

Slip Information

The hobby ceramic industry uses a liquid known as slip to create the greenware castings. This "slip" is created from a large percent of dry materials, and water.

Clay is one of the main raw materials used. Clay is the plastic part of the slip.

Talc is the other main raw material. Talc is the non-plastic or binder type of material and the high percent used in slip controls the thermal expansion in firing and makes the bisque compatible with glazes.

A simple formula for a typical low fire white body would include 60% talc, 36% clay and 4% calcium carbonate.

The calcium carbonate, commonly referred to as whiting, is necessary to control moisture absorption. Without it you may experience crazing on an item, but it might not show up for several years.

The total dry weight of these materials, for a 500 gallon batch, is about 5000 pounds. The final specific gravity of the slip needs to be 1.78 so the water required is about 44% of the dry material weight. Water weighs 8.336 pounds per gallon, so 44% of 5000 = 2200 pounds and dividing that by 8.336 we find that we'll need 263.9 gallons.

A liquid casting body cannot be made without the use of deflocculants. These are chemicals that help break down the variable properties in the water, clay and talc, so that they will go into suspension. The most widely used dry deflocculants are soda ash and barium carbonate. Soda ash is usually added at .03% to .05% and barium carbonate at slightly less, based on the dry weight of the material. Along with dry deflocculants, liquid sodium silicate is also required. The exact amount required will vary greatly. It will range from .02% up to as much as 1% depending on all the variables.

As a quick overview of the mixing procedure the water is put into the mixer. The dry deflocculants are weighed out and put into the water with the mixer running. Then the talc is added. As the talc is added, sodium silicate will have to be added to maintain a good vortex in the mixer, about 20 ounces. The whiting is added immediately after the talc and the mixer should run at least an hour. Next we add the clay. It will take more sodium silicate to maintain the mixing action. When all the talc, whiting and clay has been added, a total of 200 ounces of sodium silicate will have been used. At this point the mixer should continue to run for several hours.

After mixing, the most important test and the absolute first test that should be made is for specific gravity. Specific gravity is the ratio of the density (weight) of a substance to the density of another substance taken as a standard. We use water as our standard. Most slips would be formulated to be within 1.75 and 1.80 specific gravity. This means the slip should weigh 1.75 to 1.80 times that of water. As stated before water weighs 8.336 lbs. per gallon. Therefore, slip at 1.75 would weigh 14.59 lbs. per gallon. To adjust the specific gravity, if the slip is heavy add water, if it is light the only solution is to add more dry materials at the ratios of the original formula. That's not much fun and is the reason most slip manufacturers start with a little less water than the formula calls for. That way the final adjustment is to add water. After adjusting the slip for a specific gravity of 1.78 as per our formula we now have a slip that has the correct specific gravity but it sure looks thick. At this point the viscosity of the mix will have to be adjusted using a viscosimeter and adding sodium silicate to chemically lower the viscosity.