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Building Concrete Countertops

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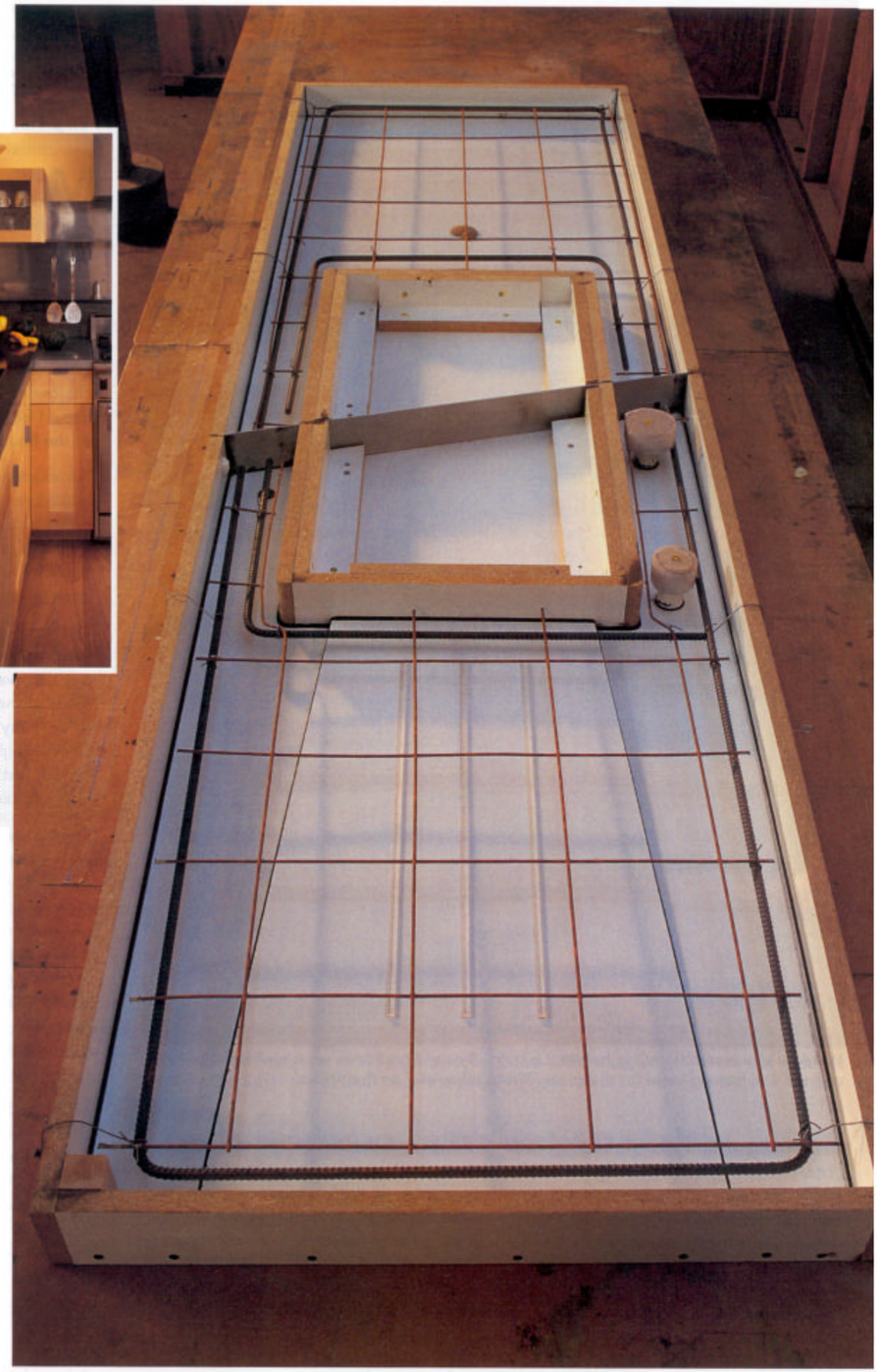


Upside down and backward. *An elegant countertop (photo above) starts with an elegantly detailed mold (photo right) that is built as a mirror image of the finished piece.*

Building Concrete Countertops

A carefully constructed mold is the key to creating a beautiful kitchen counter from everyday materials

BY FU-TUNG CHENG WITH ERIC OLSEN

Concrete is a wondrous material. It has substance and mass, permanence and warmth. It assumes forms that irrevocably touch our daily lives: bridges, floors, walls and now even countertops. I built my first concrete countertop with a friend in 1985 and was so encouraged that I began to design and build more of these "working sculptures." After learning to control the process, I've made concrete my design material of choice in kitchens and baths (see "Finishing Touches," pp. 108-109).

The first step in building a concrete countertop is making the mold (photo facing page), a task that offers opportunities for creativity, but one that demands lots of attention to detail. A mold doesn't require sophisticated materials or techniques, but the process can be conceptually challenging because the mold is a mirror image of the finished piece. When you construct a mold, you're essentially building what is not in the countertop.

For my crew and me, a common project is a mold for a simple rectangular kitchen countertop that includes an undermounted sink, a faucet, a dishwasher air gap and an integral drain board. As for any project of this sort, mixing and pouring the concrete are vital processes for a durable countertop.

The template comes first

Countertop layout begins with the template (photos right), which defines the size and shape of the countertop. It also records details such as walls that are out of square and becomes the notebook on which to write essential information such as the location of cabinet bays, plumbing and appliances.

For template material, we use 3-in. or 4-in. wide strips of hollow-core door skins (¼-in. plywood), but ¼-in. lauan plywood, foam board or even stiff cardboard works, too. The template begins with one long strip placed along the back of the cabinets. A second strip establishes the front edge, overhanging the cabinet by 1½ in. After checking that the front piece is parallel with the face of the cabinets, we tack the strips in place temporarily with a couple of small finish nails.

Two crosspieces define the counter's ends and are cut short so that they fit in the outer edges of the back and front strips. More crosspieces define the sink bay. Once all the pieces are in place and the template is square, we use hot-melt glue to attach the crosspieces to the front and back strips. We hold or clamp each glued joint until the glue has hardened.

Before removing the template from the cabinets, we note pertinent information on it, such as the position of the faucet. It's a good idea to note on the template which side is the top, along with the front and back edges, especially if you're making the mold off site. This all may seem obvious, but we've learned the hard way that such details aren't always so clear once we've returned to the shop.

Build the mold on a solid table

We recommend building the mold on a large, level table made with a ¾-in. thick plywood top over a grid of 2x4s. The ¾-in. top allows us to screw up from beneath the table into the bottom of the mold when we can't secure the mold from above. For the mold, we use ¾-in. melamine. The material is inexpensive, holds up well and produces a smooth, predictable concrete surface. After cutting the basic rectangle that establishes the mold's dimensions, we cut strips for the mold sides and the sink box. We then assemble the parts of the mold.

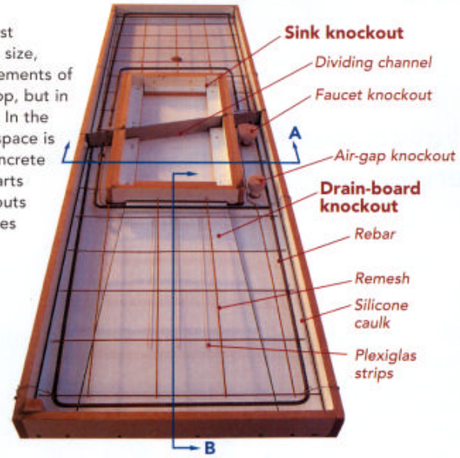
The dividing channel

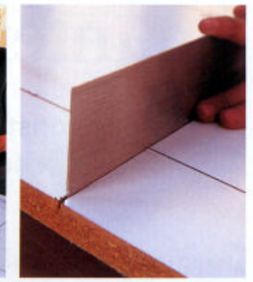
To make handling the counter easier and to reduce concrete's natural tendency to shrink

Template defines the countertop's shape. *A template (top photo) made of thin plywood strips hot-glued together is an accurate means of transferring the shape of the counter onto the mold. After notations are written on the template indicating site particulars, the template is flipped over (remember, the mold is upside down), and the information is transferred onto the melamine blank (bottom photo).*

ANATOMY OF A COUNTERTOP MOLD

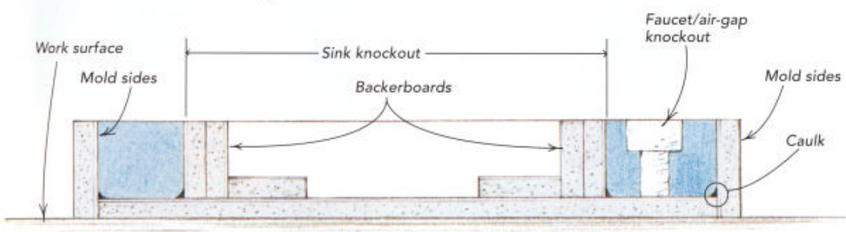
The mold must duplicate the size, shape and elements of the countertop, but in the negative. In the mold, every space is filled with concrete while solid parts called knockouts become spaces for the sink, drain board, faucets and other elements.





Dividing channel *is a thin piece of aluminum that separates the counter into smaller sections that are easier to handle and shrink less when cured. The aluminum is set into a single saw kerf that's cut into the mold's bottom.*

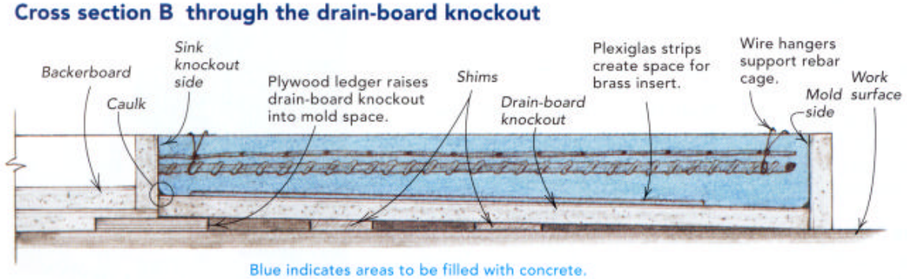
Cross section A through the sink knockout



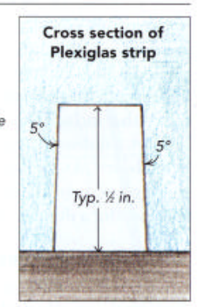
Blue indicates areas to be filled with concrete.

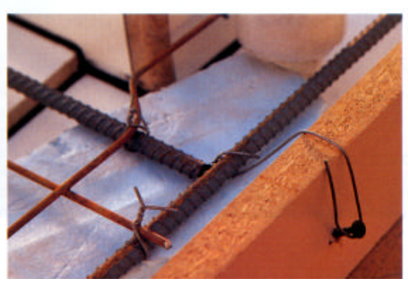
Faucet and air-gap knockouts *are made with MDF disks, wrapped with sheet foam and packing tape and screwed down through a short length of 1½-in. PVC pipe.*

Cross section B through the drain-board knockout



Blue indicates areas to be filled with concrete.

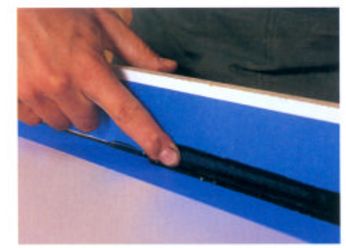




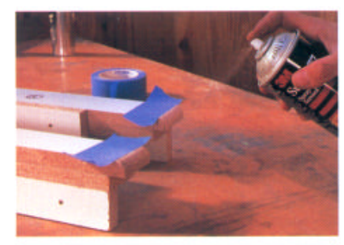
Rebar and remesh. *The concrete should be reinforced with ¼-in. or ⅜-in. rebar and remesh. Pieces of 1-in. thick foam insulation serve as spacers that establish the critical distance between the bar and the counter's surface. Remesh can be marked with tape for accurate cuts (photo left). Tied together, the cage of rebar and remesh is hung from wires attached to the outside of the form (photo right).*

Drawings: Chuck Lockhart

WATERTIGHT AND SMOOTH



Silicone caulk *seals the mold seams and creates an eased counter edge. Tape defines the area to be caulked (top photo); a moistened finger creates the concave profile (bottom photo).*



Sealing edges and joints. *Sealing the edges creates a smoother concrete finish. After the exposed edges of the sink knockout are coated with spray adhesive (top photo), the porous substrate is sealed with packing tape (bottom photo).*

and crack, large countertops such as this one usually are divided into smaller sections with 1/16-in. thick aluminum channel. Once the template information has been transferred onto the mold, the next step is to cut a saw kerf into the bottom of the mold for the dividing channels (top photos, facing page). In this example, we ran the dividing channels on the diagonal. Aluminum makes the best dividing channel because it's strong and easy to cut with a carbide blade. However, it must be coated with a waterproof sealer such as polyurethane or shellac so that it will release after the concrete has cured.

The integral drain board

Forming the integral drain board is the next step (bottom drawing, facing page). Cut from one end of the mold bottom, the three cuts that describe the drain board should be made at about a 7° angle away from the board's center so that the mold will release more easily. A ½-in. plywood shim glued to a routed recess in the mold's underside creates the drain board's incline. Strips of Plexiglas or wood also can be glued to the drain board to create space for brass rails that will be epoxied onto the finished countertop.

The sink knockout

The sink knockout can be made of melamine pieces reinforced by L-shaped backerboards or cleats. Because the sink knockout for this mold was divided by the aluminum channel, it had to be made with six pieces of melamine, plus their respective backerboards.

First, the two long sides of the sink knockout are clamped and screwed onto the backerboards; then they are screwed onto the mold (top drawing, facing page), tightly registered and square inside the outline of the sink knockout. (The backerboards go inside the sink box.) Now the remaining end pieces can be cut to fit, overlapping the ends of the first pair. We use a roundover bit to rout a ¼-in. radius on the square end of each overlapping piece. This curve gives the sink knockout its rounded inside corners.

To seal the exposed substrate on the rounded ends so that they release from the concrete, we mask the melamine face of each piece and coat the ends with spray adhesive, letting it sit for a minute. Then we tape the ends with clear packing tape and trim off the excess (bottom photos, left). A bead of silicone caulk is run along the inside edge of the end of each side piece where it butts against the end pieces. We screw the corners together, fill the screw heads and use alcohol to clean off any caulk that oozes from the joints.

The mold sides

There are a couple of ways to attach the sides to the mold. If the mold is deep, we use backerboards for added support, screwing the sides to the backerboards and the backerboards to the table. Backerboards not only give extra support to prevent the sides from deflecting under the weight of the concrete, but they also make for easy release.

The mold for this countertop was relatively shallow (2½ in.), so we decided it didn't need backerboards. Instead, we simply attached the sides to the edge of the mold bottom with countersunk drywall screws spaced about every 6 in. We ran a couple of extra screws into the sides at each corner.

Faucet and air-gap knockouts

If the countertop is thicker than the conventional 1½ in., the mounting hardware probably will need voids. To make knockouts for these voids, we use medium-density fiberboard disks, PVC pipe, sheet foam and packing tape (center photo, facing page). Because almost all faucets and air gaps are designed for conventional applications, their stems probably won't extend far enough through a thick countertop for mounting washers and nuts. If possible, we have hardware on hand so that we know if the threaded stems are long enough and if we need to size any voids for mounting hardware.

If several penetrations are close together, we make a single large void to accommodate the mounting hardware for all of them. We also make sure there is at least 1½ in. of concrete between any such void and the edges of the countertop or sink or other knockouts.

Sealing the mold

If any mold seams leak, water in the wet concrete can leach out, causing discoloration and honeycombing in the finished surface, so we seal the mold with silicone caulk (top photos, left). Strips of tape mask each seam and keep the bead of silicone neat. A moistened finger removes excess caulk and puts a nice concave curve on the caulk, which also gives the finished concrete a slightly eased edge. After the caulk has dried, we peel off the masking tape.

To caulk around the aluminum channel, first we remove the channel, mask both sides of the kerf and run a bead of silicone into the

kerf. Then we push the channel back into the caulk. (We check that the channel sinks completely into the kerf.) When the caulk is dry, we use a razor blade to scrape off excess, and then peel off the masking tape.

Countertops need plenty of reinforcement

We like to use fibers, ¼-in. or ⅜-in. rebar and remesh (4-in. by 4-in. reinforcing mesh) to reinforce the concrete. For this project, we placed a single layer of rebar around the outside edge of the countertop (photo bottom left, p. 80) and another around the sink knockout; then we tied a sheet of remesh onto the rebar.

We used the template to size the rebar and to position the bends so that the rebar is at least 2 in. from any edge, divide or knockout. We use more rebar if there's not going to be much support under the countertop or if it has a big overhang.

When the rebar is in the right position, we lay a sheet of remesh over the mold and use masking tape to mark the position of the cuts (photo bottom left, p. 80). When tying remesh to the rebar, we need just enough ties to keep the rebar and remesh cage in position as we pour and vibrate the concrete—say, one tie about every 8 in. to 12 in.

At this point, the cage still can be lifted easily out of the mold in one piece. It's not a bad idea to remove the cage and vacuum the mold. Once the cage is hung in place, the mold will be hard to clean.

To hang the cage, we drive screws into the outside of the mold every 12 in. or so, being careful not to screw through the form (photo bottom right, p. 80). Thin wire attached to the screws supports the cage. Last, we angle 1¼-in. drywall screws about every 8 in. around the outside edge of the mold into the tabletop, making sure that the mold is still square. Also, we run screws in each of the corners, through the bottom of the mold into the sink knockout (if there is one).

Pouring the mix to fill the mold

Once the concrete is mixed (sidebar facing page), it is distributed evenly throughout the form (photo right). This layer is vibrated until it flows evenly over the bottom of the form. There are several vibrating techniques: a pad sander held against the form, a concrete stinger clamped onto the table or a rubber mallet for rapping the form. The important thing is to make the concrete flow into every crevice. Vibrating also rids the mix of trapped air. Each successive batch must be vibrated.

When the mold is full, we screed the top. After the surface water evaporates, we smooth the surface with a wooden trowel. When the concrete has set up, it can be troweled again and left to cure. Then the countertop must be released from the mold, polished and installed before it is ready to use. □

SOURCES OF SUPPLY

By no means exhaustive, this partial list offers a starting point for those interested in building a concrete countertop.

General information
Portland Cement Association
(847) 966-6200; www.portcement.org

Fibers
Fibermesh
(800) 368-2888; www.fibermesh.com

Pigments and stains
Davis Colors
(800) 356-4848; www.daviscolors.com
L. M. Scofield Co.
(800) 720-3000; www.scofield.com

Water reducers
Master Builders Inc.
(800) 800-9900; www.masterbuilders.com

Ready-made ad-mix
Geo-Mix (contains enough pigment, plasticizer, fast-set additive and fibers for 3 cu. ft. of concrete)
Cheng Design Products Inc.
(510) 549-2805; www.chengdesign.com

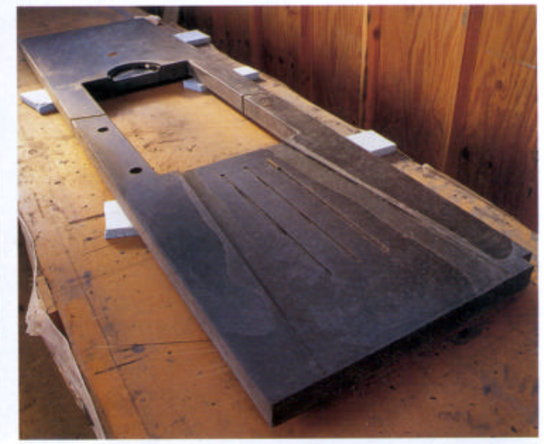
FOR MORE ON THIS TOPIC

This article was adapted from *Concrete Countertops: Design, Forms, and Finishes for the New Kitchen and Bath* by Fu-Tung Cheng with Eric Olsen (The Taunton Press, 2002; $29.95; 202 pp.; www.taunton.com; 800-888-8286). Photos by Matt Millman.

You can submit questions about concrete countertops to Fu-Tung Cheng through April 19, 2002, at www.creatingconcretecountertops.com

SHAKEN, NOT STIRRED: THE PERFECT POUR

Once the concrete has been mixed to the consistency of thick oatmeal, it can be placed in the form. Here, two pairs of hands are better than one; while one person fills the form, the other works the concrete into tight places (photo left). As the form is filled, the mix should be well agitated to ensure that the concrete has flowed into every space on the form. After the concrete has cured, the counter is released from the mold (photo below).



An all-purpose concrete recipe

Although there can be many variations, we at Cheng Design used the following basic mix for the countertop shown. This mix yields 1 cu. ft. of concrete (the countertop shown used 6 cu. ft.); to find the amount you need, multiply the countertop's dimensions to determine its volume and mix accordingly. See sources of supply (facing page) for more information.

BASIC DRY MIX

- Type II or III cement: 22.6 lb.
- 37 lb. of ⅜-in. pea gravel.
- 72 lb. of sand.

Based on the weight of the concrete, to the dry mix add:

- Sufficient water to create a mix with the consistency of thick oatmeal (6.5 oz. of water per lb. of concrete; the water formula includes the water reducer).

TO INCREASE WORKABILITY

- 8.2 oz. of water reducer (at 12 oz. of reducer per 100 lb. of cement); we use Rheobuild 3000 FC by Master Builders Inc.

INTEGRAL STAINS

- 8 oz. of carbon black (0.7% of the weight of the cement in a 6.5-sack mix).
- 6 lb. of ultramarine (8% of the weight of the cement in a 6.5-sack mix).

REINFORCEMENT

- Polypropylene fibers (check the fiber manufacturer's recommended ratio).

—*F. C.*