Reverse Engineering for the Potter

Roger Graham. Pottery at Old Toolijooa School.
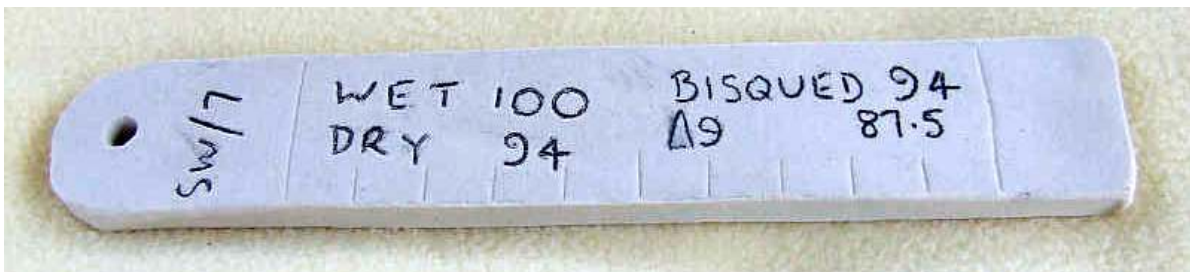
There are times when a potter needs to work backwards, beginning with the finished product and deciding how to make a copy, "reverse engineering". Perhaps this has happened to you?

- A customer brings in a casserole with a broken lid. Or maybe just the fragments of the whole pot. Can you mend it (no). Or could you make another one like it (yes, I'll try). Or, maybe…

- You once made a series of a dozen attractive pots, and they've sold well. There's only one left, and you'd like to make more, without having to re-invent the whole thing.   Or, perhaps…

- You picked up a stunningly attractive pot for a dollar at the junk shop. Beautifully made by an unknown potter somewhere in the past, and good enough to copy. This is a case for R & D (that's pottery-speak for Ripoff & Duplicate).

Let me share with you a method that works well for me. All you'll need is a black pen, a red pen, a millimetre ruler, and a simple calculator. But first, some homework:

You absolutely **must** have done a shrinkage test on the clay you plan to use. Very likely, you've done this already, but if not, here is one way to do it: Roll out a slab of clay, the same consistency that you normally use, thickness about 7 mm (1/4 of an inch, near enough). Trim it to a suitable neat shape, as in the photo, and on it make two marks just 100 millimetres apart. Leave the bar to dry, and measure the length between the 100mm marks. Expect it to have shrunk, usually by about 6 mm. Make a note of this, and set the bar aside until your next bisque firing. Measure it again , and (surprise, surprise!) usually find that it's still the same size. Just harder, but not shorter. Next, of course, put the bar through a glaze firing, and measure again. Expect more shrinkage this time.

This photo shows a typical shrinkage bar, made from our most-used white stoneware clay, which we call SW/7:

Length when wet	100.0	mm
Dry	94.0	"
Bisque fired to 1000°	94.0	"
Fired to Cone 9	87.5	"

Now that you have the necessary figures, let's get on with the Reverse Engineering bit. I'm not a big fan of shrinkage rulers, messy things. It's so much easier with a calculator. Just do this:

Wet size/Fired size (that's 100 divided by 87.5) = **1.14**, rounded to 2 decimal places

This is the Magic Number for this clay. Remember it. Write it down somewhere.
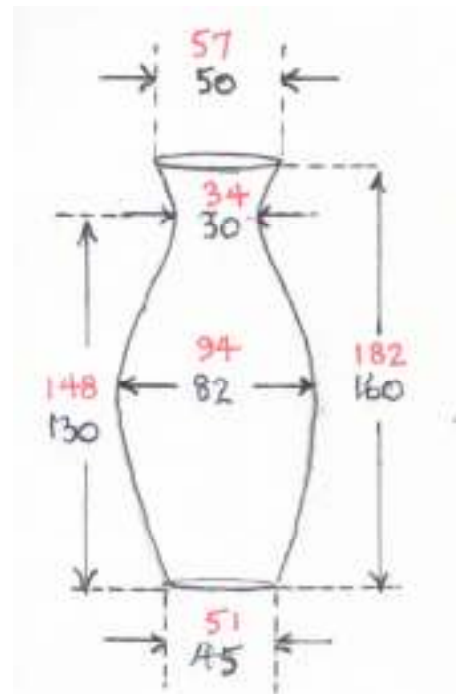
It's easier to explain using a real example. . A customer brought in a broken celadon sake jar, part of a set, hoping for a replacement, same shape, same size.

The first job: Draw a sketch of the pot, and mark the dimensions (height, width, lid size etc) in black.

This example is the actual sketch taken from our daybook. The figures in black are measurements (in millimetres) taken from the broken sample.

The figures in red are the same measurements multiplied by **1.14**   These figures are the dimensions to use when making the replacement pot.

That's all there is to it. Draw the sketch in your log book, with the fired size figures in **black**, and the wet sizes in red. Then just use an ordinary ruler.

Here is the new replacement pot under construction.

The top pointer is set 57 mm wide and 182 mm high, the same as the red figures in the sketch-book diagram.

The lower pointer, 94 mm wide and 74 mm high, marks the middle of the belly.

Here's the final result after drying, bisque firing, glazing and glost firing. . Did we get the arithmetic right?

Not perfect; but fairly close. The leaf design on this one was done by water etching.

Matching the colour of the glaze is often harder than just copying the shape of the pot.

How much clay to use? You can just guess, and probably get it right. Or maybe not. This becomes easier if you have done a little homework first.

Some time when you're not busy, weigh out a 100 gram sample of your usual clay. Let it dry, and weigh it again. Bisque fire it, and weigh once more. Then fire to the usual top temperature, and weigh again. Digital scales make this so easy.

This picture shows the idea, using a sample of our most-used clay:

Wet:	100.0	grams
Dry	78.5	"
Bisque fired 1000°	72.0	"
Fired to cone 9	72.0	"

In this example, (Weight when wet)/(Weight when fired) = 100/72 = **1.4** approx

Knowing all this, just weigh the desired pot that you want to copy, and multiply by **1.4** to get an approx figure for how much clay to use. Add a bit to allow for trimming.

Summing it up in just a few words: For the clay we use most, multiply the final fired **size** by **1.14** to get value for the wet size. Multiply the final fired **weight** by **1.4** to get the approx weight of clay to use.

That took ten times longer to explain it than it does to do it. You can "reverse engineer" a pot in just a few minutes