

DRY GLAZE MIXING INSTRUCTIONS

SAFETY

The first thing to remember about any glaze in the dry powder form is that it is hazardous as a dust, so you must **take care not to breathe it**. This is true regardless of whether the liquid form of the glaze is rated lead free and non-toxic or otherwise. Therefore when mixing dry glaze always work in a properly ventilated work area and wear a respirator and safety goggles.

GENERAL

On our price list you will find that all of our Stoneware Glazes, Low Stone Glazes and Raku Glazes are available dry in 10 lbs. bags, as well as wet in pints and gallons. Our standard wet glazes are all prepared for brushing application and our dry glaze are set up for dipping. Also, all of the glazes on our price list are available in dry form in 50 lbs. bags and can be prepared for brushing, dipping or spraying application.

PREPARATION

When preparing to mix either a 10 lb. or 50 lb. bag of dry glaze be aware that even though the powder is thoroughly mixed when it leaves the factory the components will tend to segregate as they are shaken about in shipping. The heavier components of the glaze will settle to the bottom of the bag. Therefore, when you are mixing dry glaze either use the entire bag or, if you only want to mix up part of the bag, make sure the entire bag of dry glaze is thoroughly mixed first. One way to mix up the dry glaze is to put it in a clean, dry 5 gallon plastic pail with a sealing lid. Rolling the pail on the floor for a few minutes should sufficiently mix the powder. Do not open the pail lid immediately after mixing; wait a few minutes for the dust to settle. Make sure you are wearing a mask.

MIXING

When mixing a glaze always use a clean vessel whose volume is at least 25% greater than the amount of glaze you expect to finish with. Put 90% of the required amount of water in the mixing vessel. Then immerse the mixer in the water and turn it on. Slowly feed the powder into the agitated water. The remaining 10% of water can be added if the glaze becomes too thick to mix properly. If the additional water is not needed hold it back to the end and add it gradually to adjust the viscosity and density. Mixing should be done with a powered mixer, which can be as simple as a drill with a paddle on the end of the shaft. Manual mixing is not recommended. After the glaze is thoroughly mixed it should be screened through an 80 mesh screen to remove any coarse particles. **Note:** Some dry glazes will come with a small pouch of ingredients labeled "add after sieving". These are materials that produce the speckled effects in the glaze and will not pass through your 80 mesh screen – add them to the wet glaze last and give the glaze a stir.

HOW MUCH WATER DO YOU NEED?

The following recommendations are just guidelines to establish a starting point and the actual quantities required may vary. The following are some typical examples of the amount of water that is required to mix dipping glazes and the approximate amount of glaze that will be made.

<u>Prod. No.</u>	<u>Description</u>	<u>Ratio of water to Dry Glaze by Weight</u>	<u>Qty of water per 10 lbs. of dry glaze</u>	<u>Approx. Qty of Glaze made</u>
700-D	Clear Gloss Glaze(06/04)	0.78	7.8 lbs. = 6 ¼ pints	+ 1 ½ Gallons
705-D	Opaque Gloss Glaze (06/04)	0.63	6.3 lbs. = 5 pints	+ 1 ¼ Gallons
1100-D	Clear Gloss Glaze(4/6)	0.65	6.5 lbs. = 5 ¼ pints	- 1 ½ Gallons
1140-D	Reactive Hi-Fire Glaze(4/6)	0.63	6.3 lbs. = 5 pints	+ 1 ¼ Gallons

GUIDE TO ADJUSTING GLAZE VISCOSITY AND DENSITY

Unfortunately there is no perfect set up for dipping glazes that will work in all applications. The goal is to find the right set up, in terms of viscosity and density (or specific gravity) that will provide the finish you want to achieve. Ideally for a clear dipping glaze you are trying to deposit the least amount of glaze that will provide a clear glossy finish over the entire piece. An opaque glaze will require a thicker coating of glaze to provide a consistent color and finish over the whole piece. There are several factors that affect the thickness of glaze deposited on a piece. The first is the bisque temperature of the piece. The hotter a piece is bisqued, the tighter the body becomes and the less glaze is picked up by the piece. The formulation of the clay body being used can also affect the tightness or porosity of the piece and therefore the amount of glaze deposited. The other significant factor is dryness or wetness of a piece. The drier a piece is when it is dipped the more glaze it will be able to pick up. This is particularly important for pieces with a lot of underglaze decoration on them. If the underglaze has not been allowed to thoroughly dry before dipping the decorated areas will not pick up as much clear glaze as the areas of bare bisque and may look rough or partially unglazed after firing. Re-bisquing pieces that have been decorated will help minimize this potential problem.

Due to the great variety of conditions under which dipping glazes can be used our recommendations for dipping glaze set up should be used only as guidelines. They are generally appropriate in the majority of cases. However, to obtain the best results for your particular conditions the first time you use a new dipping glaze you should dip a series of test pieces in order to determine the range of density and viscosity readings that provide the best results. The simplest way to do this is to start with a set up slightly thicker than recommended and add water in small increments, such as 2 oz. per gallon of glaze being adjusted. Dip a test piece and record density and viscosity after each addition of water. Be careful not to add too much water as glazes that are too thin can settle in the bottom of the container. The results of the fired test pieces should show you the range of density and viscosity readings that produce good results.

Specific gravity is a measure of the density of a liquid measured in grams per cubic centimeter. Water has SG=1.0, which means that 1 cc of water weighs 1 gram. To calculate the SG of a glaze divide the weight of the glaze by the weight of an equal volume of water (i.e. weigh 100 cc of glaze and divide by 100 to obtain the SG of the glaze). This can be done easily using a scale such as an Ohaus triple beam balance and a plastic measuring cylinder cut off at the 100 cc mark. Fill the cylinder to the top, weigh it, remember to subtract off the weight of the cylinder, and divide by 100 to obtain the SG.

For a dipping glaze a combination of viscosity and SG is required that will result in the correct thickness of glaze being deposited on the piece in one dip application. The usual range of SG for a dipping glaze is 1.50 to 1.70, the lower end of the range being for clear glazes and the higher end for opaque glazes. Various other factors will affect the determination of the appropriate SG of the glaze. These factors include whether the piece to be dipped is greenware or bisque, the bisque temperature, whether the piece is made from pug clay or casting slip, the moisture content of the piece, and anything else that affects the ability of the piece to absorb glaze. By comparison brushing glazes usually have SG in the range of 1.45 to 1.60.

Glaze viscosity (or thickness) can be measured in terms of the number of seconds that a given volume of glaze takes to flow through a hole of a certain diameter. The easiest way to measure viscosity is by obtaining a viscosity cup, also called a Zahn cup, from a hardware or paint store plus a stopwatch. The viscosity cup is a small container with an open top and a bowl shaped bottom with a small hole to allow the glaze to flow out. The cup has a handle so that it can be dipped in the glaze. Fill the cup to the brim while holding a finger over the hole. Start your stopwatch when you remove your finger from the hole. Record the time it takes until the stream of glaze breaks at the bottom of the cup and only drips remain. The number of seconds is a reliable measure of the viscosity of the glaze. Dipping glazes generally have viscosities in the 20 to 30 second range, although many of the factors mentioned previously with respect to SG may also call for viscosities outside of this range.

By maintaining the specific gravity and viscosity of a glaze within a predetermined range it is possible to control the thickness of glaze that is deposited on the piece. This is especially important with respect to dipping glazes versus brushing glazes since you do not want to vary the number of coats being applied. Also dipping glazes tend to thicken up as they are used because water is sucked out of the glaze into the bisque as pieces are dipped. Therefore it is necessary to monitor viscosity and SG on an on going basis, not only in the initial set up of the glaze.

The control of glaze thickness is essential for the production of consistent, high quality results. Glazes that are applied too heavily or too lightly are the cause of any number of glaze defects including pitting, crawling, color variation and rough spots. The most reliable way to check glaze thickness is with a thickness gauge which can be purchased through an instrument supply catalogue. Hold the gauge on the surface of the glaze. When the button is pressed a needle penetrates the glaze to the bisque surface and displays a reading of coating thickness in either millimeters or thousandths of an inch. However for many potters and ceramists the simple scratch test is sufficient. After dipping a test piece and letting it dry, scratch through the glaze down to the bisque with the tip of a knife. The correct thickness of glaze is usually about the thickness of a thumbnail.

Testing pieces to determine the range of glaze thickness that will produce the desired results can save many hours of unnecessary troubleshooting. Once the appropriate thickness range has been determined it can be correlated to a range of viscosity and SG values that produce the correct thickness. Maintaining viscosity and SG within the desired range can usually be achieved by the addition of small quantities of water. There are other materials, such as Spectrum's Glaze Suspender(1071) for thickening and Glaze Thinner(1072), that can be used rather than water. Achieving the proper glaze thickness on a consistent basis through the control of viscosity and specific gravity is one of the keys to avoiding many common glaze defects.