Prepping for an Outdoor Tile Patio

Detail the substrate properly for a long-lasting floor

BY MICHAEL BYRNE

Photos: Michael Byrne

Correcting minor discrepancies in a concrete slab for tile is part of my job. But if the surface is inches out of whack and slopes in the wrong direction, that's a whole other story. When my friend Bob asked me to tile the courtyard of his retirement home to eliminate the puddles and dress it up, I could tell at a glance that the slab was cracked and sloped toward a low spot at the entry door. Excess rainwater drained from this "birdbath" undesirably into an adjacent flowerbed. The next lowest spot was just inside the gate at the opposite side of the courtyard, and humps and valleys crisscrossed the rest of the area.

In the past, I've had builders downplay such problems, telling me to just "add a little more thinset" in the low areas. But with that approach, some parts of this slab would have required more than 3 ½ inches of thinset to achieve the proper slope—less than ideal because the compressive and cohesive strength of thinset drops significantly when applied in a layer thicker than ⅜ inch. So before I could tile Bob's courtyard, I had to deal with slab cracks, fix the irregular surface, and create a proper slope for drainage.

SURVEYING THE EXISTING SLAB

Bob's place is on the South Carolina coast, where temperatures regularly soar above 90°F and can evaporate moisture out of

cementitious materials such as mortar and thinset, halting proper hydration and ruining their effectiveness. These conditions are not ideal for workers either. So I erected a frame of steel tubing (designed for use as a temporary carport) and covered it with tarps to protect the work area as well as the worker.

The first step to installing the mortar bed was to survey the topography of the slab. I did this using straightedges and levels, beginning at the gate, where the courtyard's lowest point needed to be, and working my way "up-slope" toward the entry door. I could have used a single laser for the survey, but I've found it difficult to keep track of which areas of a slab are too high or too low when using one. Straightedges and levels give me a better read of a slab's surface **(1, 2)**.

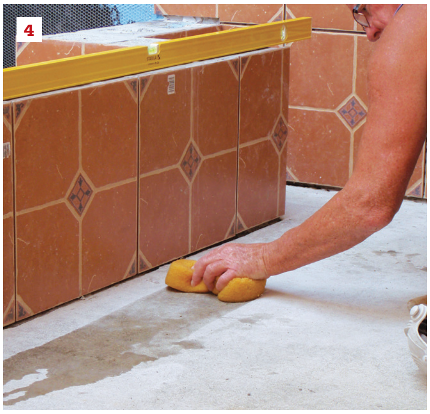
The survey revealed that the drop from the entry door to the gate wasn't nearly large enough to provide the standard ¼-inch-in-10-feet slope called for by the tile industry; in fact, it was barely enough of a drop for a ⅛-inch slope. So I opted for a nearly level surface for about 3 feet out from the door. From there, I could plot a slope of 3⁄16 inch in 10 feet down to the gate.

To help channel rainwater away from the sides of the courtyard—and away from Bob's flower gardens—I decided to create a swale in the mortar bed along the left side of the walking path as you approach the entry door. I put the low axis of the swale about a foot from the center of the path. The survey helped me to determine the location and the height of the mortar screeds that I would make to set the slope of the mortar bed, as well as to form the drainage swale **(3)**.

FORMING THE MORTAR SCREEDS

As their name implies, mortar screeds guide the straightedges used to screed or strike off mortar at the desired height. On this project, three more-or-less-parallel screeds were required: one for the low axis of the swale (called the "gutter") and two positioned outboard of the gutter, each running from the end of the slab near the entry door to the opposite end at the gate.

Because the floor in front of the entry door was to be almost flat, I needed only two mortar screeds for that area. Then, where the mortar bed would begin to slope, I angled the left-hand screed toward the gate to become the gutter screed and added a third screed to its left. I kept the two outboard screeds as far away from the gutter screed as possible to maintain the greatest accuracy in the sloped part of the floor while creating a swale to channel water runoff.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Aside from setting and maintaining the desired slope, forming the mortar screeds was fairly straightforward. After sweeping all the grit off the slab, I sponged the area with clean water to remove any lingering dust and to dampen the slab **(4)**. A completely dry slab would have sucked moisture from the adhesive layer and reduced (or completely negated) the adhesive bond. Next, I troweled on a thin coating of Portland cement slurry to create an adhesive layer **(5)**. Immediately after, while that layer was still wet and sticky, I piled on a stiff mortar mixture along the line where I wanted to place the screed **(6)**. This mixture—four parts sand to one part cement—needs to have just enough water added so that the sand and cement combine, but not so much that it is too loose to be compacted. A mixture such as that used to lay bricks, for instance, would be too wet.

To ensure that the screeds would be strong enough to resist the forces generated by floating a mortar bed, the mortar for the screeds had to be densely compacted. To do that, I placed a straightedge and level on top of the pile of loose mortar and tapped down on the straightedge until the mortar was at the correct height and slope, compacting it at the same time. I trimmed away the loose mortar **(7)** to make a better bonding surface for the bed mortar. To advance the screed, I rested one end of a 6-foot-long straightedge on the previously formed screed, and then tapped the other end down until it was at the proper slope **(8)**.

After the screeds for one section are formed, some installers will immediately float and finish the mortar bed between them, but I opted to let the screeds harden overnight.

This process may seem to be more time-consuming than using thin wooden float strips, which are often used to set a proper slope. But because this patio floor had such an irregularly shaped area and so much variation in the slab, creating a series of mortar screeds made floating the mortar bed much easier and quicker in the long run.

FLOATING THE MORTAR BED

With hardened mortar screeds in place, the areas between them and outside them can be floated simultaneously. But at my age, I tend to be less energetic than I used to be, so I usually float the areas between the screeds first. Once these areas have hardened, I go back and float the areas outside the screeds.


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As I did when forming the screeds, I first dampened the dry slab with clean water. Again, the slab should be damp only, with no puddles. Next I applied a thin coating of slurry both to the dampened slab and to the sides of the screeds **(9)**. Like the slurry used to form the screeds, this was an adhesive layer that would help the mortar bond to the slab below. Working quickly to prevent the slurry from skinning over (which would have negated the slurry-to-mortar bond), I covered the adhesive layer with mortar **(10)**.

Using a wooden float, I compacted the mortar and then smoothed it using a flat trowel **(11)**. My goal at this point was for the top of the compacted mortar to be about ¼ inch to ⅜ inch above the height of the screeds. If the surface is too low, a lot of backfilling and extra compacting will be needed after screeding; if the surface is too high, screeding off the excess is more strenuous than it has to be.

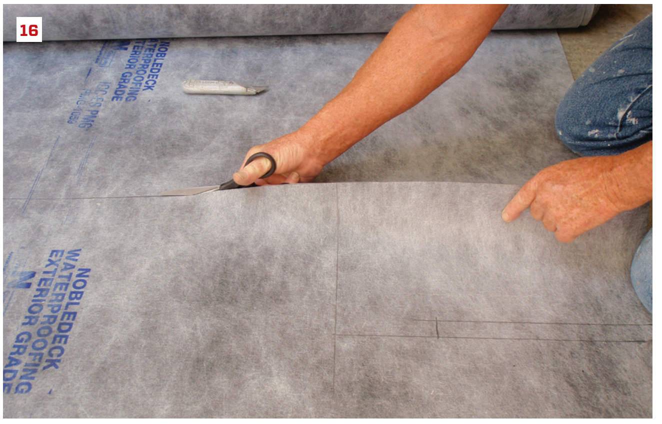
Holding the narrow face of an aluminum straightedge against the tops of the screeds, I jiggled it from side to side while gradually pulling it toward me to "saw" off or strike off the excess mortar **(12)**. Even with 46 years of experience, I still had to go back and fill in the inevitable voids **(13)** before finishing those areas with a final pass of the straightedge.

With a good helper to supply me with mixed mortar, I can generally float a lot of mortar in a day. But I was working alone on this project, and because of the effects of the South Carolina heat, I limited myself to two batches of mortar per day. By the time I'd cleaned up my tools, the mortar had set up enough that its surface could be further smoothed with a wood float **(14)**. The wood float produces a flat but coarse surface—this enables a much stronger bond between the mortar bed and crack-isolation membrane than the smooth surface created by finishing with a steel trowel.

FITTING THE CRACK-ISOLATION MEMBRANE

With the mortar bed entirely floated, I turned to fitting the membrane. A word of caution: Be sure that the membrane you choose is specifically designed for exterior use. Membranes that you depend on for interior tile installations may have a limited lifespan if used outside. In fact, some interior-only membranes can be ruined by just a few days of exposure to direct sunlight, even after the tile has been installed.

The membrane I used for this project was Noble Deck (noblecompany.com), which is specifically designed for exterior use for



waterproofing, joint bridging, and crack isolation. Because I was using the membrane for crack isolation only, this installation was relatively easy. The sections of the membrane that were needed to cover the courtyard could simply be butted together, whereas if the membrane had been needed for waterproofing as well (such as on a deck or a balcony over a living space), I would have had to overlap all of the seams by 2 inches and turn up the perimeter of the membrane onto the walls to ensure a watertight substrate.

The Noble Deck membrane I used comes in 6-foot-wide rolls and can be installed using either a companion contact-type cement or a latex-modified thinset mortar. The contact cement is relatively easy to use compared with thinset mortar and is rated for this type of application, but because the courtyard would experience a high volume of traffic and excessive heat buildup during the hot South Carolina summers, I decided to use latex-modified thinset mortar (Mapei polymer-enriched thinset mortar, mapei.com) instead. It was a judgment call, but in my experience, this type of mortar performs better under such extreme conditions.

Because I could use the full width of the membrane, I started at the front door. I plotted out the various dimensions of this area and transferred them to the surface of the membrane **(15)**. I needed a minimum ¼-inch-wide movement joint wherever the floor tiles butted against a wall, and none of the tiles could be in direct contact with the mortar bed, so I kept the membrane within ¼ inch from any abutting surface.

After plotting the dimensions on the membrane using a 3-4-5 folding square and a marker, I cut the membrane sheet to size with a pair of sharp scissors **(16)**.

I could have run the membrane in one continuous sheet from one end of the courtyard to the other. But because the floor plan of the area was quite irregular, doing so would have wasted a lot of time and material. Instead, I worked in smaller, more manageable areas, and extended the first section of membrane just down to the jog for the flowerbed **(17)**.

When I set the membrane in place, I noticed a large upward curl along the edge of the sheet, which was a mistake on my part. It may seem like a minor point, but upward curls such as this often pull away from the bonding adhesive. I should have plotted the dimensions on the other side of the membrane, with the curl facing down. This problem was quickly remedied, though, by letting the

membrane sheet lie in the warm sun on a flat surface for 10 to 15 minutes until it relaxed **(18)**.

INSTALLING THE MEMBRANE

Properly aligning a sheet membrane before installation can be daunting, but the technique I used here ensures a high degree of accuracy. After cutting the sheet to size and verifying that it properly fit the area, I moistened the mortar bed with clean water so that it wouldn't suck moisture out of the thinset mortar. Then I positioned the prepared sheet on the damp floor. Once it was perfectly aligned, I weighed the sheet down with a couple of bags of thinset mortar (buckets of water would have also worked fine) to lock the sheet in place **(19)**.

I carefully pulled the front edge of the sheet about halfway back from the entry door to expose the dampened mortar bed **(20)**. Then I knelt down carefully on the doubled-back sheet—making sure that I didn't accidentally move it or put a crease in it. Using a ¼-inch square-notched trowel held at a very low angle, I combed out the latex-modified thinset about 18 inches toward the door from the membrane fold **(21)**. On a very smooth surface, I could have used a ¼-inch V-notched trowel, though the notch size and shape isn't as important as the amount of thinset mortar that is applied: too much can create a lumpy surface, while too little can result in minimal adhesion.

With the thinset troweled on, I flopped the sheet back down. Using the smooth edge of a flat trowel and a short straightedge (less than 18 inches), I embedded the sheet into the thinset mortar that I'd spread, using heavy pressure and pushing any excess mortar toward the door. Once that section was smooth and flat, I again pulled back the sheet to expose the bare setting bed. I spread thinset mortar over the next 18-inch section of the setting bed and repeated the same process, flopping the membrane down and embedding it in the thinset mortar I'd just spread. I continued to replicate this series of steps, advancing 18 inches at a time until I reached the front door.

Once the first half of the sheet was embedded and I was certain that the membrane was smooth and flat against the setting bed, I placed protective boards over the embedded section and pulled the loose half of the sheet back far enough to expose the edge of the thinset that I had previously applied. I could then make a seamless

transition from the first section into the second. I repeated the same series of steps as I did for the first half **(22)**. After the entire sheet was adhered, I went over it with a magnesium float to embed the membrane firmly into the layer of thinset mortar **(23)**, pushing any excess mortar out to the edge of the sheet where it could be removed before fitting the adjacent membrane sheet **(24)**.

I continued the membrane installation by locating the next largest area that could be covered with a section of full-width material. I repeated the layout, fitting, and embedding process on that sheet and moved on, gradually working down to smaller and smaller areas until the whole floor was covered. At that point I let the entire membrane sit undisturbed for 48 hours to ensure that the latex thinset mortar had hardened and dried completely. With the setting bed detailed for slope and drainage, and the crack-isolation membrane in place, the floor was finally ready for me to start installing the tile.

A WORD ABOUT OUTDOOR TILE & CLIMATE

For this project located in the hot South, I just snapped layout lines on the finished membrane and installed the tile and grout much like I would for an interior tile floor. Without any real danger of freezing, there were no worries about the type of tile and whether or not it would absorb water. Similarly, I installed the isolation membrane to minimize worries about cracks—not waterproofing or the climatic effects on the substrate.

But what if we had been doing this job in Duluth, Minn.? Fact is, tile is used outdoors all the time in cold climates. For this particular floor, I used multicolored slate that was not impervious, and because the direct sunlight will dry out any rain-soaked tiles, I opted not to seal it. In a colder climate, I would have chosen an impervious stone similar to the slate that's used on roofs. Another option for an outdoor tile floor in a cold climate would be to use non-absorptive porcelain.

The thinset and grout for tiling outdoors in any climate is the same as what I'd use for wet-area interior applications. Just be sure not to leave any voids in the thinset or grout that might trap moisture, which could cause freeze/thaw damage in freezing climates or mold in warm ones.

Contributing editor Michael Byrne is a tile setter and the moderator of the tile forum at jlconline.com.