Tiling a Mortar-Bed Counter

How one tile setter builds the classic kitchen work surface

by Michael Byrne

Tile layout. **Byrne has used a 5/16-in. trowel to spread thinset mortar over the float, and he now aligns the rows of tile with a straightedge. The chalklines at the inside corner of the counter mark the position of the V-cap trim, and the starting point for the first full sheet of tile.**

I think the best part of being a tile setter is that my work doesn't get covered up by someone else's labors. On the other hand, setting tile is tough, physical work—especially large floors, where my knees cry out for a desk job and my back creaks from all the bending. So it's no wonder that I enjoy tiling countertops.

Ceramic tile offers many advantages as a finish material in the kitchen. A hot pot won't damage a tile surface, and a properly waterproofed installation can stand up to all of the splashes and spills that cooks can dish out.

The best tile countertops are done on a thick bed of mortar called a *float*. The float is usually ¾ in. to 1 in. thick, and the solid base it provides for the tile isn't affected by moisture. I'll be describing the most common type of counter that I do. It has V-cap face trim and a single row of tiles for the backsplash. To make cleanup easier for the cook, the sink is recessed beneath the surface of the counter and is trimmed with quarter-round tiles (drawing, facing page).

Choosing the tile—Kitchen-counter tiles should be either impervious or fully vitrified (see *FHB* #17, p. 74). These ratings mean that the tile will absorb almost no water, a property that increases the life expectancy of the installation.

Many tiles are designed to decorate rather than protect. You should be able to find a tile that does both. But you need to be careful even with heavy glazes since some of these are easily marked by metal cooking utensils. I urge my customers to get samples of their favorite tiles, and to rub them with a stainless-steel pan, an aluminum pot and a copper penny. Some tiles can be cleaned up after this kind of abuse—others can't. The surface is important in another way, too. Because most appliances need a flat surface to work efficiently, tiles with irregular faces, such as Mexican pavers, make beautiful backsplashes but lousy work surfaces.

Layout—The goal here is to keep tile cuts to a minimum, to locate them in the least conspicuous places, and to eliminate tiles that are less than half-size. On a straight-run counter, this usually means beginning the layout halfway

along its length or at the centerline of the sink. If you take a close look at sink installations, you'll find that there is often a trimmed tile in the center of the front edge, in line with the spout. This trimmed tile keeps things symmetrical, and it allows full tiles along the edges of the sink. I begin the layout on an L-shaped counter at the intersection of the two wings (photo facing page).

Once I have the tiles in hand, I use the direct method of measurement to help lay out the job. I unpack some of the tiles and move them around the cabinet top. Sometimes, shifting the tiles an inch this way or that can make a substantial improvement in the finished appearance. Small tiles are more forgiving, allowing you to adjust the width of the grout lines to make things fit. But unless the counter has been meticulously designed with the tiles as modules, cuts are inevitable.

The substrate—The substrate should be at least ¾-in. plywood rated for exterior use. Particleboard won't do. The waterproofing on most counters consists of a layer of. 15-lb. asphalt-saturated felt or a similar protective paper. I take this a step further and laminate the felt to the plywood with wet-patch fibered roofing cement.

Tiling a counter is a messy, gritty project. To keep the asphalt (and later the mortar and grout) from soiling the cabinets, I first drape kraft paper or plastic film over the face of the cabinets, and staple it to the counter plywood. I also protect the floors with canvas dropcloths.

I use a ⅛-in. V-notched trowel to spread a thin layer of roofing cement onto the plywood around the sink and about 3 ft. to each side. This helps to protect the vulnerable areas under the dish drainers. Ideally, the asphalt should cover the exposed plywood end grain in the sink cutout (drawing, below). If the sink is already in place, I squeeze the asphalt into the junction between the sink and the plywood. At the backsplash 1 make a tight crease in the felt and lap it up the wall about 3 in. Later this flap will be trimmed to about ¾ in. above the finished counter. Combined with the backsplash tiles, it makes an effective water barrier, keeping moisture out of the rear of the cabinets.

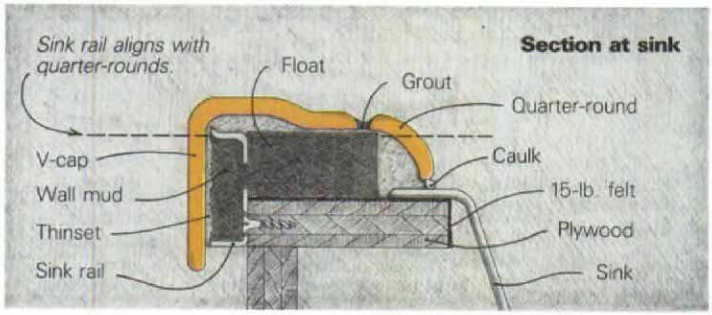
Screeds and rails—Once the waterproofing is completed, I set the sink rail. This rigid galvanized sheet-metal channel reinforces the mortar bed down the entire front edge of the counter and makes it easier to level the bed. The rail has narrow vertical slots every 3 in. for nails or screws (photo below left). Along its top edge are ⅝-in. dia. holes. Mortar will ooze through these holes, linking the mortar that faces the counter edge with the countertop float. This helps to anchor the V-cap finish on the edge.

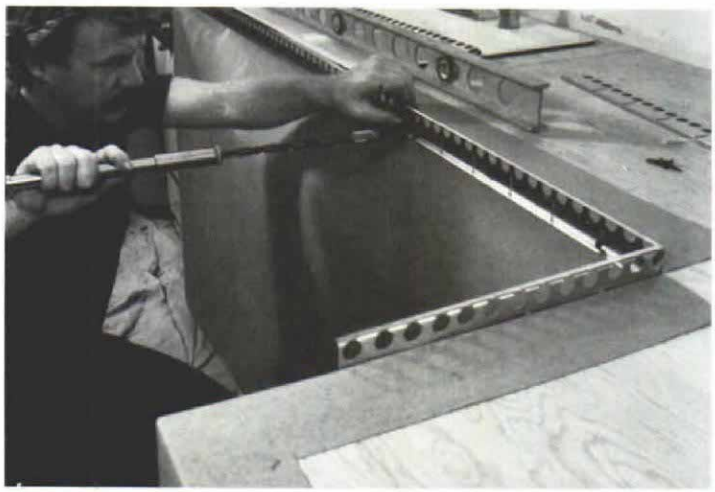
I start screwing the rail in front of the sink, adjusting it to suit the height of the quarter-round trim in relation to the top of the sink. Once all the rail is in place, I use ½-in. thick pine to box in any openings in the substrate that have been cut for the cooktop, chopping block or other built-ins. These are installed at the exact height of the finished float. Attaching the sink rail and boxing the openings is a lot like setting up the forms for a slab floor.

Metal reinforcing—My experience has taught me that metal reinforcing in a counter float reduces or eliminates cracked tiles and grout. Consequently, I use plenty of it. First, I cut 20-ga. 1-in. wire mesh (chicken wire) and secure it to the plywood substrate with ½-in. staples, overlapping neighboring pieces at least 4 in. The mesh (photo below right) extends from the sink rail to the back wall and covers the entire substrate. Rather than cut the mesh a little short to make an easy fit between the sink rail and the wall, I cut it a bit long and bend the excess back over itself.

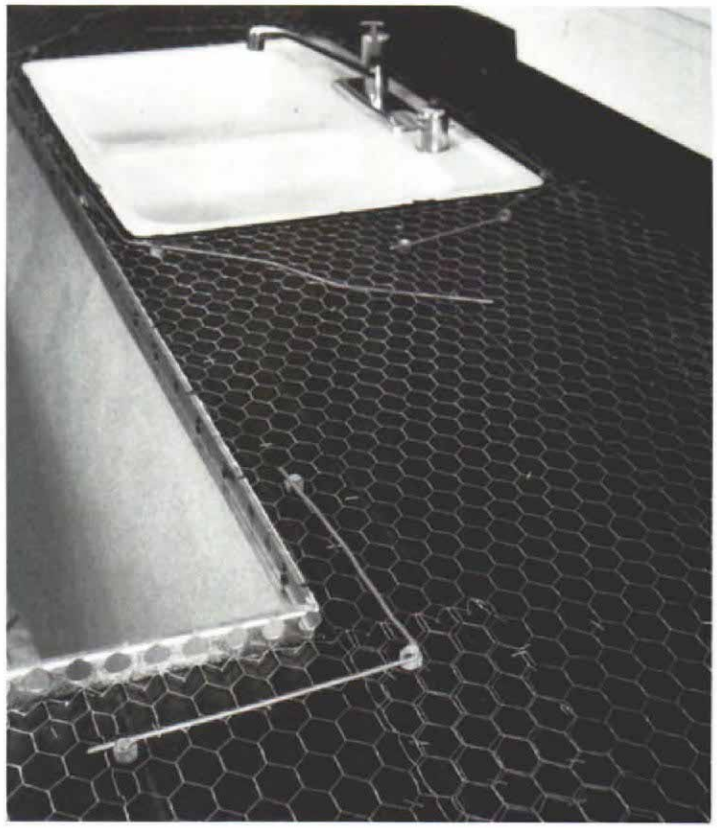
Finally, I use 9-ga. galvanized wire like rebar to strengthen those parts of the mortar bed that will be narrow in cross section. This prevents the cracks that often appear in the tiles close to the front or back corners of sinks and cooktops. I center the wire and run it parallel to these narrow sections, and I anchor it with ¼-in. or ⅜-in. furring nails. Then I bend it at about a 45° angle where the counter broadens, and extend it at least 6 in. toward the center of the field. At first, I used the wire rather sparingly. But now I use it all over the countertop—at inside and outside corners and across peninsulas—and I've found cracking problems a thing of the past. When all the reinforcing is in place, I check to make sure none of it protrudes above the top level of the sink rail. This can be done either with a 2-ft. level or by sighting the top of the sink rail.

Deck mud—Most of my jobs are in the San Francisco Bay Area, where the adobe soil swells during the winter rains and shrinks in the long





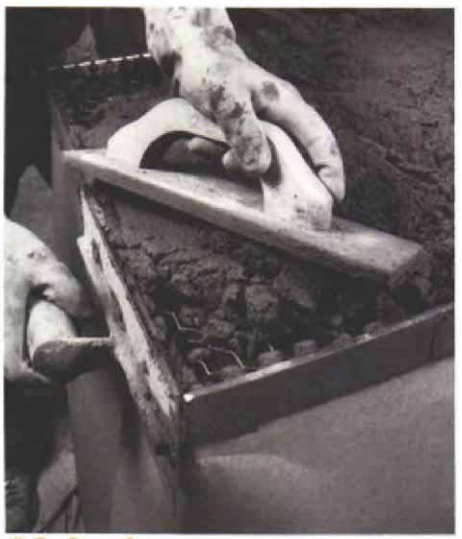
Sink rail. **Before floating the mortar bed, Byrne screws a galvanized strip called a sink rail to the edge of the plywood substrate. It serves as a screed, edge reinforcement and a framework to anchor the thin layer of mortar that will face the edge of the countertop.**



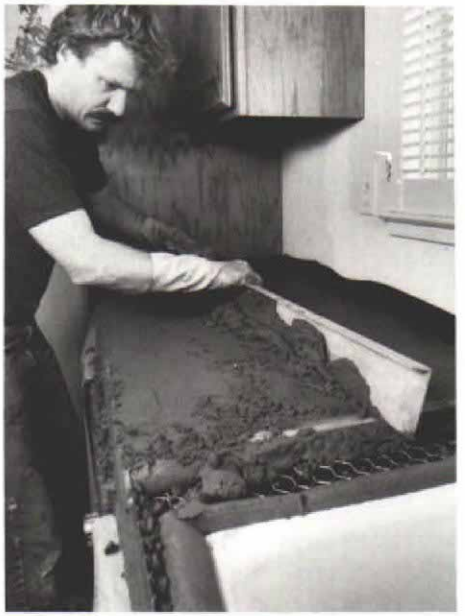
Reinforcement. **Chicken wire stapled to the plywood substrate covers the area to be tiled. If a mortar counter cracks, it usually does so in the narrows around the sink, or at inside corners. These areas are reinforced with 9-ga. galvanized wire held in place by furring nails.**

A. Float strips **are the key to controlling the thickness of the mortar countertop. Here the author beds a float strip in a mortar pad, getting the strip's relationship to the sink rail right with a level. The float strips will guide the screed board while the mortar is leveled. Later, the strips will be removed and the resulting voids filled with mortar.**

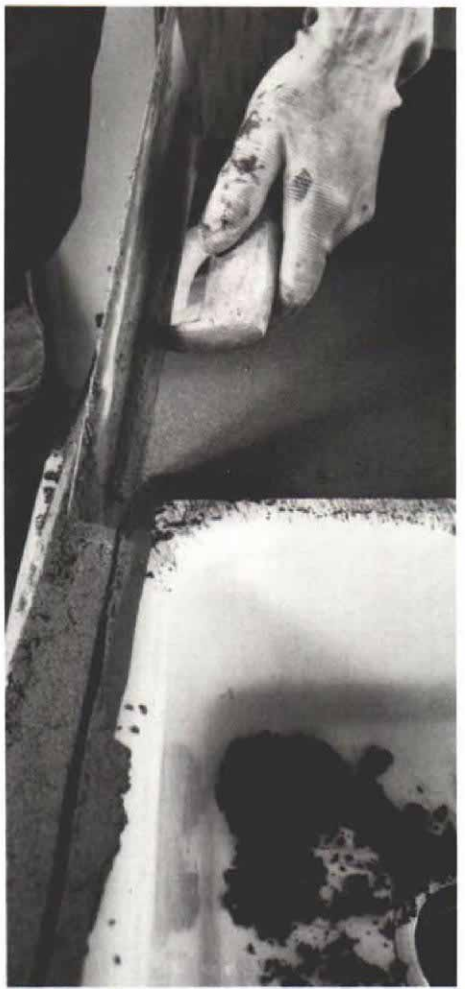
B. Wall mud**—a special mortar blend that Includes masonry lime and latex additive, which help the mortar to cling to vertical surfaces—fills the sink rail before the counter is floated. Some of this wall mud squeezes through the holes in the rail, keying it into the deck mortar.**



C. Deck mud **is loosely spread across the counter with a wood float after the sink rail is filled with mortar. Because the mortar in the rail is still fragile, it has to be supported by a steel trowel so it won't break away.**



D. Leveling the deck mud. **Byrne uses an aluminum straightedge as a screed board, and he moves it in a side-to-side motion as he gradually pulls it forward. Here both ends of the screed are resting on float strips. Note the difference in texture between the crumbly deck mud and the smoother wall mud used on the rail and around the sink.**



E. Edging. **Before it hardens, any mortar that overlaps the sink rim is trimmed away. This allows the sink to be removed later if necessary, without damaging the mortar bed. The open edge will be trimmed with quarter-round tiles.**

hot summer. Add to this the occasional earthquake tremors, and you have mortar beds that tend to move around quite a bit. I use 3701, a mortar-and-grout admix made by Laticrete International (1 Laticrete Park North, Bethany, Conn. 06525) that allows my floats to flex a little without cracking. Other companies, like Custom Building Materials (6511 Salt Lake Ave., Bell, Calif. 90201) and Upco (3101 Euclid Ave., Cleveland, Ohio 44115), make similar products.

The amount of admix I need depends on the weather and how wet the sand is (see the sidebar, facing page). This deck mud, as it is called, is considerably drier than brick-type mortars—it has just enough moisture to bind the ingredients and no more. This means that the mix can be compacted into a uniformly dense slab.

Floating the counter—Before I can start spreading the mortar around the countertop, I have to install float strips along any edges that aren't boxed or that don't have a sink rail. Float strips are ¼ in. thick and 1¼ in. wide pine or fir rippings that will sit temporarily atop a layer of mud as I level the mortar. Each float strip begins on a mound of loose deck mud piled slightly higher (about 1 in.) than the height of the finished float. Then 1 take a level and, placing one end of it on the sink rail for a reference and the rest of it on the float strip, I tap the strip with a hammer until the strip is leveled, as shown in photo A, top left.

Floating begins with filling the front edge of the counter. The channel formed by the sink rail must be filled with what's called wall mud. To make the wall mud, I take a small portion of deck mud (for this job about 2½ gallons), add about a quart (dry measure) of masonry lime, and enough Laticrete 3701 to make a thick, heavy paste. Then, using a flat trowel, I press the mix onto the face of the sink rail until the mud is forced through the ⅝-in. holes (photo B). The resulting extruded lumps of mortar will key into the deck mud.

Once the sink-rail face is filled, I use the remaining wall mud to surround the sink. Then I dump the deck mud onto the countertop and spread it around with a wooden float while 1 keep the rail and its wall mud steady with my steel trowel (photo C). By this time, the mud in the sink rail has begun to harden, but if it is not supported, it will be pushed off the rail when the nearby deck mud is compacted.

To level the deck mud, 1 use a straightedge as a screed board (photo D). Using a side-to-side motion, 1 pull it toward me, gradually removing the excess mud until the straightedge makes contact with the float strips or sink rail. I apply a horizontal rather than vertical pressure on the straightedge to avoid mashing the strips out of position. Smoothing out one area at a time, I gradually work my way around the countertop until the screeding is done. The surface is now flat, but not all the mud is compacted. The float strips also have to be removed, and the resulting voids have to be filled.

I take a lot of pride in my finished floats—they are my pieces of sculpture, and the wood float is my finishing tool. First, I scoop some deck mud onto the flattened top and ram it into

the voids where the strips sat with the float. Then with the edge of the tool, I gradually slice off the excess. Experience allows me to "feel" my way across the surface by the way the float sits in my hand. I scour the top until it feels right. With all the voids filled, the top is an unbroken expanse of grey.

The last two areas of mortar to clean up are the sink rail and the sink perimeter. The top and bottom edges of the metal sink rail provide a good surface for the float to trim off the excess mud. Around the sink, I square up the mortar with a trowel, trimming it back far enough to expose the edges of the sink (photo E, facing page). Although it is no picnic, this makes it possible to remove the sink without having to rip up the field tiles. These edges are covered later with quarter-rounds.

Inevitably, some mud will fall away from the rail, or the screed will knock a float strip out of position. Fortunately, the material is very forgiving, and problems are easy to fix. I skip over these minor accidents until the initial work is done, then I go back and fill in dings with fresh mortar before everything sets up:

Setting the tiles—Instead of laying the tiles as soon as I finish the float, I let it harden overnight. This way most of the shrinkage likely to occur will happen before the tiles are in place and grouted, and I can be less concerned about deforming the float as I set the tiles.

The next day, the first order of business is to vacuum loose sand and cement particles from the top to increase the grip of the thinset mortar that bonds the tiles to the float. Then I snap chalklines along the edges to mark the layout for the V-cap trim. I usually spread a few sheets of tile around to confirm my earlier layout; then I mix up enough thinset mortar to last through a couple of hours of setting.

Thinset is a portland-cement based mortar that contains very fine sand. The bond it forms is unaffected by moisture, and it is ideal for applying ceramic tiles to a mortar base. On this job I used Bon-Don (Garland-White & Co., P.O. Box 365, Union City, Calif. 94587). I mix the stuff with water to the consistency of toothpaste, using a drill and a mixing paddle.

The sheet-mounted tiles going on this counter are a little less than ¼ in. thick, so I used a 3/16-in. V-notched trowel to comb out the thinset. Spreading too thick a layer will cause the adhesive to ooze up between the tiles. On the other hand, the backs of the tiles must be completely covered. These 12-in. by 12-in. sheets covered the top quickly. I used a short straightedge to help align them.

Everything went smoothly on this job until I reached the open side of the L. There I realized that the tiles were falling short of the V-cap layout line by about 7/16 in. Checking back, I found that the sheets in one box were all undersized. Adding a narrow row of tiles that have been trimmed to make up for a mistake like this never looks right, so before the thinset dried I quickly widened the grout lines between the rows of tile. The string backing prevents the tiles from being spread apart, so I cut through it with a utility knife, and used a long straightedge to

Mixing the mortar

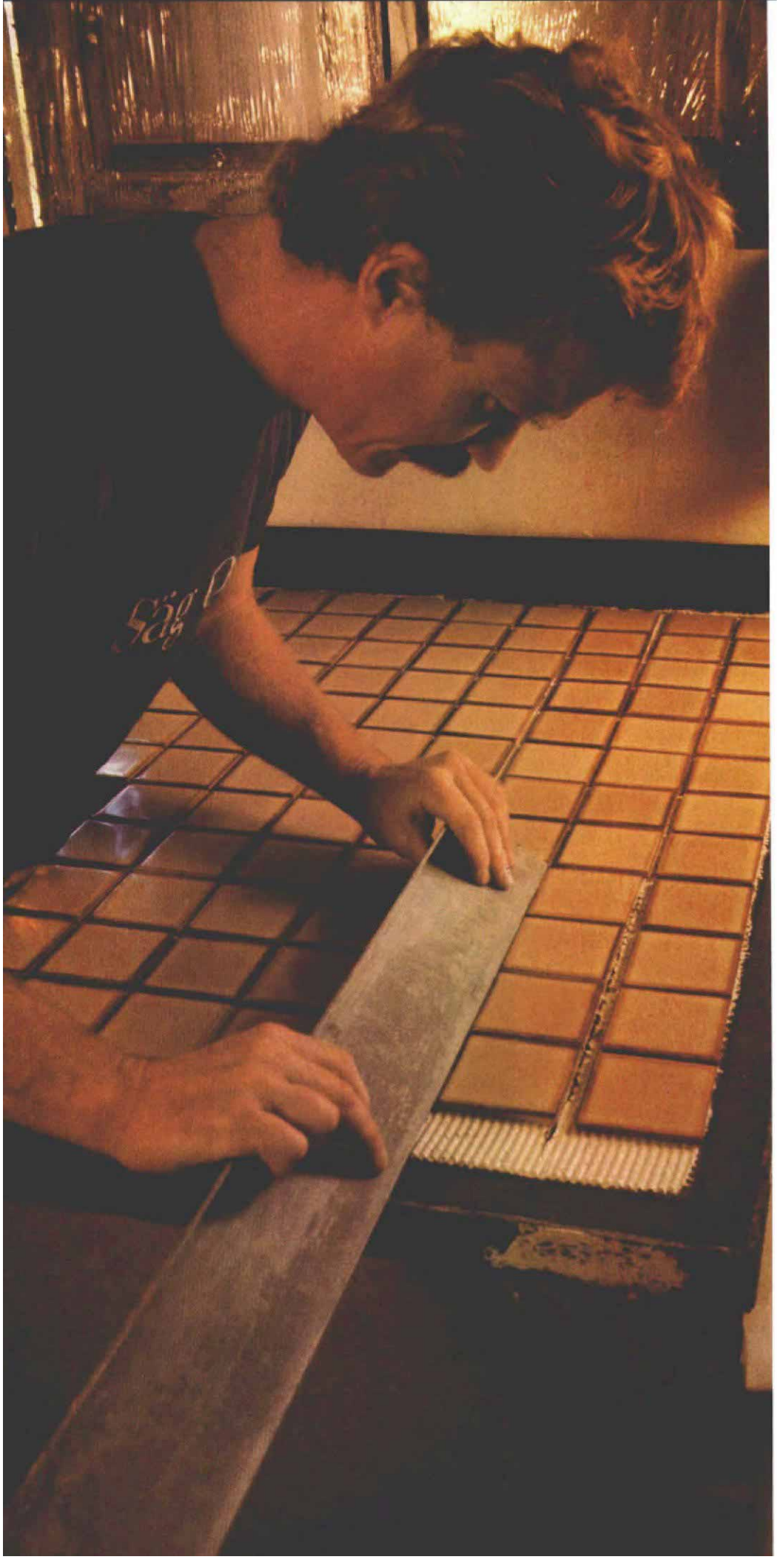
Of all the skills necessary to produce durable tile installations, none is more perplexing to the novice than mixing mud. There is no substitute for experience, but having a good recipe, the right tools, and knowing a few good mixing techniques can produce workable deck mud. The recipe I use comes from instructions printed on the bucket of latex admix (when using various mortar additives, always follow the manufacturer's recommendations). With Laticrete 3701, the mix is 1 part portland cement, 3 parts mason's sand, and about 4½ to 5 gal. of the admix per sack of cement. To help keep the batches consistent, I measure the dry ingredients in 3-gal. or 5-gal. buckets instead of counting shovelfuls. A full 5-gal. bucket holds ¾ cu. ft. of sand, and when I calculate the volume of mortar for a job, I disregard the cement. It fills the spaces between the sand particles. The sand I use comes damp from the yard, although occasionally I use dry sand shipped in paper sacks. With the dry sand, I measure out the amount I need and mix it with just enough water to dampen it.

I use a steel mixing box and a slotted mason's hoe rather than a rotary mixer, which can cause the mix to form marble-sized lumps. I layer the sand and water evenly in the box and chop them three times back and forth with the hoe. Each time, I take lots of small bites with the hoe, and I pull the ingredients toward me to form a pile at one end of the box. Before any liquid can be added, the sand and cement must be thoroughly blended to prevent lumps from forming.

Next I level the dry ingredients and use the handle of my hoe to punch holes in the mix (photo above right). This allows the liquid to distribute itself more evenly instead of just sitting on top. Then I repeat the mixing procedure, chopping back and forth three times. At this point, I pick up a handful and squeeze it. If the moisture content is right, the deck mud will form a tight ball that sticks together without cracking apart (photo below right). If it oozes through my fingers, the mix is too wet and must be adjusted by adding some dry sand with the right proportions of cement. If the ball falls apart, I need to add more liquid.

The direct rays of the sun can ruin the mud at this point, so I pack it into buckets and get it inside the house. If it's above 90°F, I'll have only about a half-hour to work the mortar. If it's 65°F to 75°F, I may have as long as two hours. ***—M. B.***

A steel mixing box (top) is the place to prepare a batch of deck mud. Byrne blends the dry ingredients with his hoe, then pokes holes in the mix with its handle to help spread the latex admix. Properly blended mud is fairly dry, but it will cling together in a ball when you squeeze a handful of it (above).



open up the joints, as shown in the photo at left. For getting out of a jam, nothing beats a good set of straightedges.

Cutting the tiles—The narrow tiles in front of and behind the sink can be cut with a snap cutter (see *FHB* #17, p. 70), but I prefer to use a diamond-bladed wet saw for the accuracy and smoothness of cut I get in one step. The saw is set up outside the house, and running back and forth for each cut eats up time, so I accumulate a stack of tiles to be cut for each trip. You can use a ruler to take measurements and then set the saw fence to these, but that leaves a lot more room for error than just marking the tile directly. The water jet on the saw can sometimes blast away a pencil mark while cutting, so I cover the tile with masking tape and make my mark on the tape.

V-cap, backsplash and quarter-rounds— After all the field tiles are positioned, I set the V-cap. Complicated trim tiles like these often distort a bit in the kiln, so they must be set with extra care. I usually butter each piece with thinset and then tap it into place, controlling the amount of thinset I use to suit the alignment (photo facing page, top left). At inside and outside corners, the V-cap tiles are mitered, and I cut them a bit short to allow for a grout line.

Before I can set the single row of backsplash tiles, I trim the excess tar paper down to about ½ in. to ¾ in. above the deck tiles (drawing, facing page). The joint between the backsplash and the deck must allow for free movement, so later, when the grout is dry, I seal it with a bead of silicone caulk. I allow a full-width joint here rather than have the splash tiles rest directly on the deck tiles. Bon-Don is especially sticky thinset, allowing me to hang these relatively light tiles on the wall without any support from below. Heavier tiles usually require wood or plastic shims between the last course of deck tiles and the bottom edge of the backsplash tiles.

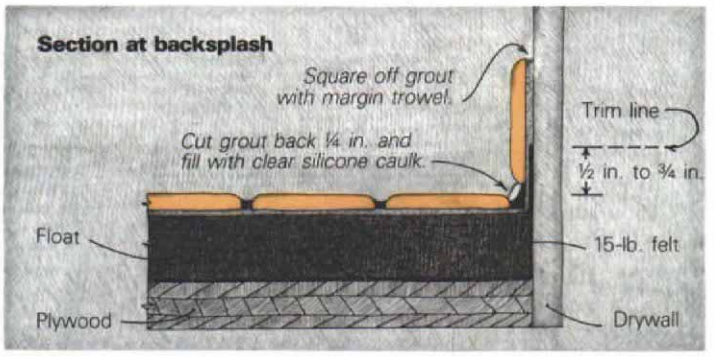
The last tiles to go down are the small radiused tiles that trim the sink. Unlike the other tiles, these quarter-round trim pieces are set on a bed of grout. This grout is the same used to pack the joints, only it is mixed stiffer. To make sure that the quarter-rounds adhere to the float mud around the sink, I coat both the float and the back of each quarter-round with thinset for a stronger bond between the tile and the grout.

Factory-made inside corner pieces look and feel better than the miter cuts you can make on a tile saw. They are set before the straight sections of quarter-round. With quarter-rounds, it's important to apply more grout than is actually needed to set each piece. As the tile is slowly pushed home (photo facing page, below left), the excess grout is squeezed out of the joint. Once the piece is in the right position, I support it with my fingers for a few seconds to prevent it from moving. When all the pieces are set, I

Adjusting the courses. **Instead of adding an unsightly row of narrow tiles, the distance between courses can be slightly increased. This strategy can spread out a discrepancy so it can't be seen, and save tedious tile-trimming.**

***V-cap tiles,* which trim the leading edge of the counter, receive a lot of contact. It's important that they be securely anchored to the mortar bed—any voids between them are unacceptable. Byrne butters the back of each trim piece with a generous helping of thinset, and presses it in place until it's in the same plane as its neighbor.**

***Quarter-round tiles,* which trim the edge of the sink, are the last tiles to be placed. They are set on a bed of stiff grout. Before bedding them, Byrne applies a thin layer of thinset mortar to the tiles and to the float. The thinset mortar helps to strengthen the bond between the two.**



***Finish.* The entire counter has been grouted and sponged. Residual cement is cleaned up with a damp sponge. The corner of the sink is trimmed with a factory-made inside-corner piece. Next to it, the quarter-rounds have been trimmed to align with the V-cap edge trim and the field tiles. The last step will be to undercut the grout around the sink, and fill it with silicone caulk once the grout dries.**

leave them alone for about a half hour or so to allow the grout to set up. Meanwhile, I prepare another batch of grout.

Grouting—I prefer a grout made with a latex admix because it is a lot stickier than regular grout. This allows it to adhere tenaciously to the slick edges of glazed tiles—an important advantage on a tile work surface that gets constant use. Also, grout with admix is far more resistant to liquids, and to the erosion they can cause.

To prepare the grout, I follow the directions on the sack, which usually recommend combining the dry ingredients with water or a latex admix to the proper consistency, and then allowing the mix to sit for five or ten minutes. The grout is then mixed again and it's ready for use. During this wait, I trim the excess grout from the sink quarter-rounds.

There is no single method for grouting, and the techniques for grouting floor tiles (*FHB* #17, p. 75) also apply to a counter. The porosity of the tiles, the moisture content of the setting bed, the addition of admixes, temperature and humidity levels are all factors that determine how much grout can be spread before it's time to clean off the excess. Usually, I begin by spreading about 8 to 10 square feet. I hold the rubber trowel at an angle between 30° to 40° as I force the grout into the joints. I work the grout from different directions until I'm satisfied that the joints are packed solid.

I start the cleaning by scraping away loose grout with the edge of my rubber trowel. Then I take a wet sponge and wring out as much water as possible. This is important because any excess moisture will weaken the grout. I work the sponge across the counter, gradually lowering the level of the grout until it is slightly below the plane of the tile, with a concave surface. During this process, the pores of the sponge quickly fill with grout and must be flushed constantly. Once the entire counter has undergone this step, I go back over it with a clean sponge to remove most of the cement haze (photo above right).

The last step is to trim the grout in a few places. At the sink, I undercut the grout below the quarter-rounds about ⅛ in. so the joint can be caulked with clear silicone. This allows the sink to move a little, without breaking the waterproof seal, and lets the color of the grout show through the caulk. Because the counter and the wall will move slightly in relation to one another, I use the same technique to seal the joint between the deck tiles and the backsplash. At the top of the backsplash, I square up the grout line with my margin trowel. This makes it easier to paint or paper the wall.

Finally, I remove any grout haze with cheesecloth or fine steel wool, followed by a thorough vacuuming to take away the loose particles. □

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