how to design, make and install ceramic tile murals and mosaics

design tips and how-to instructions for handmade ceramic tile projects
How to Design, Make and Install Ceramic Tile Murals and Mosaics: Design Tips and How-To Instructions for Handmade Ceramic Tile Projects

Handmade ceramic tiles take advantage of all the complex possibilities of the ceramic process. Add the graphic potential of a picture plane, multiply that over any area you want, and the possibilities for ceramic tile projects become nearly limitless. And ceramic tile isn’t just flat; handmade ceramic tiles can be relief surfaces that are quite complex—but you would be surprised to learn how easy it can be to make your own. In fact, you can make a ceramic tile mold that has a lot of relief so you can quickly reproduce a complex design without having to carve each tile separately.

It all starts with ceramic tile design—and good design starts at the end; considering the end result of a ceramic tile project before any tile is made will help you choose the clay and the tools to use. And the experts we’ve chosen to walk you through the process of making and installing your own handmade ceramic tiles have all the information you will need to stay on track. Whether you are making a small ceramic tile mosaic for a table top, or a complex ceramic tile mural for a large wall area, How to Design, Make and Install Ceramic Tile Murals and Mosaics: Design Tips and How-To Instructions for Handmade Ceramic Tile Projects will help you plan your ceramic tile project in no time flat.

What you’ll get from our ceramic tile experts:

How to Make and Use Ceramic Tile Molds
by Gary Carlos

If you need a lot of tiles, a ceramic tile mold can save you a lot of time and effort. Carlos demonstrates how to make a basic ceramic tile mold for impressing a design into ceramic tiles. Want to get a little deeper? Carlos also shows you how to make and use a cavity mold designed for ceramic tile relief.

How to Make Ceramic Tile Mosaics Using Poured Clay Slip
by Jerry Goldman

Making ceramic tile does not have to be complicated; in fact, you can let “happy accidents” become a partner in your ceramic design process. In this tile mosaic how-to, Goldman shows you how to use clay slip poured into a slab mold to create ceramic tile shapes that are complex, yet fit together perfectly in a mosaic design. As we all know, creativity doesn’t stop when the clay is fired. For this reason, Goldman recommends several tools for working with fired ceramic tiles.

How to Design, Make, and Install a Hanging Ceramic Tile Wall Mural
by Donna Rozman

Create a ceramic tile design based on simple experimentation with abstract shapes. Rozman shares a tile design transfer technique for quick repetition and production of your tile design, then walks you through the steps for applying glaze and colorants to ceramic tiles. She includes a glaze recipe for majolica tile decoration. Rozman finishes off by showing how to install and display a ceramic tile mural.
How to Make and Use Ceramic Tile Molds

by Gary Carlos

After college, and while working part-time for a small slip-casting studio, I began to explore a career in art education. This exploration led me to San Francisco’s vibrant mural community. Crafting a work that will hold up in the face of extreme weather conditions and graffiti is of great concern to mural painters. Many muralists have rediscovered that ceramic tile has always been an attractive, alternative medium to paint.

With a background in both painting and ceramics, in addition to my interest in public art, working in tile seemed like a natural progression for me. I find it extremely satisfying to bring work out of the studio and into public spaces, where it can become a living part of the community.

As my interest in tile grew, a colleague told me about the historic Moravian Pottery and Tile Works in Pennsylvania. Within weeks I was on a plane to attend one of their 3-day workshops. In that short time, I learned many of the simple techniques tile makers have used for centuries. In the years since, I have found my own way of using tile to explore a variety of themes in my work. I hope this brief introduction to tile making allows you to discover some new possibilities in your own work as well.

Making a Basic Ceramic Tile Mold

Start by making a good set of adjustable mold boards (figure 1). Cut four laminated boards (¾×5×12 inches is a good size). Attach a 90° framing bracket (available at hardware stores) flush to one edge of each board. Caution: If you are not comfortable using power tools have someone who is do this step for you. Most home centers will cut wood to your specifications.

Blue Streets, 2001, 23×23 inches, earthenware and low-fire glazes.

Blue Streets detail. A geometric pattern was first carved into a plaster block. I pressed a tile with this pattern and added the small house-like elements. A cavity mold was then made from the finished tile.

Freeway, 2001, 11×17 inches, earthenware, underglaze, stains, and glaze. For this piece the original tile prototype was made completely out of clay.

Hive, 2000, individual tiles are 4 inches wide, earthenware with oxides, glaze, and grout. This hexagon-shaped tile has a shallow Y-shaped groove cut into it for grout, making it appear as three separate shapes, adding another element to the design.
Good plywood also works for mold boards, but use mold soap on them. Try to get wood covered in Formica. Shelving sold in most home centers is only covered with thin contact paper. This will work, but after continuous use it will begin to deteriorate around the edges. Try a local cabinet shop for scraps or a home center for a damaged countertop. If you can’t get laminated wood for templates or a smooth work surface to pour directly on, try Plexiglas, glass, or fine-grained plywood coated with sealer. Remember to always use a release agent, such as oil soap, on a porous surface before pouring plaster on it.

Cut additional square pieces of laminated board as templates for plaster molds. When determining the size of your template, accommodate for clay shrinkage in the final tile: if you’re using a clay body that shrinks 12% you’ll need a 4½-inch mold for a 4-inch tile and a 6¼-inch mold for a 6-inch tile. Assemble the mold boards snugly around the template (figure 2). The mold should be level so check your work surface with a level and adjust it with shims if necessary.

Fasten the boards together with four spring clamps (figure 3) or C-clamps. If the boards are all cut accurately at right angles, the assembled form will keep plaster from leaking without the need to seal the joints with clay. Since laminated wood is non-porous, it also eliminates the need for a release agent. Put a wad of clay at the base of each wall to keep the form secure.

For most studio applications, I use #1 Pottery Plaster. Make sure the plaster is fresh (stored for no more than 6 months) and completely free of moisture. Measure room-temperature water and plaster by weight (figure 4) in a ratio of 0.7 parts water to 1 part plaster. Use 1 pound of water to 1.4 pounds of plaster for a 4½-inch square mold and 2.1 pounds of water to 3 pounds of plaster for a 6¼-inch square mold. Note: I’ve used decimals not ounces.

Slowly sift the plaster into the water (figure 5). Once all the plaster is in, allow it to soak (slake) for one minute without any agitation. Mix the plaster with a clean stick until it becomes a heavy cream consistency (a milkshake consis-
tency is too thick). This should ideally take 2 to 3 minutes, but can happen anywhere from 1 to 5 minutes.

When the plaster has reached a proper consistency, pour it into the form in a slow, steady stream (figure 6). Shake the table (but not too much) to bring any air bubbles to the surface, and to settle the plaster out, making the top completely flat. Swirl some water in the dirty mixing container immediately and dump it into a waste bucket.

Caution: Never pour plaster or plaster waste water down a drain.

When plaster sets, it gives off heat. After about 30 minutes it will cool back down and you can then take the form apart (figure 7). If the boards stick, give them a quick tap away from the mold and they will pop off. Tip: Pouring a few of these plaster blanks is a good way to get used to plaster before trying something more critical.

Clean up the edges on the top of the mold with a scraper (figure 8). Leave the other side (facing the template) untouched; it should already be perfectly flat and free of air bubbles. This is the side you will carve.

Create a scale drawing of your image (figure 9). Remember that your final product will be a mirror image of this, so if you use any text it will need to be written backwards. To transfer the design, place your drawing over the plaster block and trace it with a slight amount of pressure (figure 10). This will leave a shallow mark in the plaster.

If you have trouble seeing the design, scribble some graphite or charcoal onto a piece of paper and smear it on the block. Use a hook tool or a V-shaped linoleum block carving tool to deepen the grooves to about \(\frac{1}{16}\) -inch (figure 11). This is most easily done when the plaster is damp. If the plaster block is dry soak it in some water for a few seconds first.

You can press some clay onto the mold to check what it will look like, but allow the mold to cure and reach full strength (about two weeks) before using it for production. Cut a slab of clay slightly larger than the mold (figure 12). Roll the slab out so that it is a bit thicker than the desired tile thickness (figure 13). Use a straight edge to smooth the surface of the slab.

Place the mold on top of the clay and place a wooden block on top of the mold. Hit the wooden block a few times with a rubber mallet until the clay squeezes out on all four sides (figure 14). If your table is not sturdy, you may want to do this on the floor. Caution: It is possible to
crack a mold in half (more common with cavity molds). To avoid this, use soft clay and make sure the wooden block and plaster mold are both flat and free of debris.

Trim the excess clay with a knife before removing the mold (figure 15). To keep the corners square, place your thumb at the end of each cut. If the tile does not come off right away, set it aside and allow the plaster to do its work. Before long, the clay will stiffen up and release easily (figure 16). One of the things tile makers struggle with is preventing tiles from warping. Try not to bend a wet tile, as plastic clay retains a memory. Place it on an absorbent board and allow the tile to dry evenly.

Making a Cavity Mold for Ceramic Tile

If you have a sculptural tile and want to minimize distortion around the edges, or want a consistent tile thickness, you should make a cavity mold. Make an original tile out of clay, avoiding undercuts. Rub some water on the bottom of the tile to create a thin slip and stick it to a board allowing a 1½-inch border around all sides (figure 17).

Pour the plaster at least 1½ inches over the top of the tile—any less and the mold may crack during pressing. To use the mold, cut a slab of clay the same size as the opening (figure 18). Cover the clay with canvas and use a rubber mallet and a block of wood to press the clay into the mold. If you get serious about tile, you may want to invest in a tile press (figure 19). There are several types available. I prefer this converted arbor press. It is compact and applies over 2 tons of pressure. Cracking molds is sometimes unavoidable, but, if it is a problem, switch to a plaster mix of 2 parts #1 Pottery Plaster and 1 part Ultralcal.

Use a wire cutter to slice off the excess clay (figure 20). This homemade wire tool is based on one used at Moravian Pottery and Tile Works. Use a wooden straight edge to scrape off and level the back of the tile. You may want to sign or stamp the back at this point.

Give the clay some time to set. This may vary greatly depending on the weather and dampness of the mold.

If you want to make several production molds of the same tile, create a durable master with mold-making rubber. To do this, seal a cavity mold with oil soap (Murphy’s). When the soap has dried, mix the 2-part rubber and fill the mold to the brim. When the rubber has cured, glue it to a board and use it as you would a clay master. If you are pouring plaster on plaster, always seal the plaster original with oil soap.

After setting, if the tile still sticks, gently tap the mold on all four sides and the open-face side with your palm or a rubber mallet. Or try shooting air between the clay and plaster with an air compressor.
A completed mosaic utilizing small pieces of handmade tiles to create a large composition.

This composition features broken slabs reconstructed and incorporated as major elements.

Years ago, I was inspired by a friend who made wonderful mosaics. He would get tile remains from kitchen and bathroom installations and make great works. I decided to try this technique. I liked it, and got my tiles from the usual sources at first. Seeking to augment my palette, I found the dump sites of two manufacturers, one in south New Jersey and one in Massachusetts, and worked with these tiles. But it was not enough. I felt a need for something more, not that the tiles weren’t wonderful technically—hard, vitreous, nice looking; it’s just that I wanted a greater color range, and the cold perfection of the pieces moved me to start making my own.

For years, I blended metallic oxides and commercial slip stains to make many thousands of color tests that I carefully recorded. When I came upon a color I wanted, I mixed a quantity and cast a slab about 5/16-inch thick. When I had a kiln load of slabs, I stacked them one on top of another to conserve kiln space, which resulted in a couple of wonderful effects. First, the center interior of the stack never got quite enough oxygen, so there was reduction and marvelous color variation; and second, some of the tiles cracked, creating even more color variation where oxygen circulated around cracks. Opening a kiln load of tile was like Christmas and opening presents.

Process

Paint the mold with colored slip then immediately pour the required amount of uncolored slip into the mold (figure 1). I do this for two reasons: metallic oxides can be costly and require care in preparation, and using a solid-colored tile is unnecessary for this project.

Use a level to set the mold. Slip, like water, seeks its own level, so a level mold assures a slab of uniform thickness (figure 2).
Allow the slab to dry. If the slab is left in the mold too long, it will begin to curl ([figure 3](#)). As a matter of fact, the slab will continue to curl the longer it is left in the mold, and will curl even more during the drying and firing stages.

Remove the slab from the mold as follows: Completely cover the clay with newspaper then place a piece of plywood cut to the size of the mold on top. Firmly grip the mold and plywood together with both hands and flip it over in one quick movement. Place the slabs so that both surfaces will have a chance to dry evenly, such as on a grate, or flip them over from time to time.

If you want a tile with a flat surface, cover the clay with a newspaper laid flat and roll it on both sides. To diminish the possibility of edge cracks, burnish the edges with a knife.

Stack the dried slabs in the kiln and fire them to maturity. For illustrative purposes, I removed the tiles and restacked them on a ware board to show what the stack looked like in the kiln ([figures 4 and 5](#)).

To mount the mosaics, use a durable sheet material framed with the material of your choice ([figure 6](#)). I recommend a backing made of %-

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**Slab Mold Basics**

To create a plaster mold for slabs, set a piece of plate glass on wood strips so the glass is raised about \( \frac{5}{8} \) inch. Seal the edges of the glass with soft clay. Bevel and smooth the edges with a spatula. Build a 2-inch high form around the edge approximately an inch from the edge of the glass. Pour plaster into the form. Remove the glass after the plaster has set and allow the mold to thoroughly dry before use.

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This illustrates the variation achieved using this method. Tile 1 was on the top, Tile 2 was just under Tile 1, Tile 3 was below and Tile 4 was close to the middle of the stack.
Assemble the mosaic (figure 7). Here I have assembled most of the mosaic; this is one of a series of roots and rocks. The root was made of plastic clay and formed completely in that state. I allowed for about 20% shrinkage in the drying and firing.

Finish the mosaic with grout (a cement-like material forced in the spaces between the pieces of tile). There are many different colored grouts available in tile shops and home centers. Black grout usually has powerful colorants, but if that gets on the tile, it can darken the tile or make the cleaning of it very difficult. I now paint the grout after it is in place in the mosaic. Tile store and home improvement centers carry abundant stocks of tile adhesives, and have tools as well as helpful, knowledgeable staff.

Tools for Working with Fired Ceramic Tile

Carbide-tipped tile nippers are an important tool. For small cuts, use just the tip of the cutter.
WARNING: Always wear safety glasses when cutting tile.

A tile cutter is useful for straight cuts. Various tile-related tools may be rented at tile stores or tool rentals, so you don’t need a major investment up front.

The 4-inch circular saw with a diamond-tooth blade is a very versatile and useful tool. I do all my cutting outdoors because of the dust it creates.
WARNING: Read and follow all tool manufacturer warnings on any power tool.
Majolica is a folk pottery tradition that began in ninth-century Iraq as a means of imitating Chinese porcelain. Earthenware clay was coated with a tin-based glaze, which made it white and opaque. Then oxides were brushed on the unfired surface. Today, with the help of zirconium as the opacifier in the glaze, and the broader range of color available in commercial stains, you can really push the limits of traditional design.

Majolica glaze is rather unforgiving as it doesn’t move in the firing. Drips, pinholes and other imperfections that occur during application will not repair themselves during the firing. This makes working on this flat tile project a wise choice for a classroom environment or a person new to this technique. Glaze is easily applied to the tiles and their flat surfaces are easy to paint. As colorants are applied to this raw glaze surface, they are absorbed quickly. This quality can make applying the colorants rather difficult, and some practice and experimentation is necessary. For this reason, I glaze extra tiles to use for mark-making practice and for testing absorption and consistency of the colorants. This also can be done on newspaper if no extra tiles are available.
Creating a Ceramic Tile Design

Select a random 2-inch square from any interesting line drawing to create a motif or you also can create your own pattern. Make a 2-inch-square paper window to explore possible abstract patterns (figure 1).

After you have decided on the design you want to use, trace it onto a 2-inch square of tracing paper with a soft (6B) pencil (figure 2).

Divide a 4-inch square of paper into fourths, creating four 2-inch squares. Use the tracing paper transfer technique to trace the motif into each square, rotating or reversing the image as desired (figure 3).

Copy the chosen design to visualize the effect when repeated. A copier can be used to reduce, enlarge or reverse designs as needed. Once you have chosen a final design pattern, the size and how many tiles you will need, you can begin planning the mural design (figures 4 and 5).

Glazing and Applying Colorant to Ceramic Tile

You can order a variety of bisque-fired tiles from your local tile or ceramics-supply store or make your own from a low-fire earthenware clay. I like to use commercial tiles for the body of the mural and make my own border and/or accent tiles (figure 6).

For best results, pour the glaze onto the tiles. Remember, majolica glaze does not run during firing so an even glaze surface is desired. Clean excess glaze from the backs of tiles with a sponge. Sides of the tile may remain covered in glaze (figure 7).

Tile Design

TRANSFER TECHNIQUE

On the back side of your traced design, draw over the lines a couple of times with a soft lead pencil. Turn the design back over and place it where you want to transfer the design. Retrace the design so the lead from the reverse side will be transferred to the surface. This technique can be used to reverse an image as well.

TIP: Watercolors, crayons or colored pencils can be used to color in the mural design on paper to help make color choices. When I am using a wide range of colors, I assign each color a number and trace a reduced image of the entire mural on paper. I then assign each space a number, lay out the tiles and simply paint by numbers.
Lay out the tiles and use the tracing-paper transfer technique (see page 10) to transfer the design to each tile (figure 8). This way, you can see the design and make any necessary changes needed to correct or improve the pattern.

Prepare majolica colorants (see recipe sidebar at the end of this article), then begin to paint the design on the surface of the glaze (figure 9). Handle tiles carefully to avoid scarring or chipping off the glaze. Practice on an extra tile to test fluidity of the colorant and quality of the brushstroke.

Lay out tiles on a large table in the manner in which they will be placed for the mural. Number and letter the tiles with an underglaze pencil or pen to eliminate solving a jigsaw puzzle after firing (figure 10). Fire tiles to cone 04 on a flat shelf in an electric kiln.

**Mounting Ceramic Tiles to a Display Panel**

Cut the mounting panel to the finished size and clean up the edges (figure 11). Paint both sides of the board, choosing a color to accent or blend with your tiles—black is usually a good choice.

Make vertical, horizontal and diagonal guidelines to assist in correct placement of tiles (figure 12). Arrange the tiles on your board according to the numbers on the back of the tiles.

TIP: To fill in a space with even color use a large brush and brush evenly in one direction with a thin coat of colorant. Allow to dry, and then apply a second coat with brushstrokes going in the opposite direction. Another method, which creates interesting results, is to let the brushstrokes be a part of the design.

TIP: Pencil marks will burn out during the firing so you can draw directly onto the glaze surface in pencil if you wish. Just be careful to apply light pressure so as not to scar the glaze surface.

NOTE: Since the tiles will be used on a mural and mounted indoors on a wall, I have chosen not to use grout. If you prefer to make your project waterproof, use commercial grout and follow the manufacturer's directions.
To mount tiles, put adhesive on the back side using a notched trowel, scrape clean ¼ inch from the edges and press into place. Secure one tile at a time, working from the center outward. Put a sticker on the same corner of each tile to keep them rotated correctly.

**Hanging A Ceramic Tile Wall Mural**

To hang a heavy tile mural, I use a system of two lengths of fabricated metal, bent to approximately 30 degrees, that slip into one another. One is mounted on the board and the other on the wall (figure 13). Pan head screws placed not more than 3 inches apart are used to attach the length of metal to the fiberboard. Longer screws are used to attach the other piece to the wall. Screw the wall-mounted piece into studs in the wall.

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**GLAZE RECIPE**

The majolica glaze recipe I use is a slight variation of Linda Arbuckle’s majolica glaze.

**Alternate Majolica**

Cone 04

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Frit 3124 (Ferro)</td>
<td>65.6%</td>
</tr>
<tr>
<td>Nepheline Syenite</td>
<td>5.6%</td>
</tr>
<tr>
<td>Kona F-4 feldspar</td>
<td>15.1%</td>
</tr>
<tr>
<td>EPK (Edgar Plastic Kaolin)</td>
<td>9.1%</td>
</tr>
<tr>
<td>Tin Oxide</td>
<td>4.6%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
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Add:
- Zircopax: 8.1%
- Bentonite: 1.5%
- CMC Gum: 0.2%
- Sodium Hexametaphosphate: 0.3%

When the design requires leaving a lot of the white glaze showing, I add 2% rutile to soften the whiteness of the glaze for a creamier look. CMC Gum should be measured out, put in hot water and mixed in a blender, then added to the glaze. Sodium hexametaphosphate was the ingredient found in the retired version of Calgon and is a deflocculant.

**COLORANTS**

I use a variety of commercial stains mixed with frit and/or Gerstley borate for my colorants. I find the colors are brighter when mixed with 100% frit, but are less brushable and smudge easily. When mixed 100% with Gerstley borate, brushability improves but the colors are less brilliant. I have used a variety of ratios of frit to Gerstley borate to colorant with excellent results. For these tiles, I used the following recipe:

- Frit 3124 (Ferro): 1 tsp
- Gerstley Borate: 1 tsp
- Stain: ½ tsp
- Water: 2 tsp

**TIP:** Using small plastic cups, add all three dry ingredients, mix thoroughly, add water and mix again. Ice cube trays work well as inexpensive and convenient palettes.