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## Testing Clay and Claybodies

### Analysis of Clay Properties

Even with only a very small sample of clay there are a number of simple tests that can tell you a great deal about any clay or claybody. When weighing and measuring test tiles, use a good high-precision gram scale and be as accurate as possible. When measuring test tiles use a ruler marked with decimal fractions of an inch or a metric ruler. Before doing the subtraction and division convert all fractions to decimals. With each fraction, just divide the smaller number by the larger number to get a decimal equivalent. For example, to convert  $9/32$ ", divide 9 by 32, giving .28".

### 1) Water of Plasticity

This term refers to the percentage water content required to bring a particular dry clay or claybody to its most plastic state. The smaller the average particle size in the clay, the more plastic the clay will be, and the more water required for water of plasticity. Thus a high *water of plasticity* percentage indicates a more-plastic clay, but also higher drying shrinkage.

To measure water of plasticity, weigh out a 100-gram sample of dry clay or claybody. Deposit the dry clay on a clean, non-porous surface like a sheet of glass or a glazed plate. With a small clean sponge, begin dispensing drops of water onto the clay, mixing thoroughly with a modeling tool or rubber spatula until you reach the desired plasticity for a workable claybody. Use a second spatula or a rubber or metal rib to scrape all clay from the mixing tools and the mixing surface to ensure *all* of the dry is worked into the sample mass. Re-weigh and figure the increase in weight. Since the original dry sample was exactly 100 grams, the number of grams over 100 is the percentage water of plasticity.

### 2) Actual Plasticity

For a simple test of actual plasticity, take a small amount of moist clay or clay body and roll out a 4"-long pencil-thin coil on a damp but not wet surface (rolling on a dry surface will remove water from the clay and give you an inaccurate indication of plasticity). Wrap the coil around your finger, noting any tendency to crack or separate. If the clay survives this test without cracking, try tying it a square knot. Any clay that survives that without cracking is highly plastic.

### 3) Shrinkage

You can discover a great deal about any claybody by testing the shrinkage in drying and firing. To test shrinkage, roll out a small  $3/8$ " slab of moist clay or claybody. Cut a 1" by 5" test tile and trim one edge straight with a ruler and knife. Place two incised marks exactly 4" apart along this edge. If you are testing more than one clay or claybody mark each tile with appropriate identification. Allow the tiles to dry slowly under plastic or between layers of drywall so that they do not warp. When bone-dry, carefully measure between the marks and record the measurement. Bisque-fire the tiles and then fire to the expected glaze-firing temperature, measuring and recording the measurement after each firing.

To get the percentage shrinkage at each stage, subtract each measurement from the previous measurement – dry measurement from damp measurement, bisque-fired measurement from dry measurement, glaze-fired measurement from bisque-fired measurement. In each case divide the result by the previous measurement. For example, if the dry length between marks is 3 3/4", subtract from the original wet length of 4", giving 1/4" or .25". Divide .25" by 4", giving .0625, or 6% drying shrinkage. There will be negligible shrinkage from dry to bisque-fired.

To determine the overall firing shrinkage (bisque and glaze), measure the size after the final firing, subtract from the bone-dry measurement, and divide by the bone-dry measurement. To determine the percentage of shrinkage overall, subtract the final fired measurement from 4", and divide by 4".

#### **4) Porosity/Absorption**

The absorption test tells you how much porosity is in a clay sample. Low-fired and bisque-fired clay will have relatively high porosity, but any utilitarian body fired to midrange or high-fire temperatures should have very low porosity, usually 3% or less. To measure porosity/absorption, bisque-fire a test tile and immediately upon removal from the warm bisque kiln carefully weigh the tile and record the weight. Be sure to do this immediately or the tile will absorb atmospheric humidity and give an inaccurate weight. Place the tile in a pan of cold water on the stove and bring it to a boil for ten minutes. Leave it in the pan and allow to cool to room temperature overnight. In the morning, remove the cooled tile from the pan, blot off all surface water with a dry paper towel, immediately weigh it and record the weight. Allow the tile to dry, fire to glaze-firing temperature, and repeat the boiling, cooling, and weighing and record the weight. In each case, subtract the dry weight from the wet weight and divide by the dry weight to give percentage absorption of the bisque-fired and glaze-fired sample.