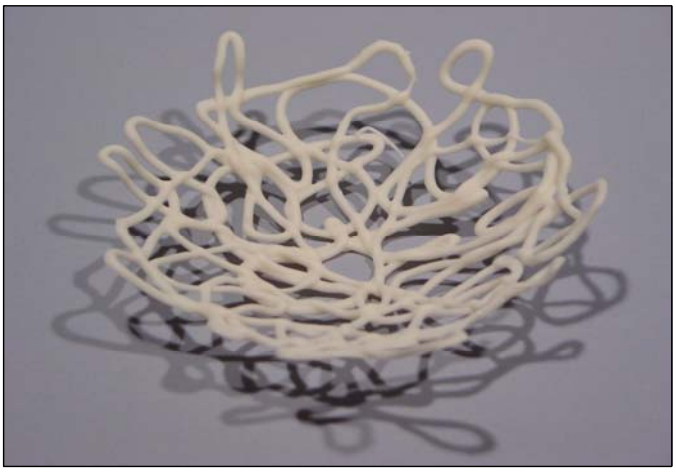
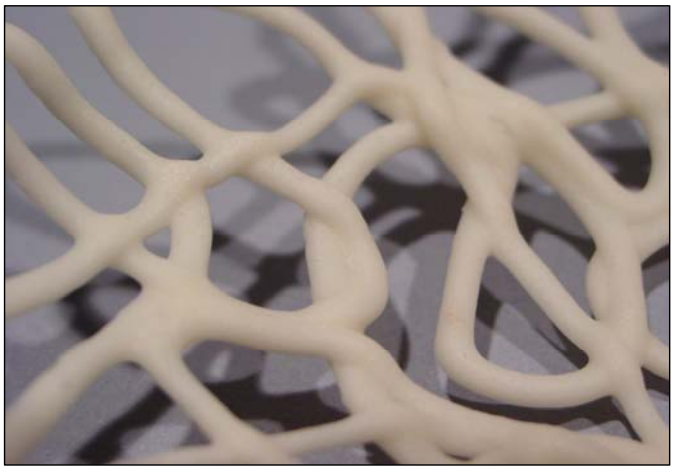
Results: Worked beautifully, held its shape, did not puddle together. Seemed to have cracked during firing and did not heal. The piece still held together as a whole, though. Came out of the mold well.



4)

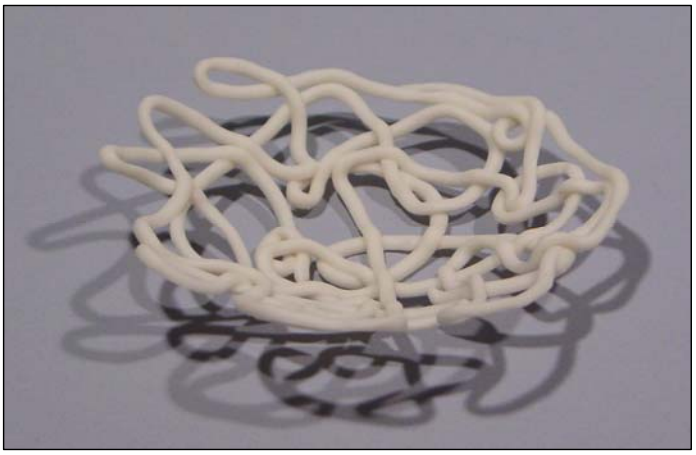
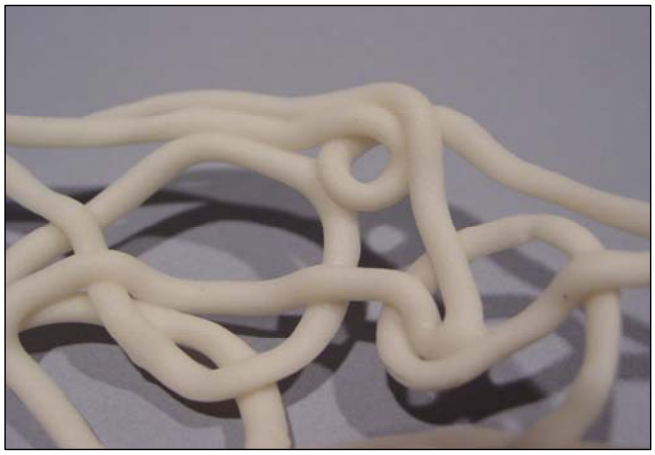
Grolleg	144
Frit 3110	156
Water	96 (24.2% of 100 g batch)
Darvan 8110	8 drops

Results: String did not hold its definition at all, puddled together completely. Did not seem to have cracked in firing. Came out of mold well.

5) Epsom salt added in unknown amount to left over body used in bowl 4

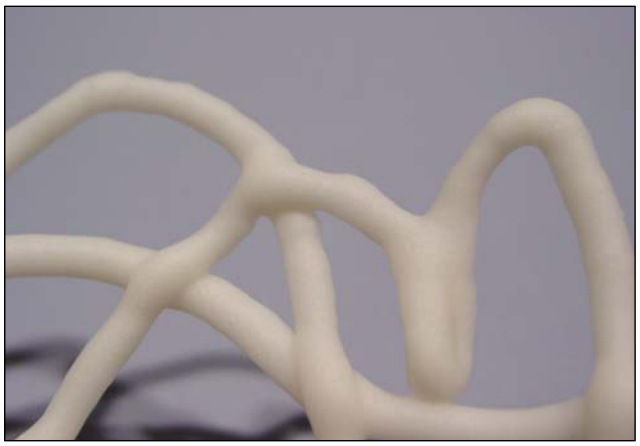
Results: Worked wonderfully, kept definition, etc. Beautiful when fired—held its definition well and did not appear to have cracked. Came out of mold well.

6)

Grolleg	144
Frit 3110	156
Water	106 (26.1% of 100g batch)
Darvan 811	8 drops
Paper	3 grams (1% of 100 g batch)

Results: Worked well, but the paper fiber gave the surface a texture. This texture is not apparent when fired. Did not seem to have cracked and it released from the mold very well.



7 and 8) Body one with body 4 drizzled over top.

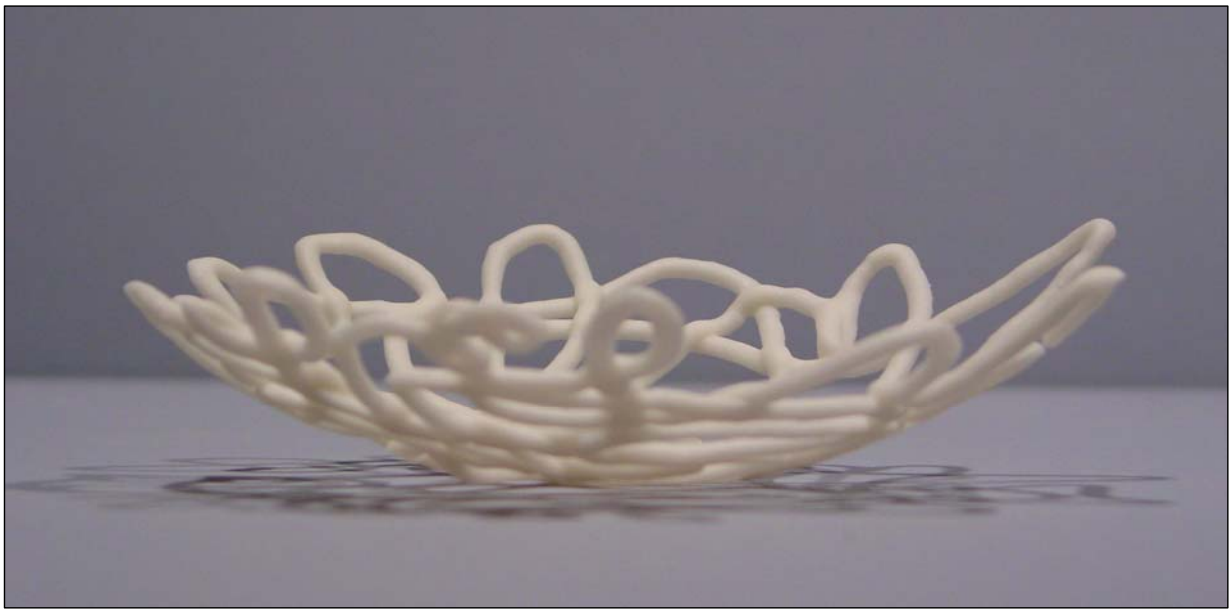
Results: Bodies seem to be compatible. No noticeable cracking resulting from layering the two clays. Released from mold.

Comparison of the bottoms of two separate pieces. Note that it was much easier to remove the Alumina residue than the kiln wash. Also note that where the Alumina contacted the clay, it robbed the clay of its sheen.

Using kilnwash

Using Alumina Oxide

Profile view of sample #6



Point 2 From the Grolleg and frit 3110 blend (Test 3)

Name: Katie Longinotti
Type: Dipping slip (for burnout materials)
Color: Off-white
Texture: Smooth
Cone: 6

Recipe:		
	Grolleg	24.16
	EPK	19.32
	C&C	14.49
	Frit 3110	38.65
	Flint	3.38
		100%
	Water	37.5%
	Darvan #7	.5435%
	Epsom Salt (Saturated Solution)	.1216%

Development Process:

Goal: To formulate a slip (white in color) viscous enough to hold onto the texture tulle (a fine mesh synthetic fabric), and strong enough to not break or be brittle once fired.

1. Recipe for slip is adapted from Carlo's personal recipes; CS#2 at cone 04.

- Used instructions from *Determining the Dispersant-Viscosity Relationship or How to Make the World's Best Stick-Up Slip.*
- Filled 10 containers with equal amounts of the dry batch; added 37.5% water to each container.
- Added deflocculant (Darvan #7) to each container, increasing each by 2 drop increments.
- Test with 30 drops of darvan was most fluid
  - (Dispersant % of Dry Batch = 0.5435%)
- Tulle was dipped into 10 different points and fired to cone 04 (points before and after the 30 drop point were used).
- These all proved quite fragile, in part because the clay was too weak, and in part because the clay coating was too thin (i.e. slip sheds off the tulle before it dries because Tulle is non absorbent)

2. Test #5 determined to be most fluid from previous test.

- Laid out 5 containers with dry batch (500 grams in each)
- Used the same amount of water and Darvan 7 in each (37.5% water; .5435% Darvan #7).
- Used the first sample as a control. To the remaining 4 samples I added a saturated solution of Epsom salts in 2-drop increments.
- Tulle dipped in each sample and fired to cone 04 and cone 6.

Conclusion: Test #5 fired to cone 6 was determined to be the strongest/ least brittle. (Cone 6 samples were stronger overall)

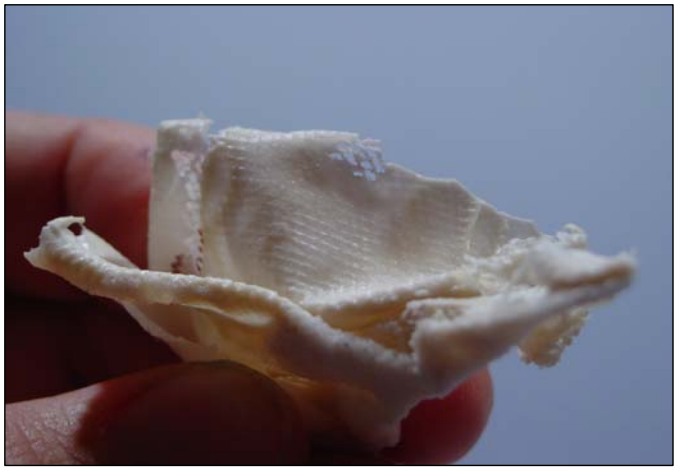
- Test #5 was 8 drops of Epsom salt saturated solution for 500 grams of dry clay (or .1216% assuming each drop of Epsom salt saturated solution weighs .076 grams)

From the second test: additions of Epsom salt solution to a 500 gram batch of slip

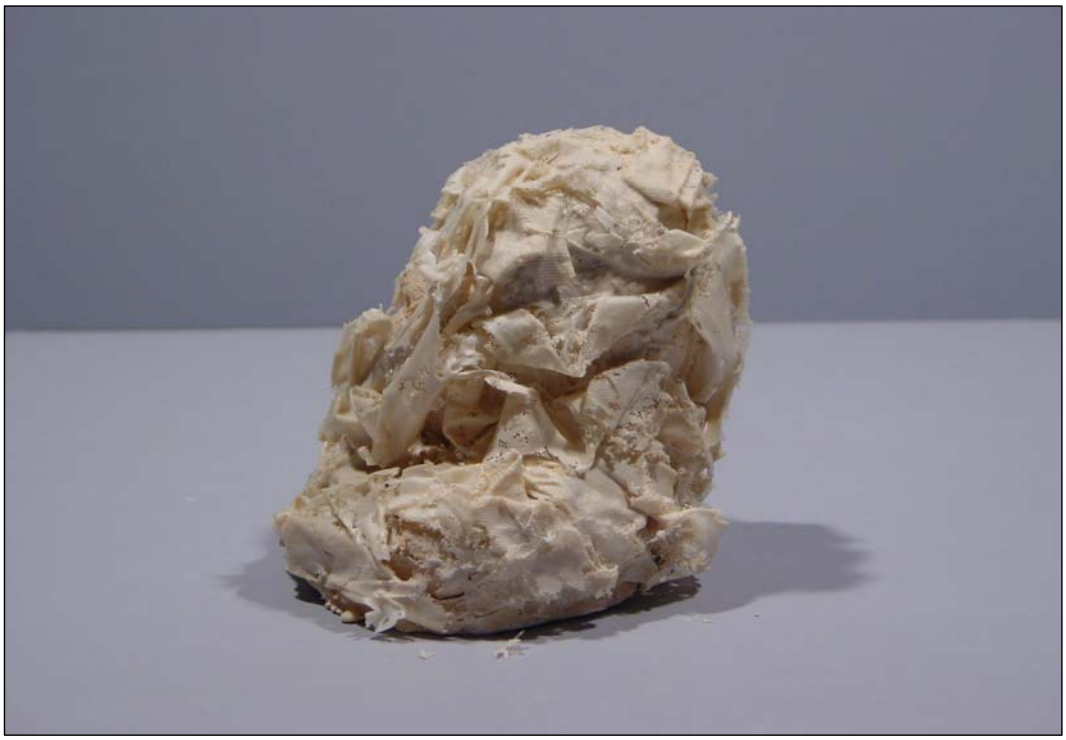
4 drops of Epsom | 6 drops of Epsom | 8 drops of Epsom

4 drops of Epsom

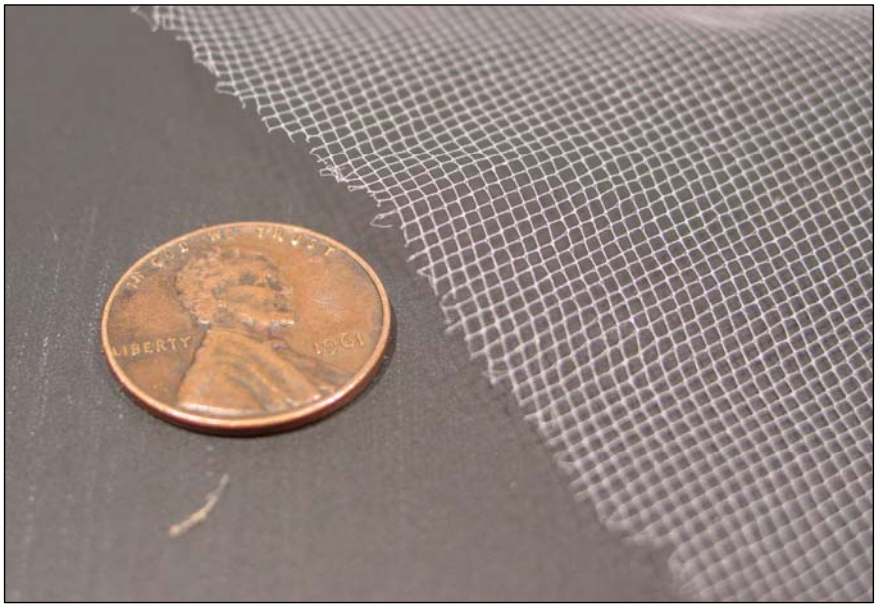
8 drops of Epsom

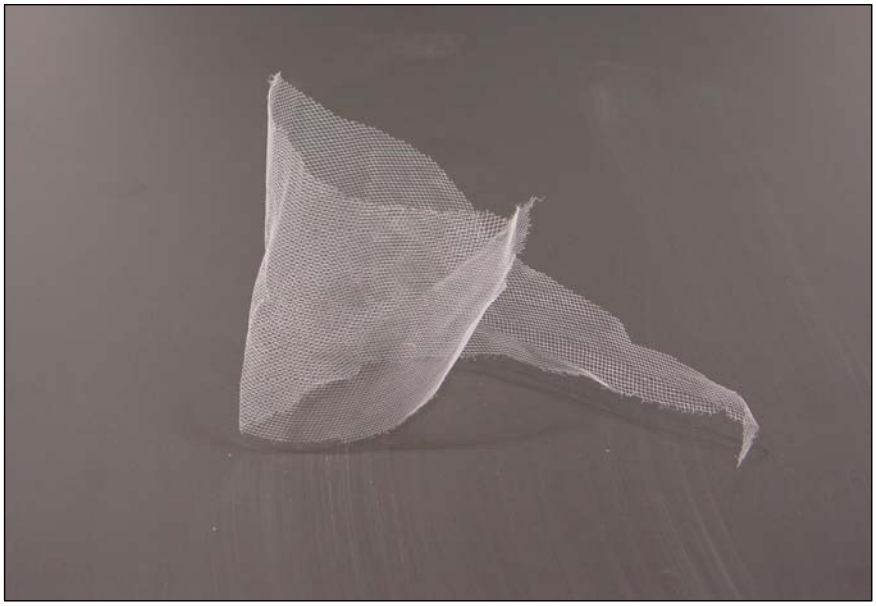


Tulle with 8 drops of Epsom was applied to a cylinder thrown using #570 boxed clay. The cylinder was scored prior to application, and the same slip used to dip the tulle was applied to the surface as intermediary glue.



Tulle fabric





Name: Luciano Pimienta and Hiroyuki (Hiro) Someya
Type: Colored clays for throwing and handbuilding
Color: Various
Texture: Smooth
Cone: 6

Recipe:

A	
Grolleg	25
Tile-6	20
C&C	15
Flint	14
Kona F-4	26
	100

Hi Calcium

B	
Grolleg	25
Tile-6	20
C&C	15
Talc	40
	100

Hi Magnesium

C	
Grolleg	25
Tile-6	20
C&C	15
Flint	19
Neph. Sy.	21
	100

Hi Sodium

D	
Grolleg	25
Tile-6	20
C&C	15
Flint	10
Custer	30
	100

Hi Potassium

Add:

OXIDES

1. Chrome Oxide 7.5%
2. Chrome Oxide 3.25%
3. Black Iron Oxide 2%
4. Red Iron Oxide 2%
5. Red Iron Oxide 5%
6. Cobalt Oxide 5%
7. Yellow Ochre 4%
8. Copper Oxide 5%
9. Black Nickel Oxide 2.1%

Commercial Stains

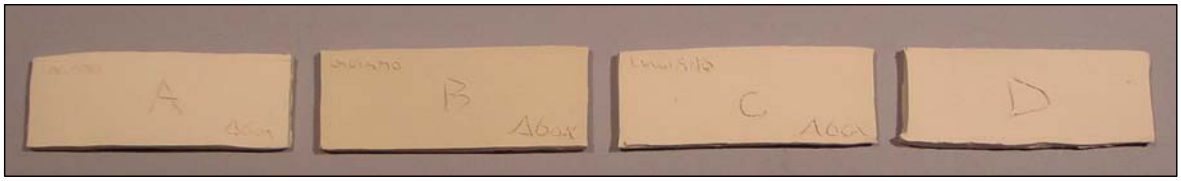
10. Mason Dark Red #44508 10%
11. Mason Chrome Free Black #44704 10%
12. Mason Delft Blue #44306 10%
13. Mason Peacock Green #44205 10%
14. Ferro Turquoise #44301 10%
15. Mason Praseodymium (Yellow) #44406 10%
16. Mason Pansy Purple #44603 10%

Development Process: The purpose of this project was to experiment with colored clay bodies with oxides and commercial stains using clay bodies from previous cookbooks.

We started our research by testing 4 different clay bodies that had been developed in previous Raw Mats classes. Absorption tests were done for all four clays. The bodies were similar in color and absortion prior to adding colorants with the exception of the talc clay body, which was denser and less porous.

Absorption rates for uncolored bodies

A B C D



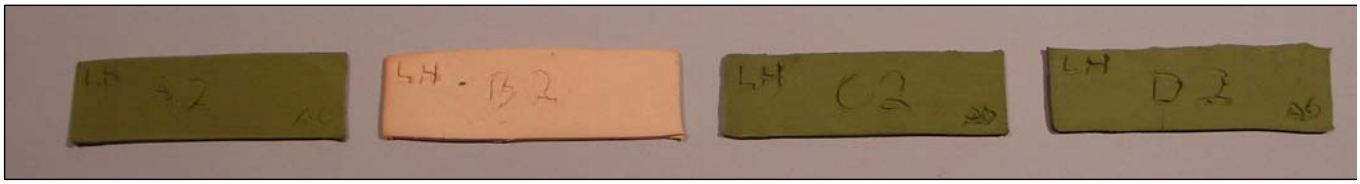
2.63% .94% 2.06% 3.93%

For the next step, colorants were added to the base clays. We first tried oxides in various percentages . Most of the oxides and all of the Mason stains were bright in color and had no defects except for those in the talc body, which bleached some of the results.

7.5% Chrome Oxide

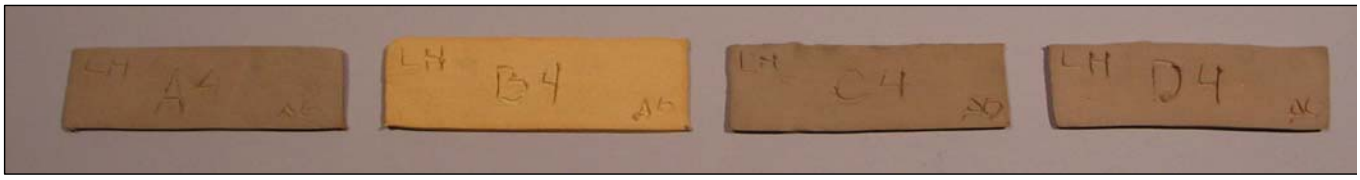
A B C D

3.25% Chrome Oxide



2% Black Iron Oxide

2% Red Iron Oxide

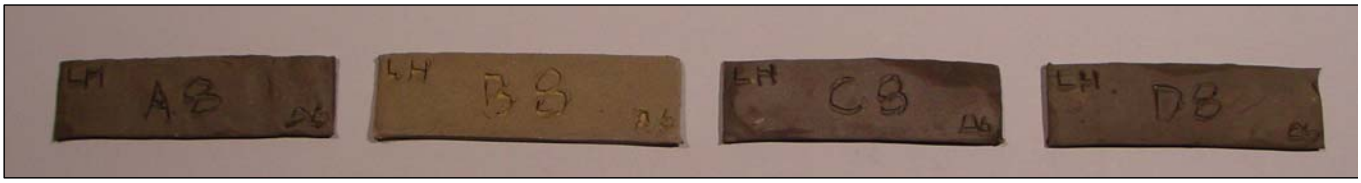


5% Red Iron Oxide

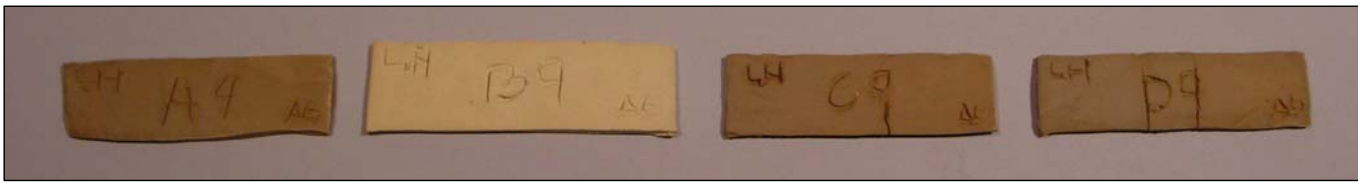
5% Cobalt Oxide

4% Yellow Ochre

5% Copper Oxide



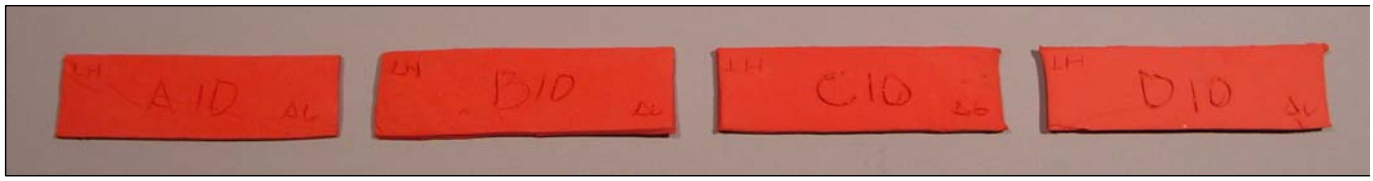
2.1% Black Nickel Oxide



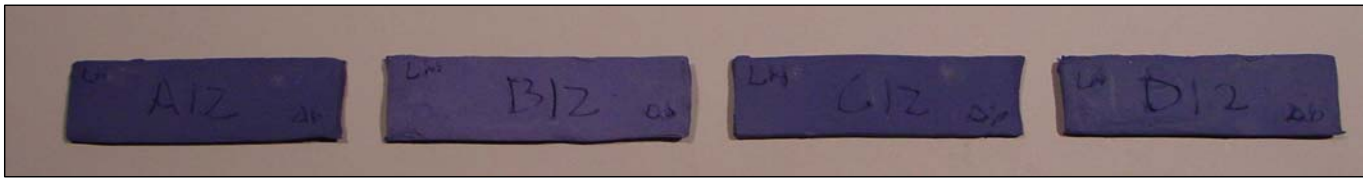
In a second set of tests, we tried Mason stains at 10%. The results were similar, with the talc body bleaching some of the colors. The black stain also blistered during the firing.

10% Mason Pansy Purple

10% Mason Dark Red



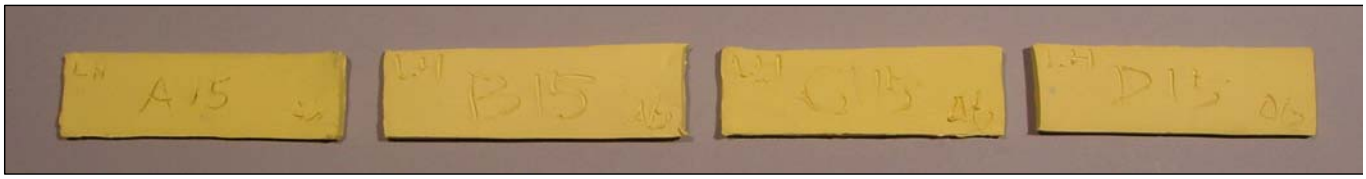
10% Mason Delft Blue



10% Mason Peacock Green

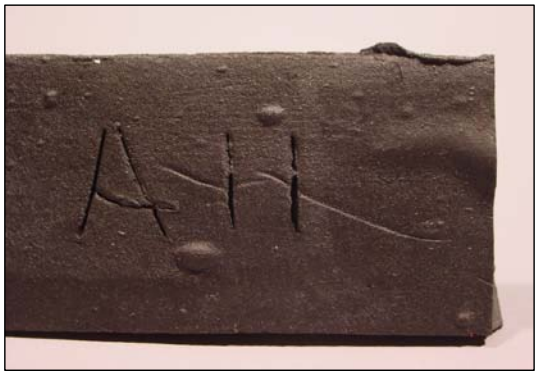
10% Ferro Turquoise

10% Mason Praseodymium Yellow



10% Mason Chrome Free Black

A11

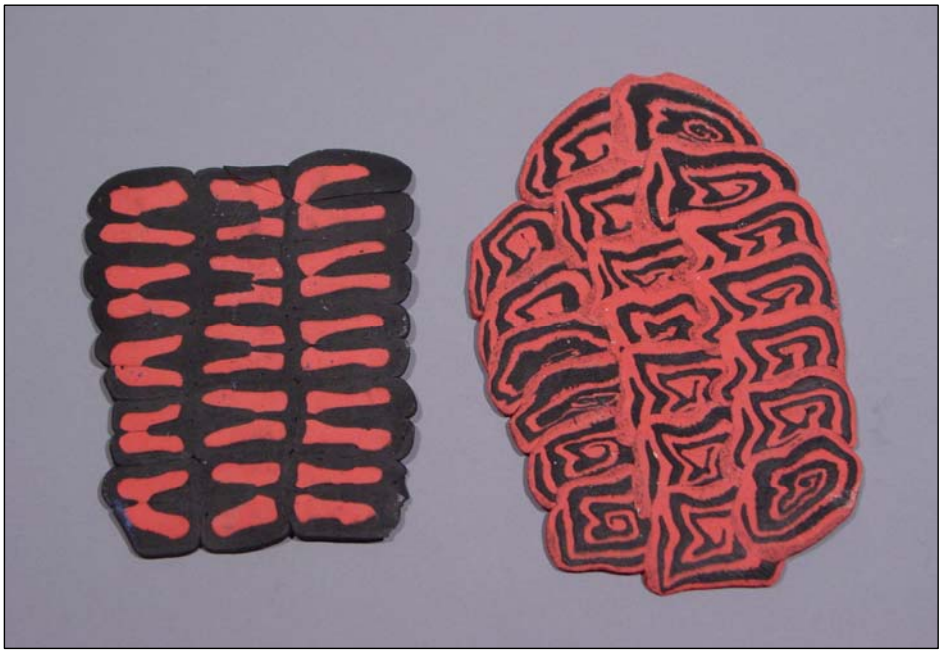


A11 sample cut to reveal the cross section of a bloat. All black bodies bloated with the exception of B11.

From the reullts, we concluded that Recipe A gives the best result in color, both with oxides and with stains.

With the information from the results, we decided to test handbuilding, using mold and slabs to see how the colored clays would react with each other. For all remaining tests we used Recipe A. The defects in the black stain were especially interesting. We used the black with other stains to see if it would bubble in small amounts. We also sandwiched the black between two other colored clays. We tried carving into these layers and pushing from behind to expose the interior colors. Carving into laminated clays was also tested. In general, all colors seemed to be compatible before and after firing.

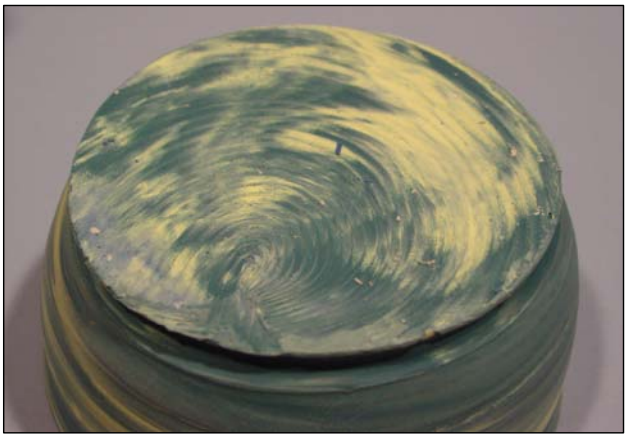
Slabs made using black and red colored bodies (10 and 11)



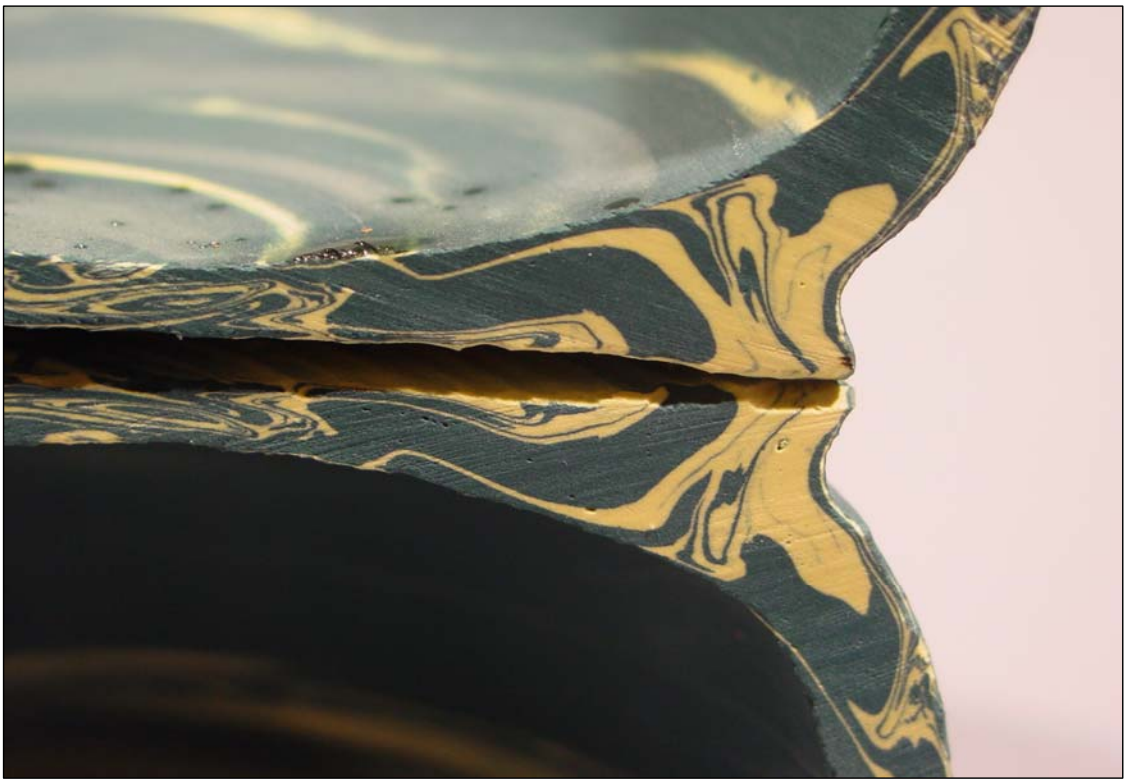
Slab made using black and red colored bodies inset into #444 boxed clay

Colored bodies wedged and thrown. Lighter colored cylinders used #444 boxed clay

Combination of green and yellow bodies wedged and thrown

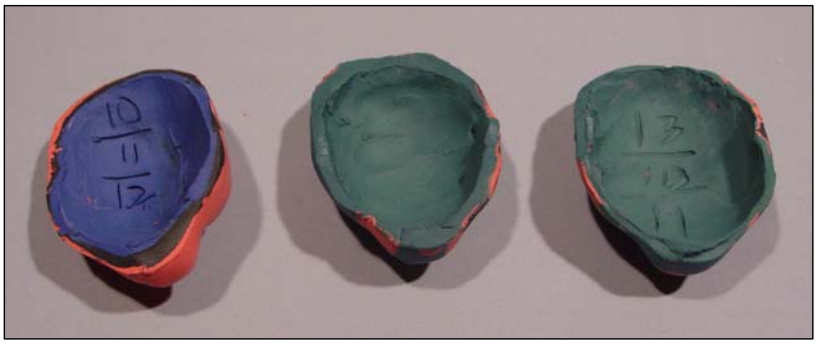


Cutting the above pot reveals the intricate marbelization that took place during forming

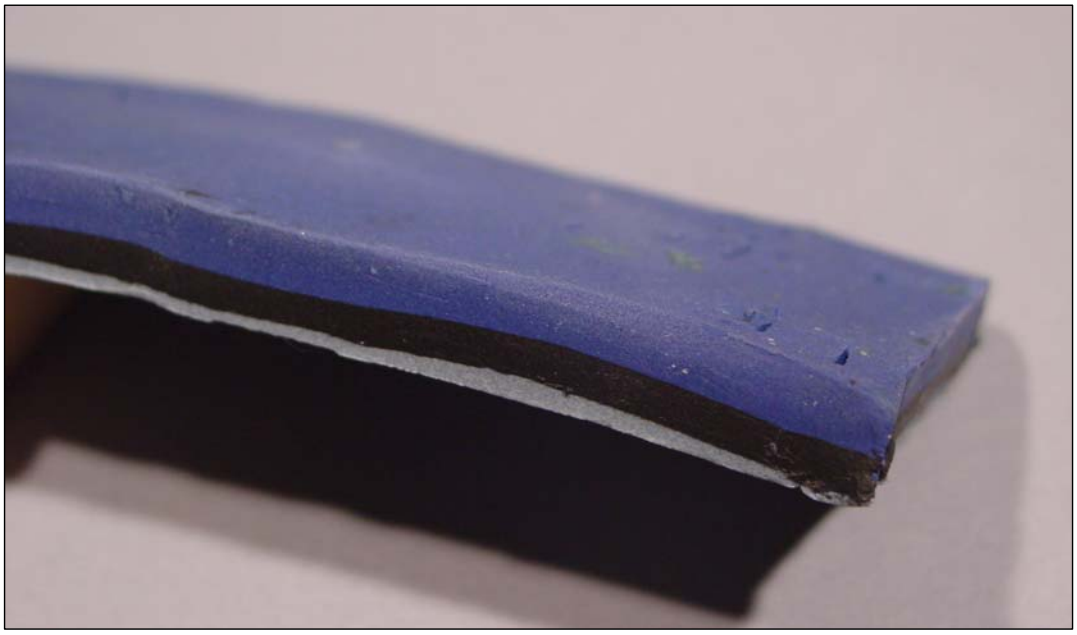


Colored bodies used in press molds

Rear view of pressed heads



Tile made by laminating bodies 12, 11 and 16



Laminated tile. Clear glaze applied in some areas adds "pop" to color...

Name: Carin Sankus and Laura McGraw
Type: Colored Slips
Color: Various
Texture: Smooth
Cone: 10 Ox. And Red.

Recipe:

Base 1	
Grolleg	17.58
EPK	29.05
C&C	14.52
Custer	22.2
Flint	16.65

Base 2	
Grolleg	17.58
EPK	29.05
C&C	14.52
NC-4	22.2
Flint	16.65

Base 3	
Grolleg	17.58
EPK	29.05
C&C	14.52
Wollastonite	12.2
Neph Sy.	10.0
Flint	16.65

Base 4	
Grolleg	17.58
EPK	29.05
C&C	14.52
Talc	12.2
Neph Sy.	10.0
Flint	16.65

Development Process:

The goal of this research was to create colored slips that could be applied to both a porcelain and stoneware body for a cone 10 firing.

We started by first choosing four different base slip recipes. Within each of these different base recipes, we tested ten different oxides in both reduction and oxidation firings. From these results, we narrowed down the slip recipes to base 1 (for its whiteness) and base 2 (for its blue hue), and only chose to keep two of the oxides (Chrome Oxide 3.5% and Cobalt Carbonate 5%).

After the results from the oxide tests, we decided to extend our testing to Mason stains to gather desired colors. We were also unsure about which colorants would burn out, so this step would tell us just that. We stayed with two base recipes, two clay bodies (#570 stoneware and #747 porcelain), and with this, we tested eleven colorants, each with three different percentages. We also limited our firings to cone ten reduction.

The next step of our testing was to test the application of slips as well as to test layering. At this point, we were able to choose one base slip recipe (Base 1) to use based on the previous test results. We chose to dip four different layers of slip on stoneware tiles and to brush four different layers on the porcelain tiles.

FIRST COLOR ROUND: OXIDES

A. Chrome Oxide	3.25%
B. Black Iron Oxide	2%
C. Red Iron Oxide	2%
D. Cobalt Carb.	1% and 5%
E. Yellow Ochre	4%
F. Copper Carb.	1% and 5%
G. Manganese Dioxide	3%
H. Manganese Carb.	1%
I. Nickel Carb.	5%
J. Rutile	5%

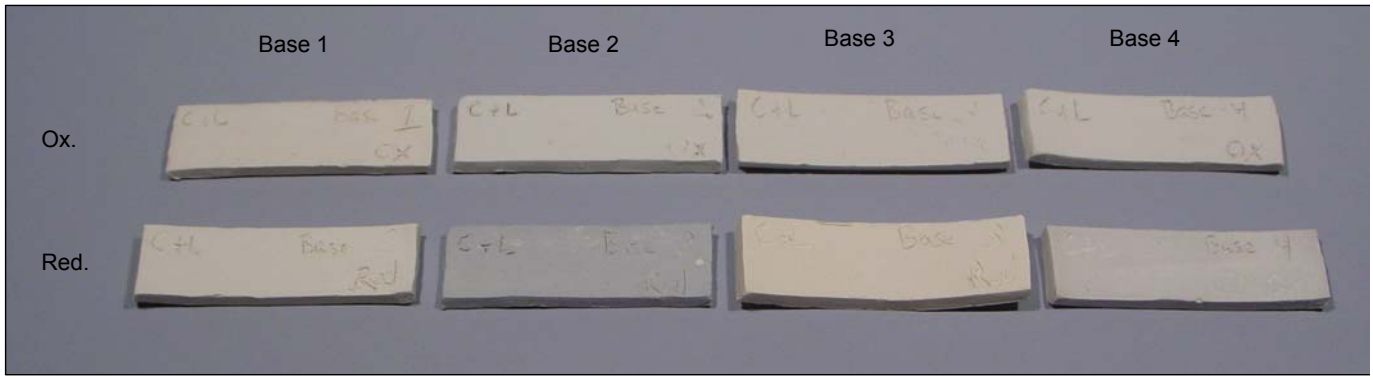
MASON STAINS USED: ROUND ONE: Varying Percentages

A. Mason Pansy Purple #6385	5%, 7%, 10%
B. GS Orange Brown #600	5%, 7%, 10%
C. Cerdec Yellow #239416	10%, 12%, 14%
D. Mason Deep Crimson #6005	10%, 12%, 14%
E. Mason Dark Red #6021	10%, 12%, 14%
F. Mason Bermuda Green #6242	5%, 7%, 10%
G. Cerglas Lilac #28-161-475	10%, 12%, 14%
H. Mason Tangerine Orange #6027	10%, 12%, 14%
I. Ferro Green	5%, 7%, 10%
J. Mason Alpine Rose #6001	10%, 12%, 14%
K. Ferro Turquoise C636A	5%, 7%, 10%

FINAL COLORANTS/OXIDES USED

A. Pansy Purple	10%
B. Cerdec Yellow	14%
C. Dark Red	14%
D. Bermuda Green	10%
E. Tangerine Orange	14%
F. Ferro Green	10%
G. Ferro Turquoise	10%
H. Chrome Oxide	3.25%
I. Copper Carb	5%

Base slips were made into test bars to give us an idea of colour...



5% Cobalt Carbonate on porcelain in oxidation

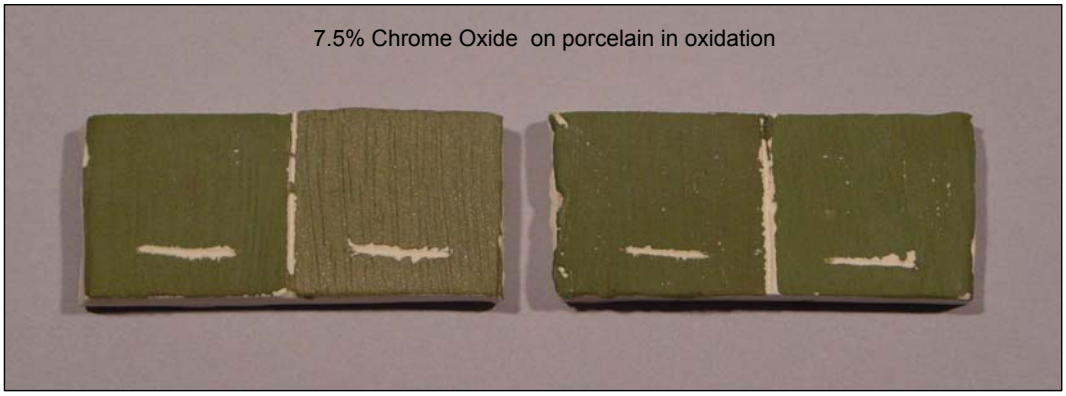
Base 1 Base 2 Base 3 Base 4

5% Cobalt Carbonate on stoneware in oxidation

5% Cobalt Carbonate on porcelain in reduction

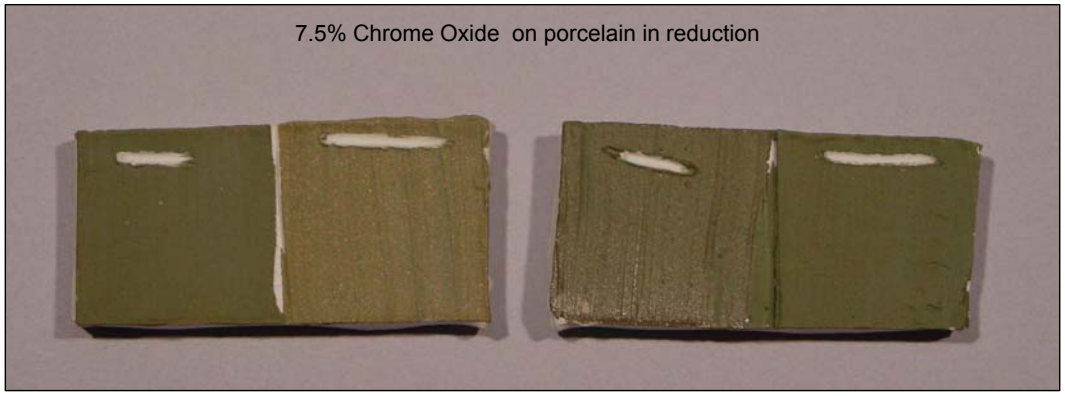
5% Cobalt Carbonate on stoneware in reduction

7.5% Chrome Oxide on porcelain in oxidation

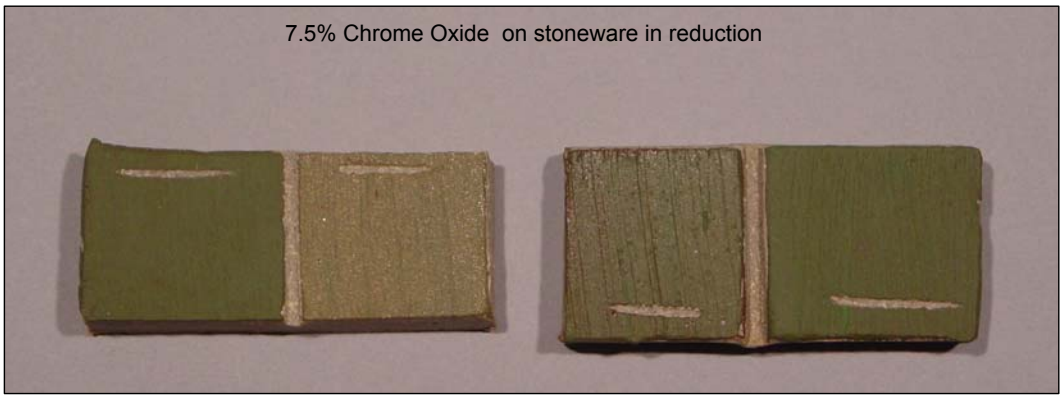


7.5% Chrome Oxide on stoneware in oxidation

7.5% Chrome Oxide on porcelain in reduction

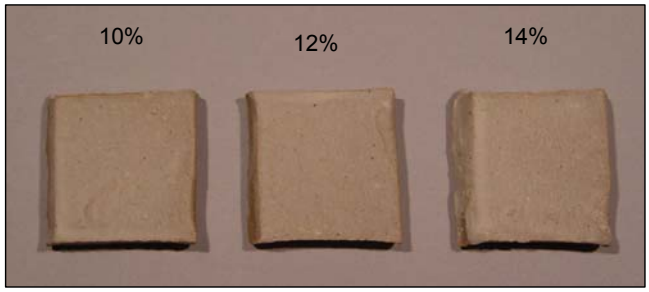


7.5% Chrome Oxide on stoneware in reduction

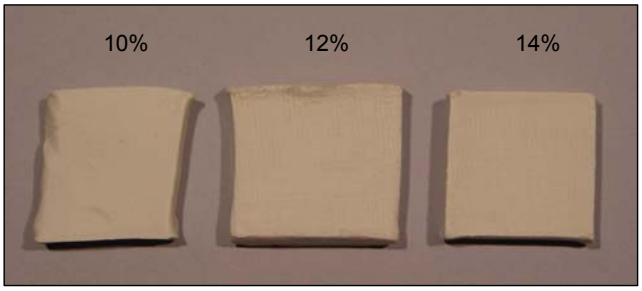


Deep Crimson

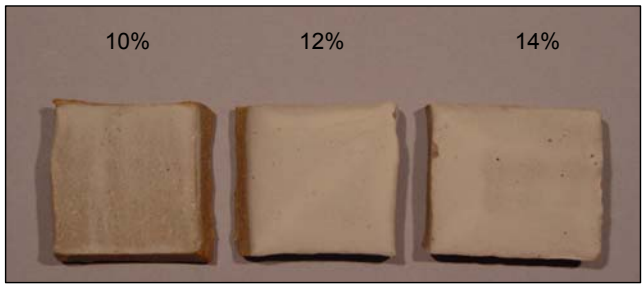
Base 1 over Stoneware



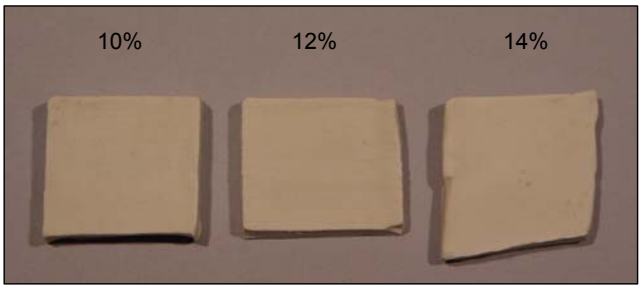
Base 1 over Porcelain



Base 2 over Stoneware

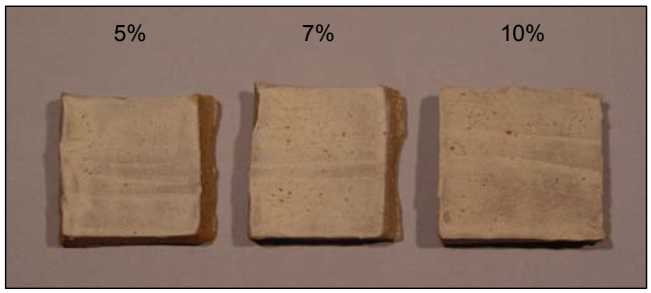


Base 2 over Porcelain

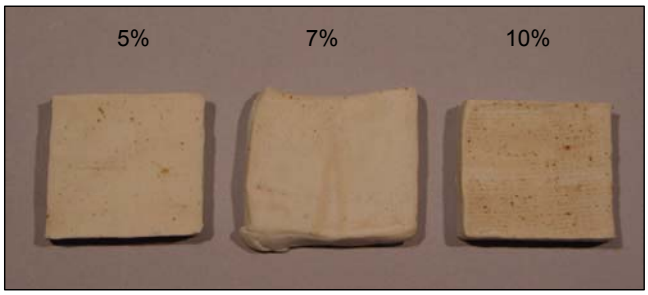


Orange Brown

Base 1 over Stoneware



Base 1 over Porcelain



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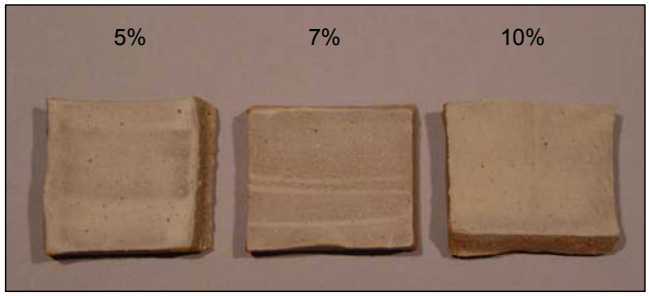
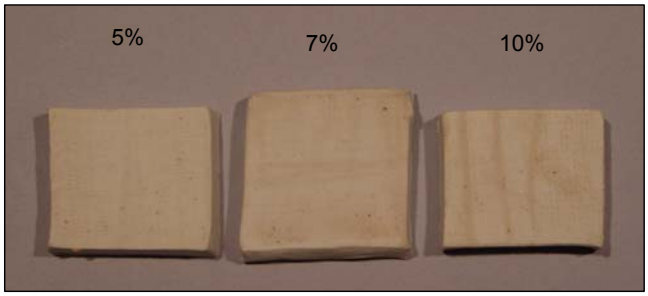
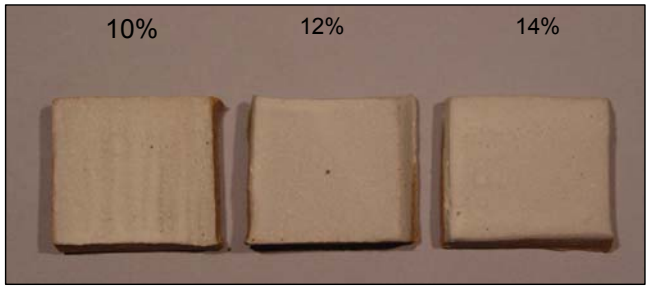


Base 2 over Porcelain

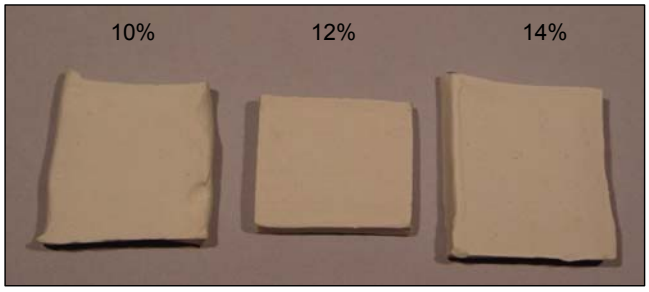


Lilac

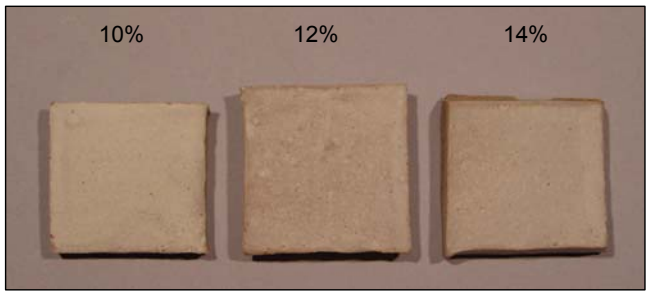
Base 1 over Stoneware



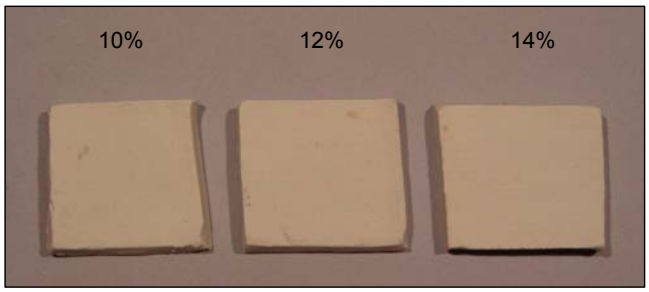
Base 1 over Porcelain



Base 2 over Stoneware

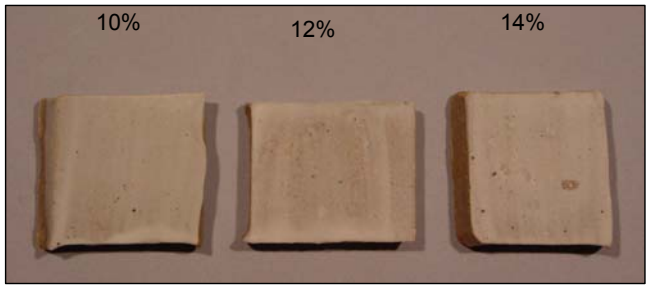


Base 2 over Porcelain

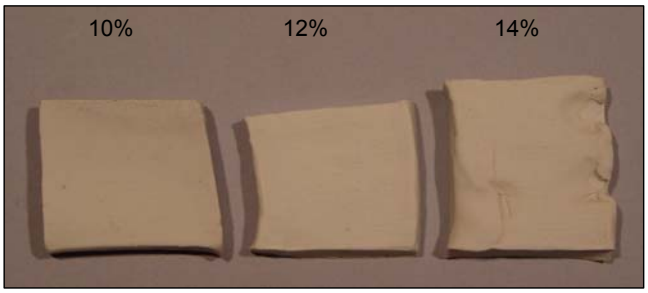


Alpine Rose

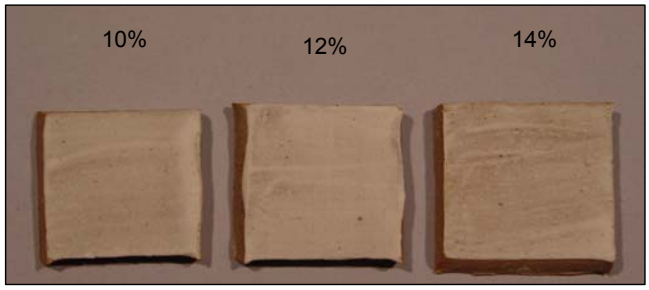
Base 1 over Stoneware



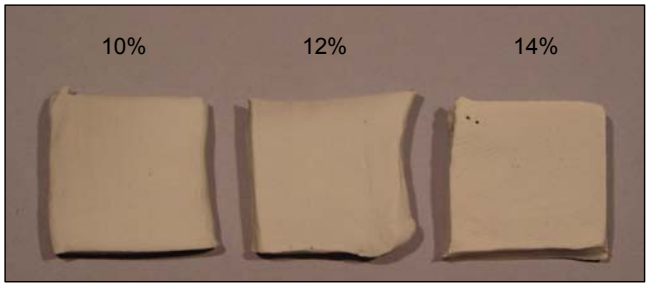
Base 1 over Porcelain



Base 2 over Stoneware

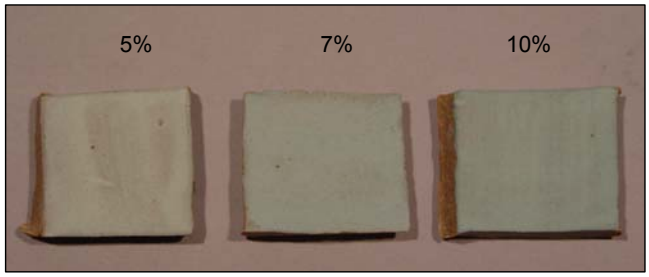


Base 2 over Porcelain

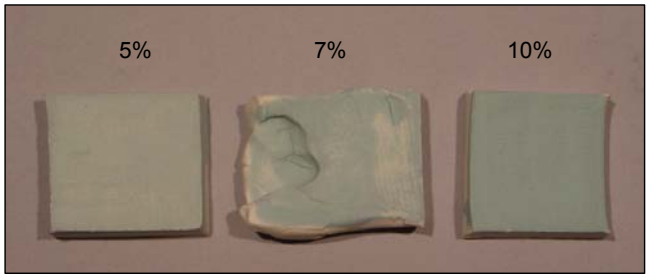


Bermuda Green

Base 1 over Stoneware



Base 1 over Porcelain



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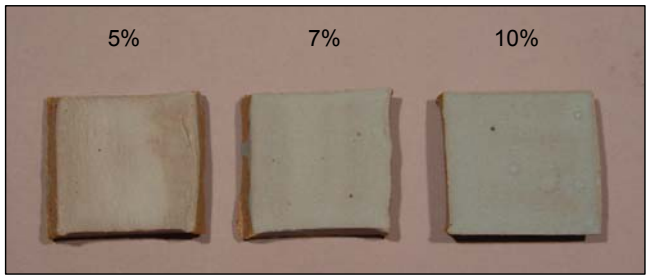
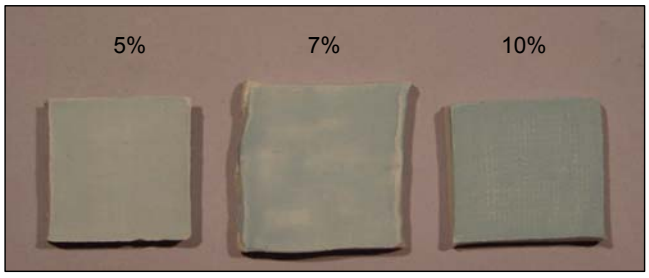
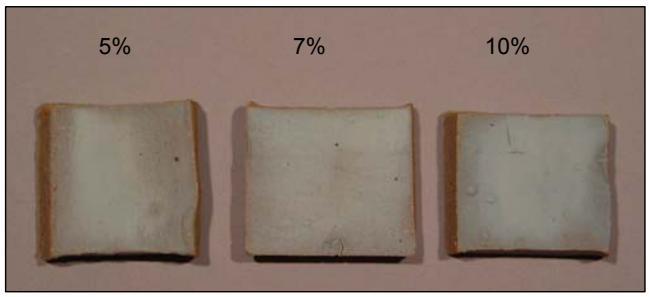


Base 2 over Porcelain



Turquoise

Base 1 over Stoneware



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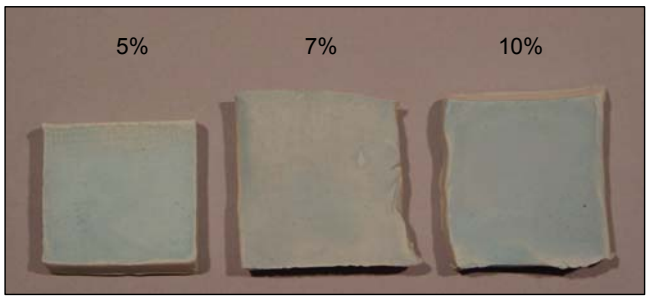

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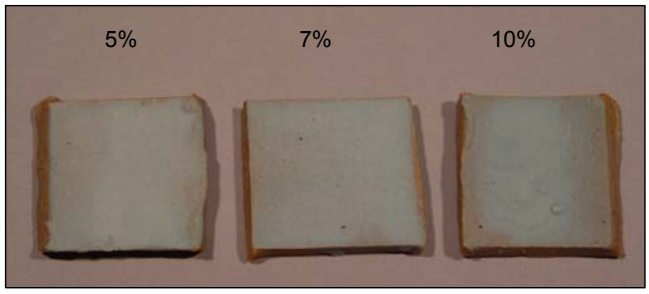

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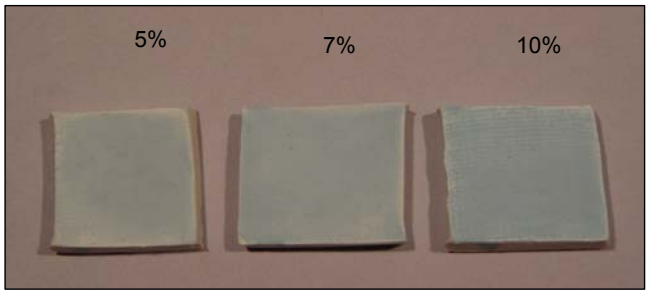
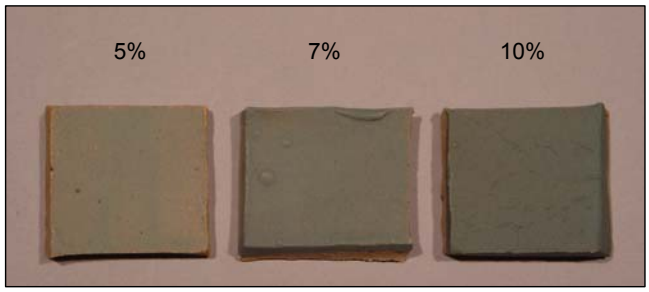


Green

Base 1 over Stoneware



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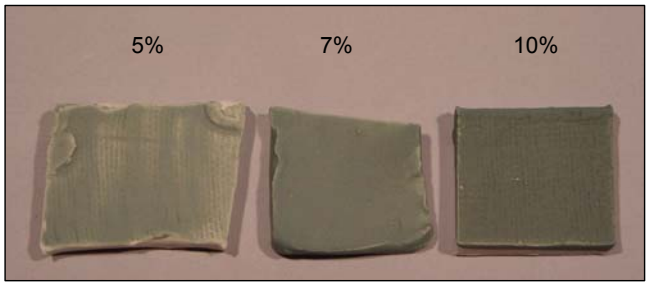

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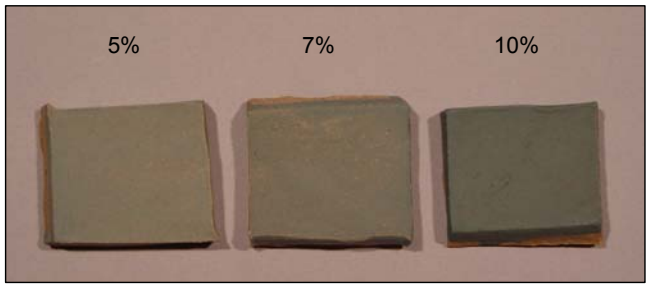

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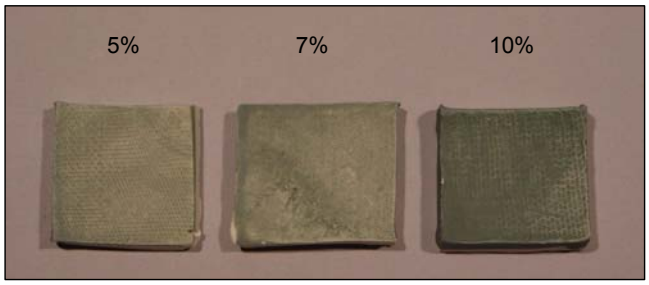
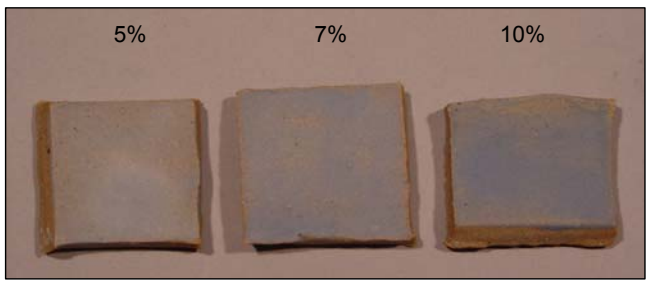
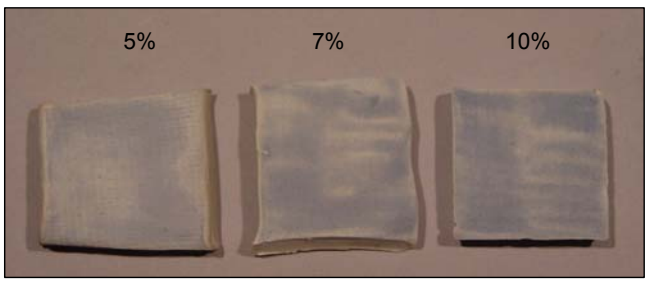


Pansy Purple

Base 1 over Stoneware



Base 1 over Porcelain



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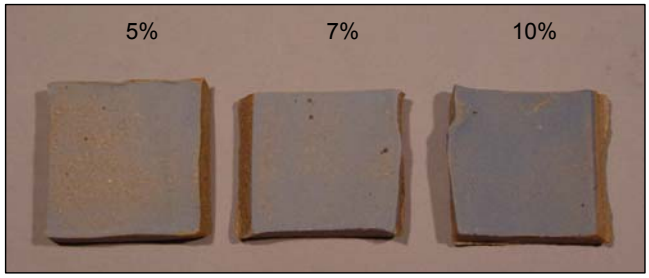

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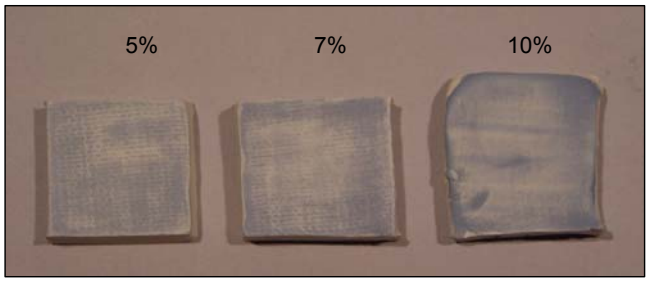
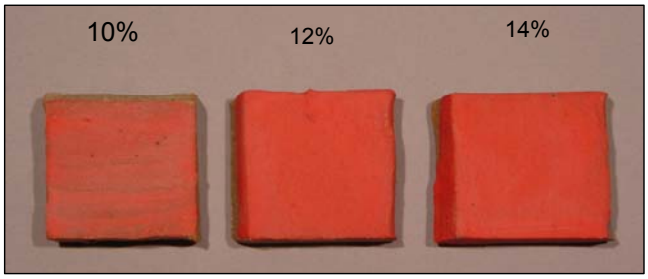
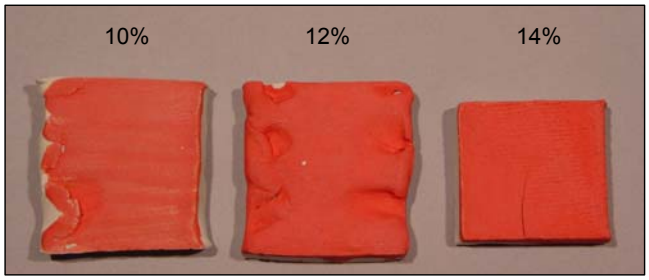


Dark Red

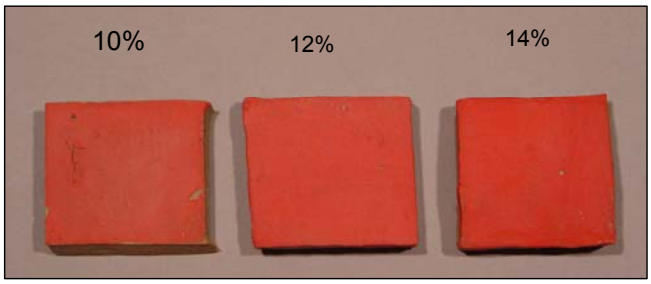
Base 1 over Stoneware



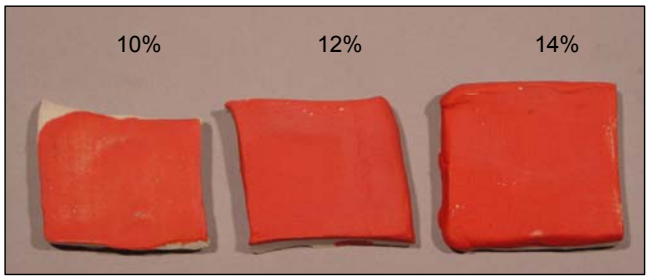
Base 1 over Porcelain



Base 2 over Stoneware

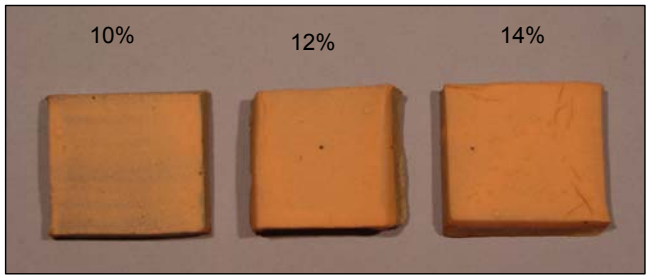


Base 2 over Porcelain

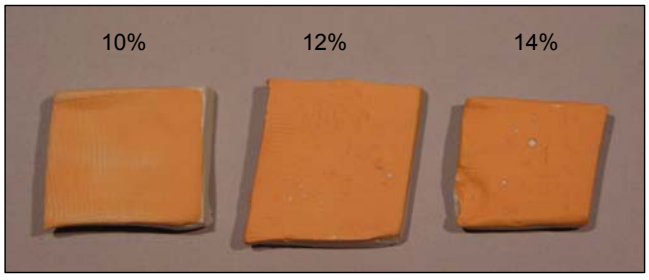


Tangerine Orange

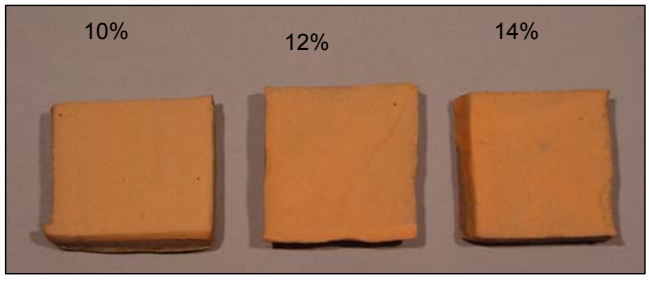
Base 1 over Stoneware



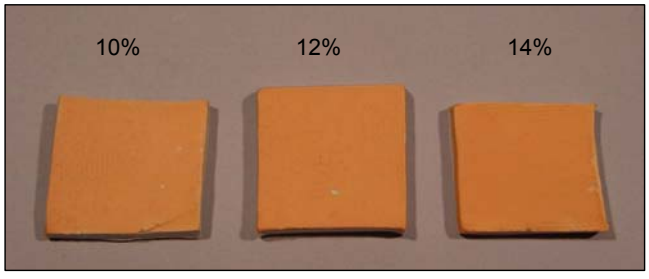
Base 1 over Porcelain



Base 2 over Stoneware

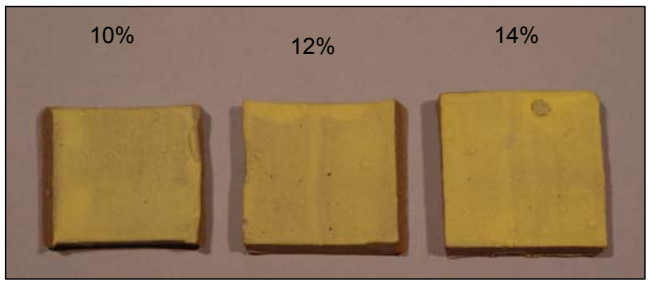


Base 2 over Porcelain

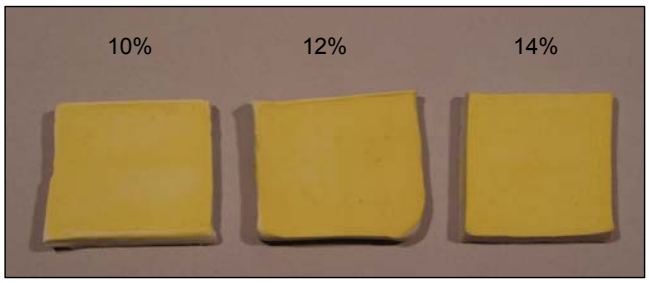


Yellow

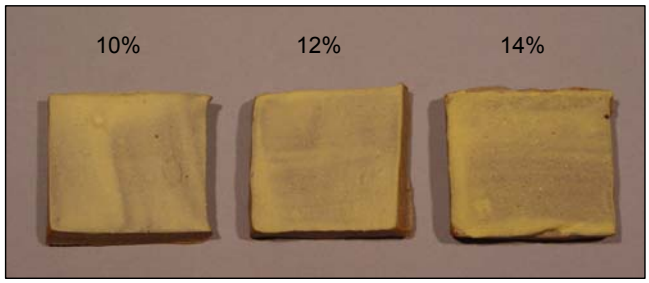
Base 1 over Stoneware



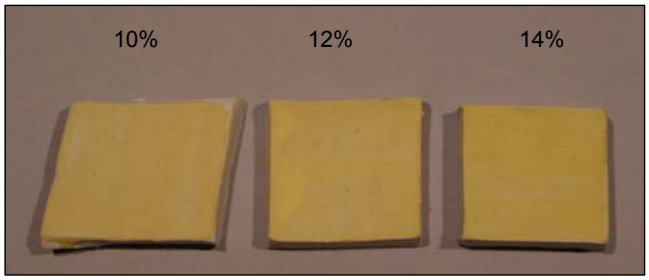
Base 1 over Porcelain



Base 2 over Stoneware



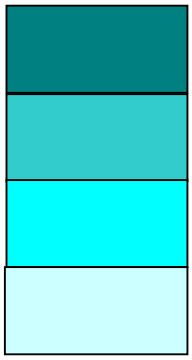
Base 2 over Porcelain



Final tests

For the final round of tests the stoneware tiles were dipped while porcelain tiles were brushed. Base 1 from previous tests was used throughout for this final series. For color percetages used, refer to index on the first page. The clay state at the time of application ranged from wet through leather hard to bone dry.

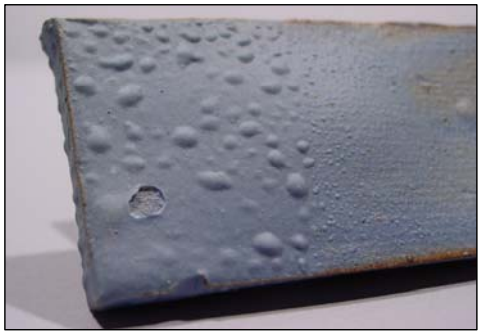
For each tile, slip was applied from one to four coats...



In all samples, cracking increased as layer thickness increased. Also note that all the following tests were reduction fired, and that bloating occurred on some of the stoneware samples as a result. This was responsible for some of the cracked surfaces. Also, some of the slips blistered, especially on the stoneware samples. This was probably due to volatile emmisions from the body during firing...

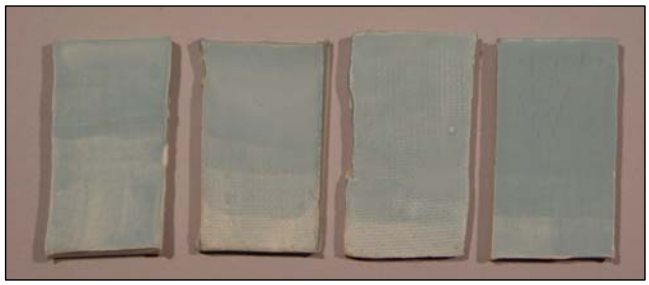
Large scale bloating (Chrome Oxide series)

Blistering (Pansy Purple series)



Turquoise slip on Porcelain

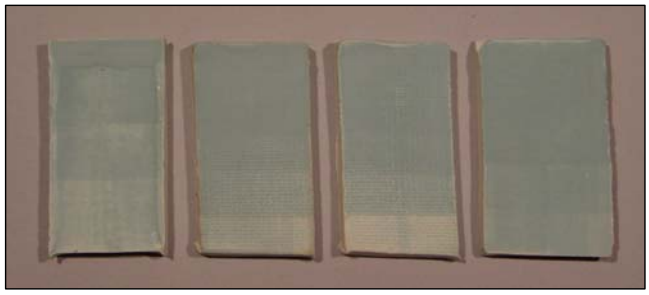
Wet | Leather hard (wetter) | Leather hard (drier) | Dry



Turquoise slip on Stoneware

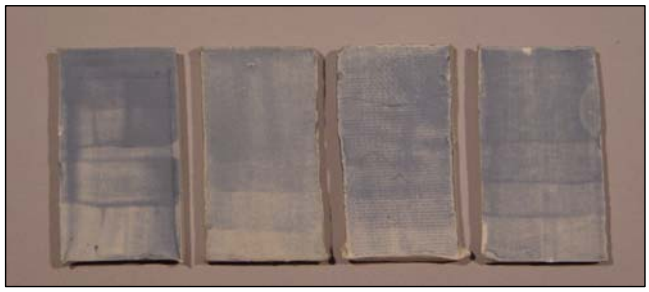
Wet | Leather hard (wetter) | Leather hard (drier) | Dry

Bermuda slip on Porcelain



Bernuda slip on Stoneware

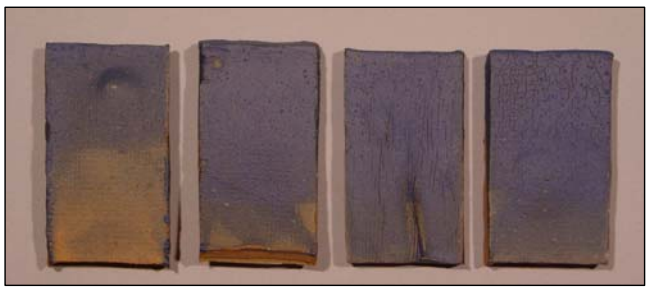
Pansy Purple slip on Porcelain



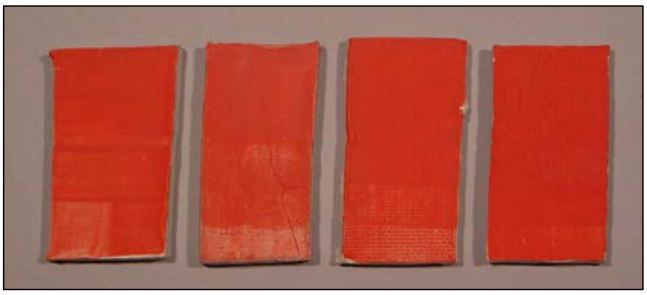
Pansy Purple slip on Stoneware

Cobalt Carbonate slip on Porcelain

Cobalt Carbonate slip on Stoneware



Dark Red slip on Porcelain



Dark Red slip on Stoneware

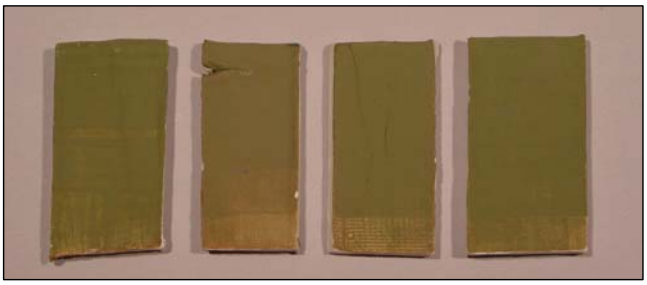
Tangerine slip on Porcelain

Tangerine slip on Stoneware

Cerdec Yellow slip on Porcelain

Cerdec Yellow slip on Stoneware

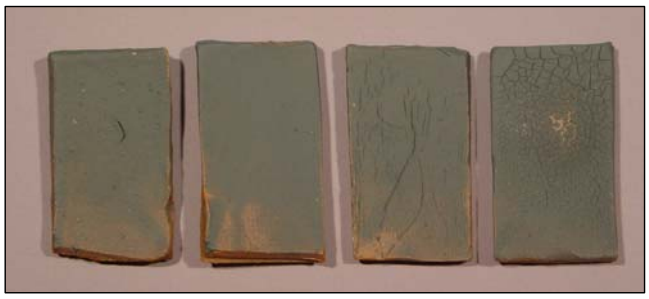
Chrome Oxide slip on Porcelain



Chrome Oxide slip on Stoneware

Ferro Green slip on Porcelain

Ferro Green slip on Stoneware



Name: Miki Sato and Ronda Wright
Type: Flameware throwing body
Color: Beige/Light Beige
Texture: Smooth
Cone: 10 reduction

Recipe:

A-3		B-4		C	
Tile 6	26.25	EPK	45.28	EPK	13.00
Jackson Ball Clay	30.00	Tile 6	2.94	Ball Clay	35.00
Haworth bond 35mm	18.75	Talc	33.20	Petalite	45.00
Talc	25.00	G-200	3.53	G-200	5.00
	100%	Flit	2.35	Bentonite	2.00
		Alumina	12.70		100%
			100%		

Development Process:

The purpose of doing this research was to develop flameware bodies that could be fired to cone 10 and which could be thrown.

We both started by taking a different recipe and line-blending it with talc. When the line blend came out of the kiln it was apparent that there was a visible eutectic point in “Line Blend A”. This is shown in test A8 through A10 where the clay body melted down on the kiln shelf. Selecting the test with no cracks or slumping, we then tested the flame ware properties of each by placing one inch of water in each test and heating it on a gas stove top (we also used a flameware recipe from Susan Peterson’s book “The Craft and Art of Clay” as a reference to which we could compare our results: see recipe “C”). The tests were left on the flame five minutes after the water had evaporated out of the test. At that point we then submerged the tests in cold water.

After looking at the results it was probable that the flame on the gas stove was too even and would not reflect the sample’s true ability to with stand the shock of a random flame such as a flame in a campfire or uneven heating. Therefore, the tests were then taken and heated in a small spot with a hand torch until the clay had turn a glowing red and then submerged into cold water.

We selected A3 from Line Blend A and B4 from Line Blend B as our final choices. Each of these clays bodies were used in a throwing process. They throw similar to non-plastic porcelain. B4 was slight more finicky when larger objects were to be constructed. It is still a throw able clay body. If we had more time to continue testing we would have included cone packs by each test to determine if the firing plays a role in the flame ware quality. After finding a clay recipe that we know would be a high quality flame ware body the next step would be to find a glaze that would fit the body and stand up to the heating and cooling of cooking as well as the clay body itself.

Line blend recipes:

	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11
Tile 6	29.75	28.00	26.25	24.50	22.75	21.00	19.25	17.50	15.75	14.00	12.25
Jackson Ball Clay	34.00	32.00	30.00	28.00	26.00	24.00	22.00	20.00	18.00	16.00	14.00
Hawthorn 35mm	21.25	20.00	18.75	17.50	16.25	15.00	13.75	12.50	11.25	10.00	8.75
Talc	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00	55.00	60.00	65.00

	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9
EPK	35.11	38.50	41.96	45.42	48.88	52.34	55.80	59.26	62.72
Tile 6	2.28	2.50	2.72	2.94	3.16	3.38	3.60	3.82	4.04
Talc	48.20	43.20	38.20	33.20	28.20	23.20	18.20	13.20	8.20
G-200	2.74	3.00	3.27	3.53	3.79	4.05	4.32	4.59	4.85
Flit	1.82	2.00	2.18	2.36	2.54	2.72	2.90	3.08	3.26
Alumina	9.85	10.80	11.77	12.74	13.65	14.68	15.65	16.62	17.59

Absorption Test Results:

	Dry(g)	After soaking(g)	Porosity (%)
A-1	312.1	316.37	1.35
A-2	307.44	319.69	3.98
A-3	222.48	233.75	5.07
A-4	303.45	316.94	4.45
A-5	337.48	359.44	6.51
A-6	316.73	331.9	4.79
A-7	314.43	317.81	1.07
A-8	290.13	292.2	0.71
A-9	246.71	249.87	1.28
A-10	343.92	350.6	1.94
A-11	324.05	351.56	8.49

	Dry(g)	After soaking(g)	Porosity (%)
B-1	-	-	
B-2	-	-	
B-3	346.47	347.55	0.31
B-4	-	-	
B-5	340.35	341.05	0.21
B-6	325.65	326.45	0.25
B-7	364.94	366.61	0.46
B-8	340.25	348.21	2.34
B-9	319.11	329.54	3.27

C	297.62	306.08	2.84

Flameware test:

Test 1- One inch of water heated directly on the gas stove. Left on stove 5 minutes after all water had evaporated, then submerged in cold water

Test 2- Heating small area and with torch until glowing red and submerging in water

Flameware test results:

	Test 1 (with a stove)	Test 2 (with a torch)
A-1	-	-
A-2	-	-
A-3	no ping, no cracks	no ping, no cracks
A-4	no ping, no cracks	no ping, no cracks
A-5	no ping, no cracks	no ping, no cracks
A-6	no ping, no cracks	one loud ping, no visible cracks
A-7	-	-
A-8	-	-
A-9	-	-
A-10	-	-
A-11	no ping, no cracks	no ping, no cracks

	Test 1 (with a stove)	Test 2 (with a torch)
B-1	no ping, no cracks	no ping, no cracks
B-2	sharp ping sound, no cracking visible	no ping, no cracks
B-3	no ping, no cracks	no ping, no cracks
B-4	no ping, no cracks	no ping, no cracks
B-5	heard ping, cracking	ping when in water, a big horizontal crack
B-6	heard ping, cracking visible	no ping, no cracks
B-7	no ping, no cracks	pinged and cracked
B-8	heard pinging, no cracks	pinged, several big cracks when cooling
B-9	no ping, no cracks, but one loud creak sound	ping, but no cracks

C	no ping, no cracks	no ping, no cracks

"A" series
(Note the Eutectic from A-8 to A10)

A-1 A-2 A-3 A-4 A-5 A-6 A-7 A-8 A-9 A-10 A-11

A-10

"B" series

B-1 B-2 B-3 B-4 B-5 B-6 B-7 B-8 B-9

B-8
After firing, the cracked section seperated from the body with very little force

Final bodies

"C" body A-3 B-4

"C" body

A-3

B-4

Name: Scott Shuman
Type: Dipping body
Color: Tan/Grey
Texture: Smooth
Cone: 10

Recipe:

Foundry Hill Creme	10
Grolleg	25
Tile 6	16
C&C	19
Custer	14
Pyrax	6
Flint	10
	Total 100%

Add:

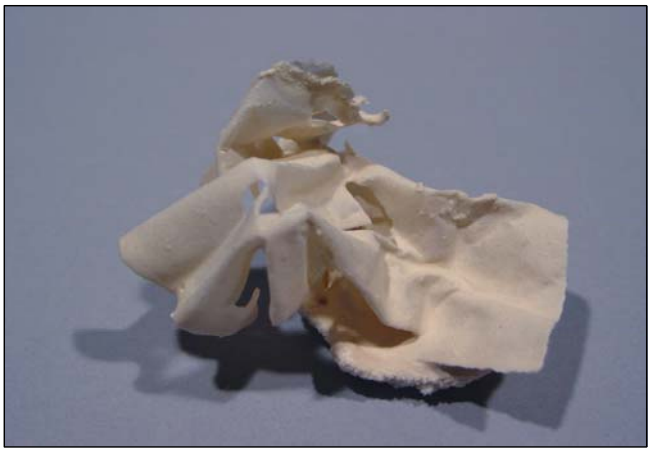
Darvan	.4%
Water	45%

Development Process: I wanted to be able to dip paper in a casting slip and have it fire without cracking. I knew I would need a casting body with minimal shrinkage. I thought of this idea because a friend of mine from a hand building class made origami paper cranes and cast them. However the clay cracked and some of her birds where destroyed. I didn't want the slip to crack as it dried against the paper structure.

I tried using different shapes, stacking, and number of dips. Before the firing the clay didn't crack and even after the firing was the same. The paper seemed to have burned out from the inside creating a fragile, light weight, and hollow piece. Even though some of the pieces I cast thicker with more layers they all seemed to have held their shape. Although the texture was smooth, it resembled wet paper or a cloth like look to it. In the future, I would like to create from these samples, to create large scale paper cast sculptures. Another way to go about this is to create a collage of cast paper objects and shapes. The dispersant- Viscosity test definitely helped hold their shapes without cracking or pulling away from each other. The paper also seemed to have helped the drying process by dispersing the moisture level on the inside with the wet paper.

Overall I got the information I need and the correct clay body with minimal shrinkage to create cast paper sculptures.

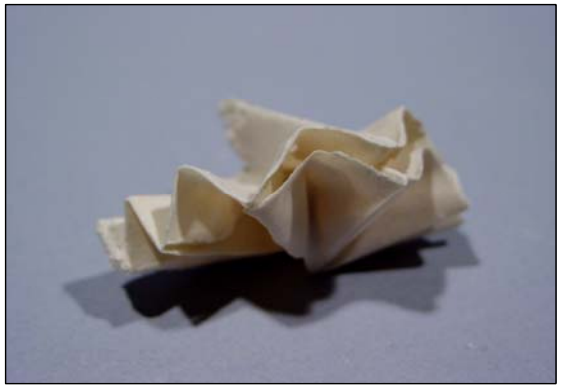
1 dip



2 dips

3 dips

Crumpled/folded before dipping



Crumpled/folded after dipping

Name: Carrie Steere
Type: Powder for coloring hot glass
Color: Olive green, but alterable
Texture: Smooth
Cone: Glassblowing temperatures

Recipe:

1) Frit 280 - 170g
Black Nickel Oxide - 20g

2) Frit 280 - 170g
Black Nickel Oxide - 20g
EPK – 5g

3) Frit 280 - 170g
Black Nickel Oxide - 20g
EPK – 10g

4) Frit 280 - 170g
Black Nickel Oxide - 20g
EPK – 15g

5) Frit 280 - 170g
Black Nickel Oxide - 20g
EPK – 20g

Development Process: I wanted to use raw materials to create my own glass color to use in the hot shop. I found that the ingredients worked well for that purpose, though they were a little stiff if not covered with another gather.

I tried the recipes both dry and wet, but the wet mixture didn't adhere to the glass at all. I just mixed the ingredients with a drill, nothing special. The varying amounts of clay didn't seem to make a difference in the color. It only added white specks where it hadn't been completely integrated with everything else. The color deepened with each layer of powder added, as with all glass color, so that was the only thing that altered the color.

I did find that the fumes from melting the powder into the glass were a little nauseating, but blowing with a respirator negated that. A little cumbersome, but it worked. Keep in mind that different colorants can be added to any sort of frit to make different colors.

1

2

3

4

5

The white mark circled in red is unmelted kaolin (EPK)

The image below shows the ceramic layer sandwiched between two gathers of glass

Detail of Point 1

Detail of Point 2

Name: Laura Turo
Type: Handbuilding/Casting body
Color: Off-white/Yellowish
Texture: Smooth
Cone: 6 Oxidation

Recipe:

Recipe A		Recipe B	
Foundry Hill Crème:	30.60%	Foundry Hill Crème:	15.6%
Helmer:	15.50%	Helmer:	30.4%
OM4:	15.50%	OM4:	15.6%
Neph Sy:	26.40%	Neph Sy:	26.4%
Flint:	12%	Flint:	12%
Total	100%	*Total*	100%
If casting: Darvan #7:	1.15%	*If casting:* Darvan #7:	.88%
Water:	40%	Water:	37.5%

Development Process:

My objective was to create a smooth plastic stoneware that would cast well and could also be easily manipulated.

I started by doing a dispersant test on a recipe that was known to be plastic enough for hand building (referred to as Recipe A).

From the dispersant test, I chose 1.15% Darvan #7. I also made a plastic version of this body. I then tried joining parts that were slip cast from this recipe with parts that were handbuilt from the same recipe (without Darvan). The cast time was about 24 minutes and the set up time (in the mold) was also about 24 minutes. Although the casting time is consuming, the cast itself was very plastic and could be easily manipulated. The cast could almost be bent into a right angle from its original position if formed directly after being taken out of the mold. The plastic body held its weight well on a small to medium scale (I have not built with this body on the large scale, but doing so would probably require an addition of grog; 7% fine grog would probably work well). When attaching the cast to the plastic body, I typically would wait until they both felt to be about the same moisture level. I found that If this was not done correctly, the pieces would dry at different rates and crack. I could also reach a similar moisture level by covering the whole piece in cheesecloth or plastic overnight.

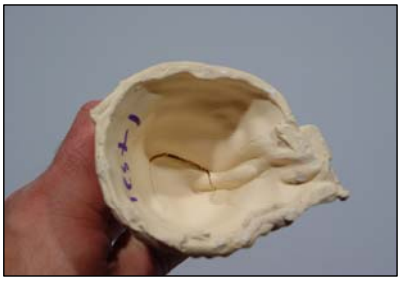
The body required further fine tuning because it tended to gel when left in the mold too long. This meant that areas that should be hollow in the cast often sealed up, creating almost solid objects that would crack and behave unpredictably with the hand built elements. To solve this, I brought the water in the casting slip up from 37.5% to 40%. I also drained the mold earlier during the casting cycle.

Outside shape

Inside view

Drained at 12 minutes
40% water

Drained at 16 minutes
40% water



Drained at 33 minutes
37.5% water

Though this recipe was now working, I wanted to see if I could speed up the casting by altering the recipe (it was taking 33 minutes to build up ¼" walls). I created another body that was derived from Recipe A called Recipe B. While this new body cast a lot quicker because of the larger particles in the recipe, the clay was very short and felt dead.

So Recipe A is more plastic, while Recipe B casts more quickly.

I now had the option of combining handbuilt parts made using the more plastic recipe A body with parts cast using this new casting body. There was too much cracking in the actual tests. I think a lot of it was due to Recipe B alone, however. Even when I tried joining plastic and cast versions of Recipe B, these shrank at different rates and cracked. This recipe is quite non-plastic and cannot tolerate much manipulation without cracking.

Plastic body A
Cast body A

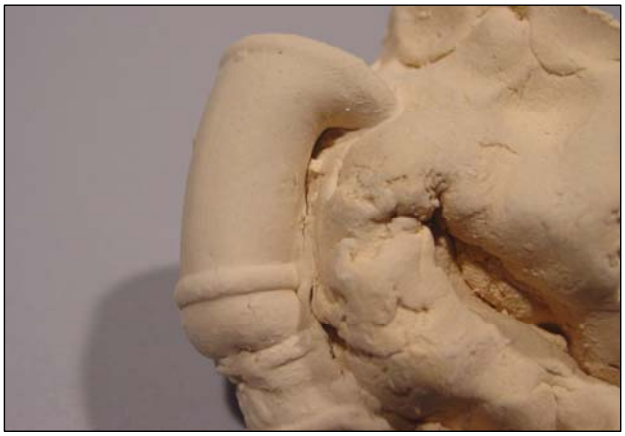
Plastic body A
Cast body B

Plastic body B
Cast body A

Plastic body B
Cast body B

Plastic body A
Cast body A

Plastic body A
Cast body B



Plastic body B
Cast body A

Plastic body B
Cast body B

This test attempted to attach plastic body A and cast bodiy B. It also examined wether merging the two bodies would be better (one cast quicker, the other built better…etc).

	Casting: 40% water	**Recipe A**

notes:

plastic clay: great to work with, very plastic- holds itself up over its own weight | when rolled in hand and bent over itself, very minimal cracking, very smooth and wonderful

Recipe	
FHC	30.6
Helmar	15.5
OM4	15.5
Neph Sy	26.4
Flint	12
Darvan #7	1.15

casting clay: entire casting process took about an hour, very plastic however still a little gooey on the inside. Bent easily and did not crack as much as other body. Did not dry out as fast as other body
The mold needs to be slammed on the side before dumping out (to destroy gelling)
can be pinched pretty thin before cracking
in mold cast time- about 24 minutes, set up in mold time- about another 24 minutes

	Casting: 37.5% water	**Recipe B**

notes:
made plastic clay and cast clay

plastic clay: very short/ feels kind of dead… when rolled in hand and bent over itself- cracks dramatically and deforms
cannot hold itself up on its own weight, can't get too thin
plastic but very short at the same time

Recipe	
FHC	15.6
Grolleg	30.4
OM4	15.6
Neph Sy	26.4
Flint	12
Darvan #7	0.88

cast clay: great cast, poured out after about 19 minutes, and took out of mold around the half hour mark. Shook the mold prior to draining, no gelling problems. Inside of cast dried quickly. Plastic characteristics- able to bend but dried out quickly, some cracking could pinch lightly, but using lots of force leads to perpendicular cracking
about 20 minutes in mold, 10 minutes setting up in the mold

Attachments:

Plastic A and Cast A
no cracking at seams
good contact

Plastic A and Cast B
minor cracking at weak connection, strong connections have no cracks

Plastic B and Cast A
minor cracks at weak connections

Plastic B and Cast B
cracked most of all- not catastrophic but unless really strong connectivity will crack

all cracks were in the cast area, not handbuilt

In conclusion, although Recipe A takes a long time to cast and needs to be slammed before draining the mold (to destroy the gelling effects), it is a great casting slip that has very little cracking between plastic and cast parts.

Examples combining plastic body A and cast body A

Class evaluation of group claybodies...

Developed by:	Group 1
Type:	Throwing
Color:	White
Texture:	Smooth
Cone:	Cone 6 Ox.

Recipe:		
	Peerless	27.95
	Grolleg	27.95
	NephSy	23.1
	Flint	12
	Tenn #10	5
	Molochite	3
	Veegum	1
		100%

Wet to dry shrinkage	6.7%	Absorption .19%
Dry to fired shrinkage	9.5%	
Total shrinkage	16.2%	

Class Ratings

Very Poor	1
Poor	2
Average	3
Good	4
Very Good	5

Throwing
7 students surveyed

Plasticity	4.4
Building strength/Resistance to slumping	3.3

Hand Building
7 students surveyed

Plasticity	4.6
Building strength/Resistance to slumping	3.3

What the critics are saying...

"Very smooth. Stands nicely. Good color"

"So smooth. Really easy to throw quickly. Harder to handbuild with due to slumping a bit. Dosen't hold shape really well"

"Great texture, smooth out real well. Some trouble with structural strength and holding shape"

"Was a horrible handbuilding body, but everyone seems to love it for

"Feels like cream cheese"

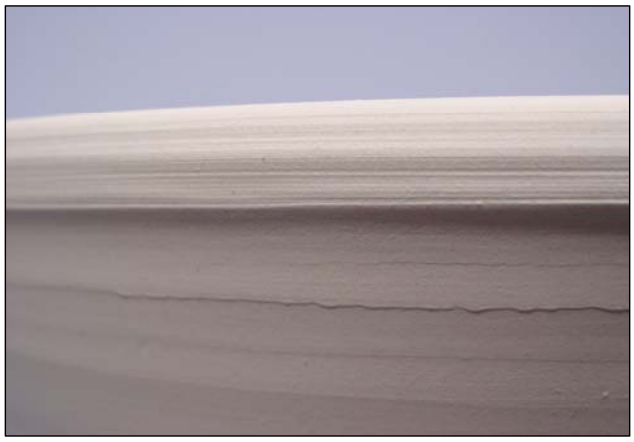
"Very nice throwing body. Love it"

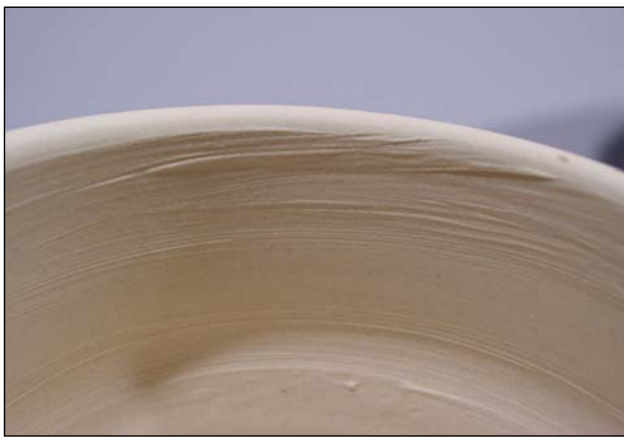
"Too plastic for handbuilding. Not enough grog but still workable for a throwing clay body"

"Alright to throw with. Better for plates and cups"

"Really nice while building, plastic, responsive. May be good as a slip?"

"It is good for throwing. I like the color, too. But the edge is very easy to be broken when its dry"





Note the cracked surface on handbuilt piece below...

Developed by: Group 2
Type: Throwing
Color: Light beige
Texture: Smooth
Cone: Cone 6 Ox.

Recipe:

FHC	30.3
Helmer	15.3
OM4	15.3
Neph Sy	26.1
Flint	6
Fine Grog	7
	100%

Wet to dry shrinkage 7.4% Absorption .38%
Dry to fired shrinkage 8%
Total shrinkage 15.4%

Class Ratings

Very Poor	1
Poor	2
Average	3
Good	4
Very Good	5

Throwing
7 students surveyed

Plasticity	3.9
Building strength/Resistance to slumping	3.3

Hand Building
7 students surveyed

Plasticity	4.4
Building strength/Resistance to slumping	3.7

What the critics are saying...

"Very nice claybody. Smooth texture"

"Feels like oil clay"

"Very nice, decent throwing and handbuilding qualities. Great color, slow to dry"

"Good for throwing"

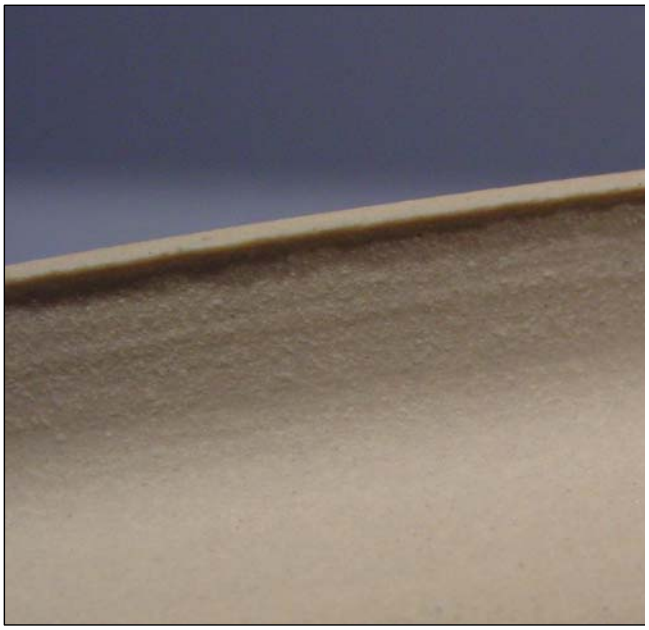
"Slightly sticky. Maybe more drying is needed. Good Plasticity

"Too plastic for handbuilding. Not enough grog but still workable for a throwing clay body"

"Really plastic and wonderful! Holds its weight well"

"Nice to throw with for a handbuilding body"

"Throws OK"



Developed by: Group 3
Type: Handbuilding
Color: Dark Brown
Texture: Semi-smooth
Cone: 04 Ox.

Recipe:

Barnard Substitute	32.5
Red Art	32.4
Frit 3110	12.4
Mullite 35	9.1
Medium Grog	4.6
OM4	8
Bentonite	1
	100%

Add: Barium Carbonate .25%

Wet to dry shrinkage 7% Absorption 5.24%
Dry to fired shrinkage 5%
Total shrinkage 12%

Class Ratings

Very Poor	1
Poor	2
Average	3
Good	4
Very Good	5

Throwing
7 students surveyed

Plasticity	2.4
Building strength/Resistance to slumping	3

Hand Building
7 students surveyed

Plasticity	3.3
Building strength/Resistance to slumping	4

What the critics are saying...

"Very pliable as far as bending it"

"Absorbed water very quickly and left a "slippy" mess with grog. Not nice to work with on the wheel (acted like crappy porcelain with large grog added)"

"Didn't really like this so much. Didn't really connect well with separate parts despite scoring and wet attachment"

"Not good for throwing"

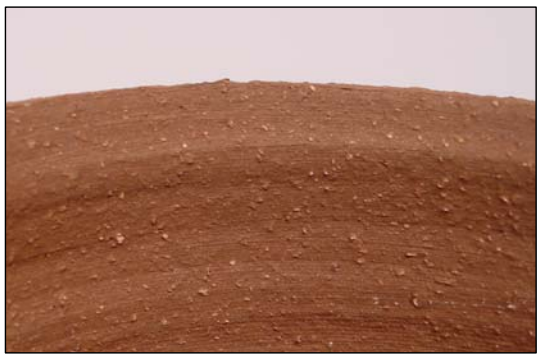
"Awful to throw with-boo"

Excellent handbuilding clay body. Plastic and has enough grog""

"Works like a crumbly paste if its just a little dry"

"It was not so comfortable to throw. My hands, tools and water… everything became red/brown when throwing"

When thrown, the grog becomes visible on the surface



When handbuilt, the grog remains below the surface

Developed by: Group 5
Type: Throwing
Color: Off white
Texture: Smooth
Cone: 10 Ox. / Red.

Recipe:

Tile 6	11.69
XX Sagger	26.41
C&C Ball	11.69
Kona F-4	30.06
Flint	12.15
Molochite 200	8
	100%

Wet to dry shrinkage 7%
Dry to fired shrinkage 7.7%
Total shrinkage 14.7%

Absorption .25%

Class Ratings

Very Poor	1
Poor	2
Average	3
Good	4
Very Good	5

Throwing
7 students surveyed

Plasticity	4.3
Building strength/Resistance to slumping	4.3

Hand Building
7 students surveyed

Plasticity	3.6
Building strength/Resistance to slumping	3.9

What the critics are saying...

"Great for a smooth sculpture body"

"Nice color. Good workability"

"Feels and works like a combination of porcelain and stoneware"

"Throwing was amazing. I recommend wedging the clay and letting it sit for 10 minutes"

"Very good for throwing"

"Really smooth"

"Very nice texture, although slumping happened when handbuilding thicker walls. Nice color though"

"I like it"

"Too plastic for handbuilding. Not enough grog but still workable for a throwing clay body"

"Nice throwing body"

Reduction

Oxidation

Developed by:	Group 4
Type:	Throwing/Handbuilding
Color:	Grey/Orange
Texture:	Rough
Cone:	10 Ox / Red.

Recipe:		
	Hawthorn Bond 35	30.4
	Alfred Shale	15.2
	C&C ball clay	15.2
	Kona-F4	19.2
	Flint	20
		100%

Wet to dry shrinkage	7.25%	Absorption	1.68%
Dry to fired shrinkage	7.25%		
Total shrinkage	14.5%		

Class Ratings

Very Poor	1
Poor	2
Average	3
Good	4
Very Good	5

Throwing
7 students surveyed

Plasticity	3.6
Building strength/Resistance to slumping	3.7

Hand Building
7 students surveyed

Plasticity	4.1
Building strength/Resistance to slumping	4.4

What the critics are saying...

"Loved working with this claybody. Smooth but strong"

"Good for throwing"

"Works like a good stoneware"

"I threw and handbuilt with this body, the tooth helped it retain shape, could handbuild very small and delicate with out breaking"

"Excellent handbuilding clay body. Plastic and has enough grog"

"Great body to throw with. Stands up very well, great balance of coraseness and smoothnes"

"Good building body"

"Weakened a lot when thinned (pinched)"

Oxidation

Reduction

Impurities in Hawthorn create localized bubbling on the surface of reduced samples

Developed by: Group 6
Type: Handbuilding / Throwing
Color: Speckled brown
Texture: Semi-rough
Cone: 6

Recipe:

Barnard Substitute	15.2
Lizella fireclay	15.2
EPK	30.4
OM4	24
Neph Sy	10.6
Fine Grog	4.6
	100%

Wet to dry shrinkage 6.7%
Dry to fired shrinkage 9.3%
Total shrinkage 16%%

Absorption .24%

Class Ratings

Very Poor	1
Poor	2
Average	3
Good	4
Very Good	5

Throwing
7 students surveyed

Plasticity	4.1
Building strength/Resistance to slumping	3.9

Hand Building
7 students surveyed

Plasticity	4.4
Building strength/Resistance to slumping	4.3

What the critics are saying...

"Great color! Very pliable as far as bending it"

"Body feels slightly thixotropic-is really resistant when molding or modeling. Gummy feeling. Smoothes out well. Color is great"

"Excellent handbuilding clay body. Plastic and has enough grog"

"Good for throwing but not the best"

"Very nice, love the color (prefired). Held shape very well in both throwing and handbuilding"

"The body threw really well. Trimming it was like butter"

"Slightly self-glazing when fired. Nice texture and color. Stands well"

"Hard to make thinly thrown work. Dries out. Had to be very sensitive to touch"

"It was not so bad for throwing"