

Making Concrete Countertops

Solid, durable and attractive, an uncommon countertop can be cast from common materials

by Thomas Hughes

I was in the last stages of building a house for John and Kathy Buckley when they decided on a concrete countertop for their kitchen (photo facing page). Ordinarily when clients start making last-minute decisions like this, it can drive the builder to the aspirin jar. But I have to admit, my reaction was immediate and not even cautiously optimistic. I liked the idea.

John and Kathy considered marble and granite as a counter surface but felt it was ostentatious. Plastic laminate lacked pizzazz. But concrete had just the right mix of a stark industrial image, weathered outdoor coarseness and coloration, and a sense of solidity and strength.

I've used concrete in many projects, from foundations to flatwork. So I felt comfortable with the task of forming the counters. The part of the project that I wasn't so sure about concerned the finishing of the counter to a surface that would be tough enough to withstand kitchen usage.

First, make test samples—Before beginning the actual counters, I made a series of 10-in. square by 2-in. thick concrete samples, using different finishing techniques on them. I used a magnesium float on some of the samples, which brought more cream to the surface. I steel troweled these samples, and they had a crackled look when they cured.

I let other samples cure without a steel-troweled finish. Then I sanded them with a belt sander and a random-orbit sander to reveal the pattern of sand and aggregate. I applied the finish I had chosen for the counter (more on that later) to the samples and had the Buckleys evaluate them. They chose the most uniformly gray of the steel-troweled batch, with a little aggregate showing from sanding for color and texture.

All three of us liked the somewhat honey-combed edges of the sample blocks. The edges were marked with the typical voids and cavities of poured concrete, where lumpy clusters of cement-coated pebbles reveal the rocky contents.

A two-piece countertop—Where to pour? That's the dilemma facing anybody who's making a concrete countertop. If you cast the top in



Put handles on the forms. Made of plastic-covered plywood and 2x4 sides, the forms were affixed to 2x4 handles for transport. In the background, the sink blockout is screwed to the form bottom.



Joint connectors pull the parts together. A quartet of joint connectors was used to pull the two wings of the countertop together. The blocks glued to the form sides were removed after the pour, leaving slots for the connectors.

place, you eliminate the hassle of moving around a heavy, cumbersome slab of concrete. But there are problems with that approach. In addition to dealing with the mess that accompanies any concrete pour, a countertop has to be etched with muriatic acid and then thoroughly rinsed before its finish can be applied. I didn't want to introduce that wild card into the final stages of trimming out the Buckleys' house.

In this case, I made the top in the garage, which meant that I could slop concrete around without worrying about the floors and the walls. Then I could take the top outside to rinse it off.

The kitchen base cabinets were L-shaped, with a 7-ft. wing and a 5-ft. wing. The countertops are 25 in. deep. Even with subtracting the sink cutout, the total weight would be around 500 lb. What's more, the awkwardness of moving such an odd shape out of the garage and up the stairs to the kitchen dictated splitting the top into two pieces.

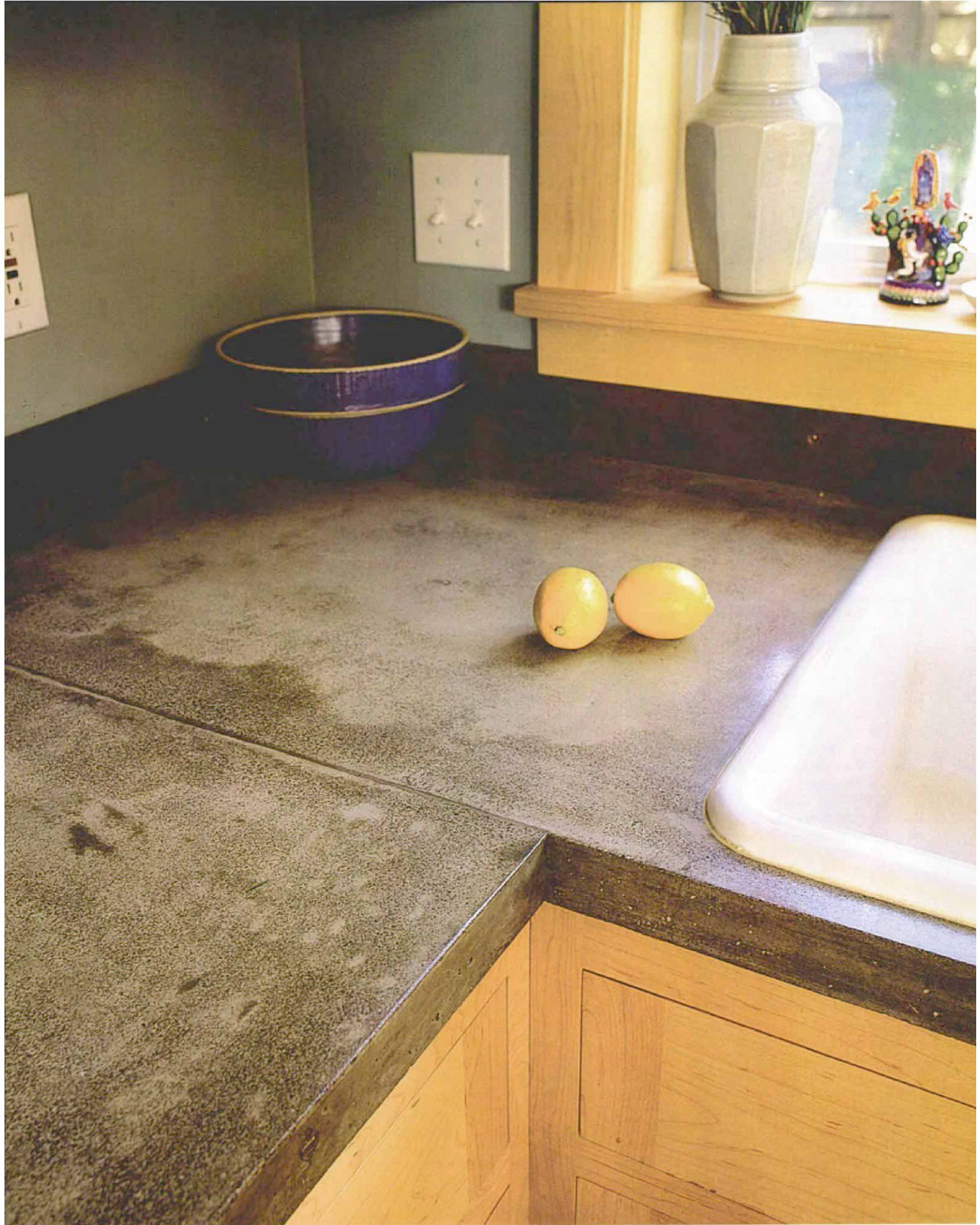
Building the forms and making the joint

—The bottoms of the forms for the countertop slabs were made from $\frac{3}{4}$ -in. plywood. I cut the plywood 3 in. larger than the top in both directions to create flanges that support the form edges. I ran three 2x4s under each form as supports. The 2x4s extended beyond the form to serve as carrying handles (top photo, this page). I attached the plywood base to the 2x4s with drywall screws, making sure the heads were fully countersunk into the plywood. Then I stretched a layer of 6-mil polyethylene over the plywood and stapled it around the edges.

The countertop edges were formed with 2-in. tall strips that I ripped out of 2x stock. I beveled the tops of these strips to minimize the surface where concrete aggregate might collect as I filled the forms. I attached the form sides to the bottom of the form with drywall screws, but in this case I ran the screws from underneath, sandwiching the polyethylene between the plywood and the form sides.

People who make L-shaped counters out of particleboard and plastic laminate often use concealed joint connectors (bottom photo, this page) to draw the two pieces together evenly. I decided to apply the same strategy to this countertop, using Knappe and Vogt #516 Tite Joint fasteners (Knappe and Vogt Mfg. Co., 2700 Oak Industrial Dr., N. E., Grand Rapids, Mich. 49505; 616459-3311).

Joint connectors fit into holes that are typically drilled in the underside of the countertop. I avoided drilling by gluing eight $\frac{5}{8}$ -in. tall keyhole-shaped knockout blocks to the sides of the



A thin, gray line reveals the seam. Cast in two sections, this L-shaped concrete countertop is joined at the inside corner. The two sections are held together by joint connectors (bottom photo, facing page) and epoxy. A tough finish of moisture-cured urethane protects the countertop from spills.



Steel trowel the work surface. After screeding the concrete into the forms and tooling the surface with a magnesium float, the author leans into the final finish of the countertop with a steel trowel. He then wrapped the counter sections in plastic and left them to cure for two weeks.

form. I beveled the blocks and sprayed them with WD40 for easy removal.

To accommodate the 20-in. by 33-in. sink cutout, I made a block by screwing together two layers of $\frac{3}{4}$ -in. plywood and another layer of $\frac{1}{2}$ -in. plywood. Then I screwed the block to the 7-ft. form from underneath (top photo, p. 86).

Reinforce the concrete and strengthen the mix—

For strength during not only the life of the countertop but also during transport and installation, I decided to reinforce the countertop pieces with stucco wire. I also added polypropylene fibers to the concrete in the lower two-thirds of the countertop. I didn't use polypropylene for the entire mix because the fibers make it impossible to get a smooth finish on the concrete. Sold under a couple of trade names, these short fibers help reduce microscopic cracks in the concrete. I didn't need enough of the stuff to justify buying a minimum order. Fortunately, my local concrete supplier keeps the fibers on hand and was kind enough to give me a small bag of them.

The narrow bands of concrete in front and behind the sink are potential weak points, so I reinforced them with $\frac{3}{8}$ -in. rebar.

Preparation for the pour included setting the forms onto leveled pairs of sawhorses so that there was no chance of ending up with a twisted countertop. Because it was handy and not as smelly as form-release oil, I used WD-40 as a release agent on the form sides.

I needed just a small amount of concrete for the countertops, so I used prepackaged concrete

mix. Hoe in hand, I mixed the $3\frac{1}{2}$ cu. ft. of concrete $\frac{3}{4}$ cu. ft. at a time. As I mixed the batches, I added a handful of the polypropylene fibers. I also added enough extra portland cement to bring the concrete to a six-sack ratio, which increased the concrete's compressive strength.

I screeded the concrete to the tops of the forms, then I smoothed it first with a wood float, then with a magnesium float. After the tops had set up for about three hours, they were ready to be steel troweled (photo above). The concrete should be hard enough that pushing on it with your finger doesn't leave a depression, but you can still compress the top layer of fines (the creamy cement and sand mixture that rises to the surface during troweling) by applying hard pressure with the trowel. You can't be timid about troweling. You really have to lean on it. After troweling, I let the slabs cure for a day.

The next day I removed the form sides, leaving behind the knockout blocks for the joint connectors, and lightly sanded the edges with 100-grit wet-dry paper. That gave me the slightly rounded edges I wanted. Then I wrapped the countertops in plastic and let them cure for two-and-a-half weeks.

Installing the countertops—

A few days before I installed the countertop, I wet-dry sanded the entire top to 120 grit. Besides hand sanding, I also found the random-orbit sander, fitted with silicon-carbide paper, to be effective, although not particularly economical with regards to the life of a disk of paper. On the advice of the tile and ma-

sonry contractor, Nikos Maragos—a native of Greece who started out doing terrazzo floors—I mixed up a paste of portland cement and acrylic additive for tile work and squeegeed it over the tops to fill any small voids. Then I sanded the tops again to remove excess filler.

I moved the tops outside, washed them with a diluted solution of muriatic acid and rinsed them with water, as called for in the finish instructions. After the countertops dried, I enlisted the help of my two working buddies, Scott Rekate and Knox Swanson, and we moved the tops to the kitchen for installation.

The maple cabinet bases, $1\frac{1}{4}$ in. shorter than standard height to accommodate the 2-in. thick countertops, were already installed. I drilled holes in the plywood subcounter to gain access to the joint connectors

By setting up the forms even with the cabinet tops, the countertops could be moved right into place. I slid each top off its form so that I could reach under the ends where I'd placed the knockouts for the joint connectors. I extracted the knockout blocks from below by running a screw into each one, then pulling on the screw.

After sliding the countertops onto their cabinet bases, I test-joined the two tops. Then I loosened the joint, applied epoxy to the joint faces and drew the joint tight again for a permanent bond.

I drilled a half-dozen pilot holes with a masonry bit through the plywood subcounter into the concrete countertops and affixed them with $1\frac{1}{4}$ -in. concrete screws. Finally, I filled the seam gap with a paste of cement and acrylic admixture.

When it set up, I smoothed the joint with my random-orbit sander (top photo, this page), and seeing it was about midnight, called it a day.

The countertop pieces were now united into a monolithic unit and firmly anchored to the base cabinets. The fragile, thin sections of concrete that border the sink were thoroughly supported from below, so with the help of my jigsaw, I removed the block of plywood that located the sink opening (bottom photo, this page).

A tough finish of moisture-cured urethane—

The finish recommended to me was a moisture-curing aliphatic urethane called Wasser MC-Clear (Wasser Hi-Tech Coatings, 8041 S. 228th St., Kent, Wash. 98032; 206-850-2967). This is an industrial-strength coating used primarily to protect bridges. It's often applied to concrete structures to protect them from graffiti. Unlike typical finishes, this finish cures faster with higher humidity.

Instructions for a usable surface called for two coats thinned with a proprietary thinner. You can apply the coating with a brush or a roller. I used a brush, and I found that the bristle lines from brushing leveled out quickly, leaving a very smooth, polished surface.

Moisture-cured urethanes contain isocyanates. You can protect yourself while using them by wearing a respirator fitted with an organic-vapor cartridge but only if you're monitoring the vapors to make sure they stay below recommended levels. To be safe, you should wear a supplied-air respirator. Adequate ventilation is therefore an absolute must, and you should make sure there aren't any ignition sources in the area.

There are more user-friendly concrete sealers on the market, but I haven't tried any of them. My concrete supplier recommends waterborne acrylic sealers. They aren't as durable as moisture-cured urethanes, but they can be renewed periodically with minimal effort. The Glaze 'N Seal Company (3700 E. Olympic Blvd., Los Angeles, Calif. 90023; 800-486-1414) sells both water-based and solvent-based concrete sealers that can last eight to 10 years when used indoors.

Framed by a splash of copper—To cap off the elemental feel of the countertops, I ran a 4-in. high backsplash of $\frac{3}{8}$ -in. thick copper around the edges of the countertop where it meets the wall. Before installing the copper, I washed it a couple of times with a muriatic acid wash. Then I left the copper outside for a week in our salty winter weather. Once the patina looked right, I finished the copper with two coats of D-18 (Ultra Coatings, Inc., 2218 15th Ave. W., Seattle, Wash. 98119; 206-283-4120) to preserve the coloration.

Countersunk brass screws affix the splash to the wall. Where the copper meets the concrete, I sealed the joint with clear Polyseamseal caulk (Darworth Co., P. O. Box 639, Simsbury, Conn. 06070-0639; 800-672-3499). The plumber didn't have any problems installing the cast-iron sink, but he did have to fasten the dishwasher to concrete, rather than to the usual wood. □

Thomas Hughes builds houses and makes furniture on the northern Oregon coast. Photos by the author except where noted.



Buff out the joint. The author grinds the joint flush with a random-orbit sander. Next he'll fill what tiny crevices remain with a paste of acrylic admixture and portland cement.

Time to remove the sink blackout. Once the countertop was safely in place atop the base cabinets, the sink blackout could be removed. The author cuts out the bulk of the plywood block by drilling holes near the corners and then connecting them with a jigsaw. The remaining plywood edges are then carefully peeled away from the concrete.



FINISHING TOUCHES

Beyond ready mix

As designers gain experience with concrete as an interior finish material, more homeowners come to appreciate concrete as a work surface. Not only is concrete durable and solid, but it can also be tooled and tinted with great delicacy. Here's a sampling of what cutting-edge concrete artisans are up to.

Architect Fu Tung Cheng, of Berkeley, Calif., combines integrally colored concrete counters with black marble with Orthoceran fossils. The brass strips in the counter to the right protect the surface from heavy pots. Photos this page by Alan Weintraub.

