



Rebuilding a Brick Patio

Properly installed rigid pavers are an attractive and durable hardscaping option for warmer climates

by John Carroll

Last year, the owner of a house with a 20-year-old patio hired me to repair the loose bricks along the patio's perimeter and repoint some areas of deteriorating grout. As I removed the loose bricks, however, the next row of bricks came loose; and when I removed that set of bricks, the next row came loose. It soon got to the point where more than a third of the bricks would need to be replaced. Not only would that have looked bad, but it also would have left two-thirds of a deteriorating patio in place. After I showed the owner just how easily the bricks were coming up, we decided it would be best to remove them all and start from scratch.

Uncoupling Membrane

Although I was concerned about a settlement crack in the existing slab, the end had settled only about $\frac{3}{4}$ inch over the course of 19 years. I reasoned that it would not settle any further, especially if I resolved the grade problems that had led to water being trapped on the patio, which had caused much of the damage to the brickwork (**Figure 1**).

Because even the tiniest differential movement between the two parts of the slab would probably cause the existing crack to telescope up through the new brickwork, I decided to install a Schluter-Ditra (schluter.com) uncoupling membrane on top of the old slab

before installing the new brick paving. The membrane would let the masonry bear fully on the slab while permitting slight differential movement between the slab and the masonry. Although Schluter's literature doesn't address the membrane's use with brick pavers, I had used it for both interior and exterior tile applications and could see no reason why it wouldn't work here (**Figure 2**).

The slab was 54 feet long. The patio itself was nearly 35 feet long, and a walkway extended 19 feet more from the end. This is an unusually large expanse of masonry in residential flatwork. The uncoupling membrane would keep the settlement crack from telescoping into the paving, but I was also concerned about contraction and expansion of the paving itself. Breaking the paving into three sections would allow each part to move independently.

To make the joints between sections as inconspicuous as possible, I planned to place them where grout joints in the brickwork would normally be. The uncoupling membrane had to be cut at these joints, too, to prevent it from bridging the gaps and thus restricting the independent movement of the three sections.

Following the manufacturer's recommendations, we bonded the membrane to the slab using unmodified thinset. First we dry-fit the membrane, then rolled half of it back and spread wet thinset out on the slab. Before rolling the membrane back into place, we combed the wet thinset with $\frac{3}{8}$ -inch notched trowels. Using $\frac{3}{8}$ -inch rather than the recommended $\frac{1}{4}$ -inch notched trowels allowed us to apply more mud to the irregular slab we were working with. Starting in the middle and working toward the edges, we used magnesium concrete floats to press the membrane into the mud.

After embedding the first half of the membrane, we rolled back the other half and repeated the process. In about six hours, we had covered a third of the slab—the part with the large settlement



Figure 1. Installed in 1996, this North Carolina brick patio began to come apart within 10 years. But what started out as a repair of a few loose bricks turned out to be a major replacement job, thanks to faulty installation details and poor drainage.

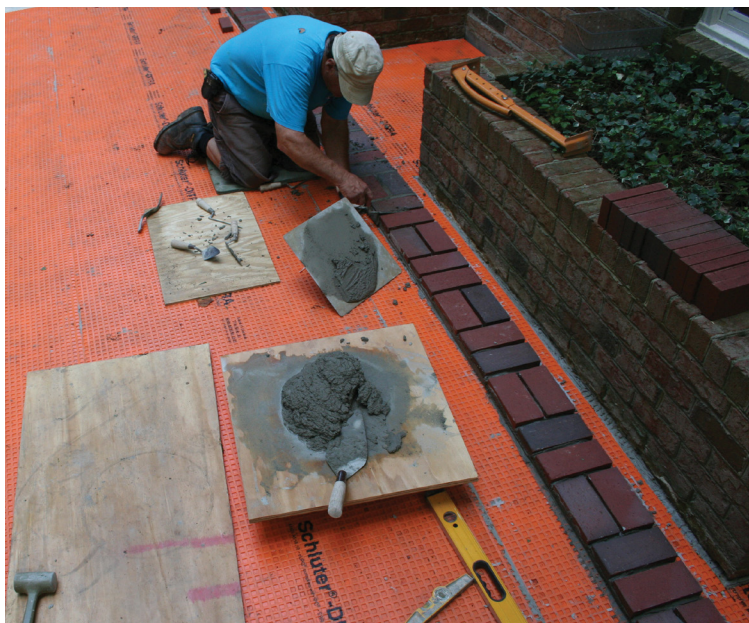


Figure 2. Modular brick pavers measure $7\frac{5}{8}$ inches by $3\frac{5}{8}$ inches and are designed to be laid out in 8-inch increments (with $\frac{3}{8}$ -inch mortar joints). Here, the author installs the first of two parallel columns of bricks over a Schluter-Ditra uncoupling membrane. The columns will act as story poles as he installs the remaining pavers.

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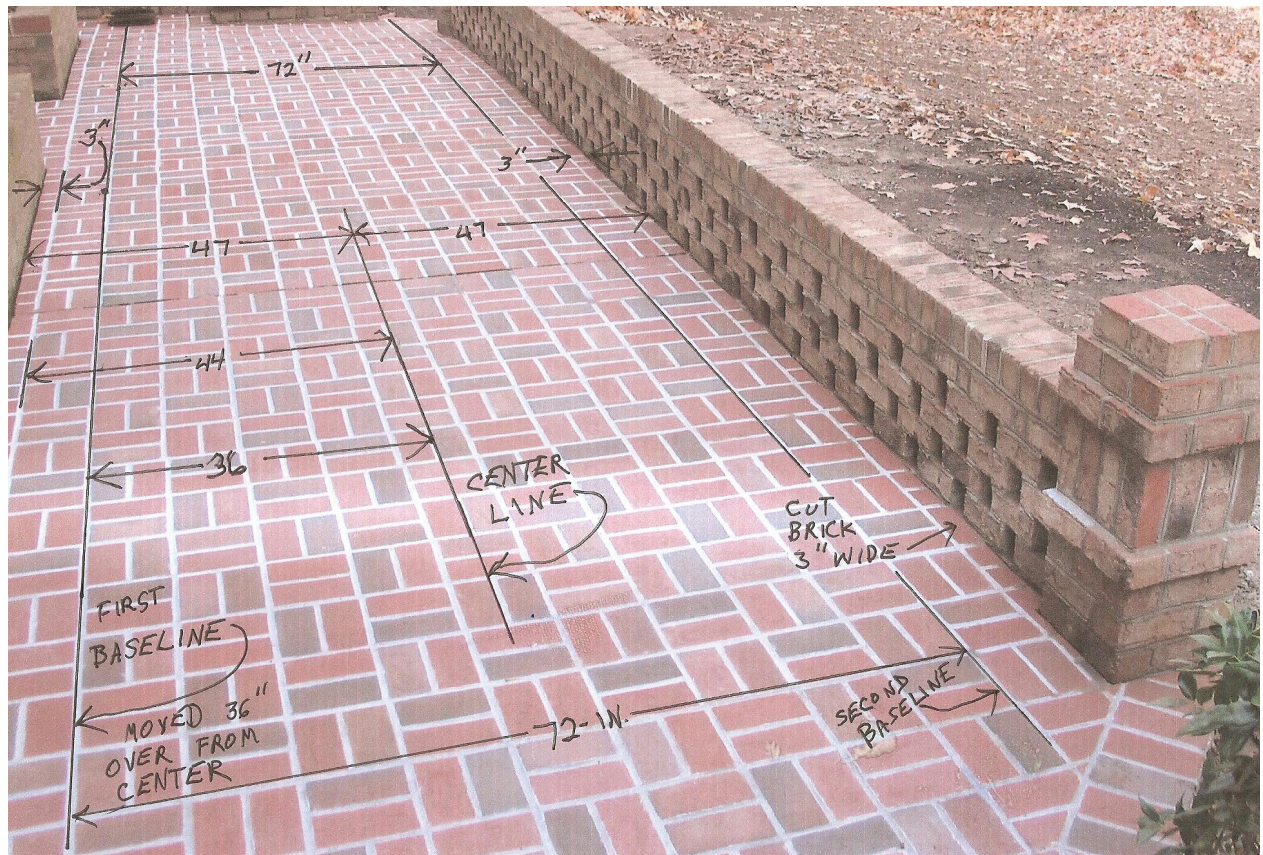


Figure 3. Here's a photo of the installed brick patio, with the layout lines superimposed on the photo to show how the pattern is centered both along the length and width of the patio.

crack—with the membrane.

The next section of membrane extended to the end of the patio and into the walkway, bridging a second, smaller crack caused by shrinkage. Since the final section of the slab (a walkway about 19 feet long) didn't have any cracks, I didn't install any membrane there.

Installing the Pavers

We used face bricks that matched the home's brick veneer for a new garden wall that we built at the patio edge. For the patio floor, we selected new severe-weather-rated (SX) pavers, which are required for exterior paving in most of the United States. When I'm installing brick paving, my main objectives are to install the bricks in an even plane (graded away from the house); to create neat, consis-

tent mortar joints; to pack both the bed and grout joints full of mortar; and to do all this without staining the faces of the bricks with mortar.

Layout. In flexible brick paving, bricks are usually a full 8 inches long and 4 inches wide, but when you're installing rigid brick paving—as I was here (see *Flexible vs. Rigid Brick Paving*, page 44)—this size won't work for many patterns, including the basket-weave pattern used on this project. Instead, I used modular bricks, which are $3\frac{5}{8}$ inches wide and $7\frac{5}{8}$ inches long. The slightly smaller size leaves room for $\frac{3}{8}$ -inch mortar joints, and allows the pavers to be laid out in 8-inch increments (**Figure 3**).

The layout for this job was a lot like a layout for a tile job. First I established a baseline along the length of the patio

that would maximize the size of the cut bricks at the upper and lower ends of the patio. Then I laid out the positions of each pair of bricks along this line. Since a pair of bricks plus one mortar joint equaled 8 inches, I made a mark every 8 inches starting at the edge of the membrane.

To keep the bricks in a straight row, I laid a pair at each end, then set a string between the two pairs. Next, I laid the intervening bricks to the line to complete the course, which consisted of pairs of bricks that alternated between being set along the line and being set perpendicular to the line. Next, I marked a second, parallel baseline near the garden wall exactly nine courses (72 inches) away from the first baseline. As before, I marked 8-inch brick spacing along the line, then laid a course of bricks to those marks.

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With the two columns of bricks in place, I was able to use them as a pair of story poles as I laid the paving between them. Following the string ensured that the surface would remain flat and that the spacing between the courses would remain straight and consistent in size.

I used the same basic procedure for laying out the rest of the job. In the rectangular spaces between the planters and in both legs of the L-shaped walkway, it was always the same sequence: I would establish two parallel baselines set apart by a multiple of 8 inches, mark 8-inch increments along the lines, lay a course along both lines, then use those two courses as guides as I laid the field between them.

Mortar. I mixed the mortar using Type S masonry cement and sand in a 1:2½ ratio. To keep both the color and the quality consistent, I always measure the dry ingredients for every batch, then gradually add water until I get a workable consistency. I usually can't tell if the mud is right until I pick it up with my brick trowel and determine by feel that it's soft enough to work with. Because brick pavers are engineered to absorb water at a very slow rate, you can use mortar that's slightly drier and stiffer than that used for building walls with face bricks.

Installation. I typically install pavers in two distinct steps: First, I install the units in a full bed of mortar, then I wait a day or two to fill the grout joints. To fully embed the bricks in the mortar, I spread the mortar a bit high. After setting a brick in place, I tap it into the mud using a plastic soft-blow hammer so that it's flush with its neighbors (**Figure 4**).

When I tap bricks into position, some mud usually squeezes up into the joints. I consider this to be desirable, but I've noticed that the mortar often bulges up and separates slightly from the side of the unit. To flatten the bulge and close off the slight separation, I go back over the joints lightly with a tuck pointer about 15 minutes later. This only takes a few minutes, and it seems to lock the bricks

Flexible vs. Rigid Brick Paving

Flexible brick paving—where the pavers are set on a well-compacted, drainable base—is the best choice for cold climates where frost heave is a recurring problem. In this system, the bricks are placed close together, and sand is swept between the cracks to hold the bricks in place. Any water that seeps between the bricks readily drains through the base.

But I prefer the finished look of rigid brick paving, where bricks are set in a full bed of mortar over a concrete slab poured on a well-compacted, drainable base (typically a 4-inch layer of washed gravel). The joints between the bricks are filled with mortar, either as the bricks are laid or later in a separate operation, to minimize the amount of water that penetrates the brickwork. Because mortar is used in this system, it is sometimes called “mortared brick paving.”

Flexible brick paving is a lot cheaper than rigid paving, is easier to build and repair, and—perhaps most important—accommodates movement. But rigid brick paving has its own advantages: It has a very even surface, and weeds don't grow up through the cracks. When installed properly, rigid brick paving lasts indefinitely in climates like mine; here in North Carolina, I've installed dozens of mortared brick paving jobs, some of which have been through more than 25 winters without losing a brick or showing any deterioration in the mortar joints. —J.C.



Figure 4. Brick pavers should be tapped or pressed into a full mortar bed, but avoid sprinkling the face of the bricks with mortar and staining them (a common problem when using a trowel handle). A torpedo level is handy for determining when the brick is even with its neighbor.

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in place with a continuous layer of mud all around the perimeter.

Cutting. I was able to cut bricks to fit around the edge of the patio using a tile saw, which was a lot easier to transport to the job and less likely to trip the breaker of the house than my 14-inch brick saw. For the trickier cuts, I used cardboard templates to mark the brick and a 4 1/2-inch angle grinder fitted with a diamond blade to make the cuts.

Expansion joints. As I laid the bricks, I created expansion joints wherever the paving abutted vertical surfaces, such as walls and the riser of a step and a concrete driveway. I also made two expansion joints in the field of the paving. To keep the mortar from squeezing into the 1/2-inch spaces I wanted to leave for the expansion joints, I inserted 1/4-inch slats of wood, wedged in place by shims.

Grout

After laying bricks for a couple of days, I went back over them to fill the joints with a slightly stiffer mix of the same mortar used to set the brick (**Figures 5, 6, 7**). When you're grouting, the trick is to pack the joints full without staining the faces of the bricks.

Although many masons use a grout bag to place mortar in the joint, I prefer using a hawk, a pointing trowel, a margin trowel, and a variety of tuck pointers (for a selection of tools used for masonry work, go to bontool.com and select "masonry tools"). Using these tools, I can deposit drier mortar than I can using a grout bag; grout that's plastic enough to squeeze through the bag's nozzle needs to be pretty wet, and it's hard to keep the loose mud from staining the faces of the bricks.

Cleanup

When I finished jointing the bricks, they looked pretty bad. The surface was littered with mortar crumbs, and large fins of mortar rose up from the edges of the joints. Some of the bricks had



Figure 5. Grouting is a separate process. After cutting a 1/2-inch-wide slice from the flattened mortar on the hawk, position the slice over the joint, then push it into the joint with a small margin trowel.



Figure 6. As the joints are filled with grout, they should be packed with a tuck pointer. It typically takes several passes of filling and packing before the grout joints are completely filled up.



Figure 7. Once the grout joints are packed full and have set up a bit, they are dressed with a concave jointer. Pressing hard against the jointer as it is run over the joints packs the mortar tight and gives the top of the joint a neat, concave profile.

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Figure 8. With careful work and timing, Scotch-Brite scouring pads (green synthetic steel-wool pads) and water, rather than harsh chemicals, can be used to scrub the bricks clean.



Figure 9. Foam backer is inserted in the open expansion joints to prevent sealant from sticking to the bottom of the joint. Rescissing the top of the backer rod about $\frac{3}{8}$ inch below the top of the joint will ensure that the joint depth will be the same as the joint width.



Figure 10. Expansion joints are then filled with a premium-grade polyurethane sealant.



Figure 11. Rigid brick-paver surfaces are smooth and weed-free, and well-suited for moderate climates that don't experience many freeze-thaw cycles.

mortar smudges at the edges. But from experience, I knew that any attempt to clean the mortar while it was still fresh would do more harm than good. I called it a day and went home, knowing that I could make this day's handiwork shine the next morning.

The next day, the mud was hardened but not completely cured. I used a bucket trowel, which has the front half cut off square, to break off the fins on the joints.

After sweeping up the crumbs of mortar, I used Scotch-Brite scouring pads (green synthetic steel-wool pads) and water to scrub the bricks around the edges. At this point, the water does the mortar nothing but good because it helps it hydrate completely (**Figure 8**).

Finally, about two weeks after I finished the masonry, I returned to caulk the expansion joints. To keep the sealant from sticking to the bottom and to

ensure that the depth ended up about the same as the width of the joint, I first installed a foam backer rod. After pressing the backer rod in place, with the top recessed approximately $\frac{3}{8}$ inch from the top of the joint, I filled the remaining space with a premium-grade polyurethane sealant (**Figures 9, 10, 11**). ❖

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