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# A New Way to Tile a Big Floor

A high-tech membrane minimizes the chances for cracked tile or grout failure

BY TOM MEEHAN

**T**here are buildings in Europe with tile floors that are in perfect shape after more than 1000 years. However, on this side of the pond, tile floors routinely fail after less than 10 years. What did the Europeans of the first millennium know about tile that we have yet to learn?

## **New material for an old system**

The answer is that Europeans developed what is known as an uncoupling system. The system

began with a bottom layer of mortar covered by a thin layer of sand. The tile then was set into another layer of mortar on top of the sand. As the building settled and shifted over the years, the sand separated the tile from the floor below, allowing the tile to float on top, unaffected by the building's movement.

Without an uncoupling system, the tile floors of today move when the building moves. Results can include loose grout, loose tile, and in extreme cases, cracked tile as the floor surface

under the tile moves and shifts, especially if the floor is big.

In the past, I've had pretty good luck by first making sure that the subfloor was thick enough, then applying felt paper, wire lath, and a layer of mortar before installing the tile. But that was a lot of extra work, extra materials, and extra thickness being added to the tile floor. Recently, I started using a product from the Schlüter Company ([www.schluter.com](http://www.schluter.com); 800-472-4588), called Ditra, which applies ancient European concepts using

some 21st-century materials (sidebar facing page).

## **Start with a sound floor**

Adding a membrane under the tile may be a great way to lengthen the life of a tile installation, but the floor below has to be structurally sound. There are formulas for determining if a floor has too much deflection (bottom sidebar, facing page), but I've also learned to rely on feel. Too much give when I jump on the floor tells me that it probably needs strengthening.



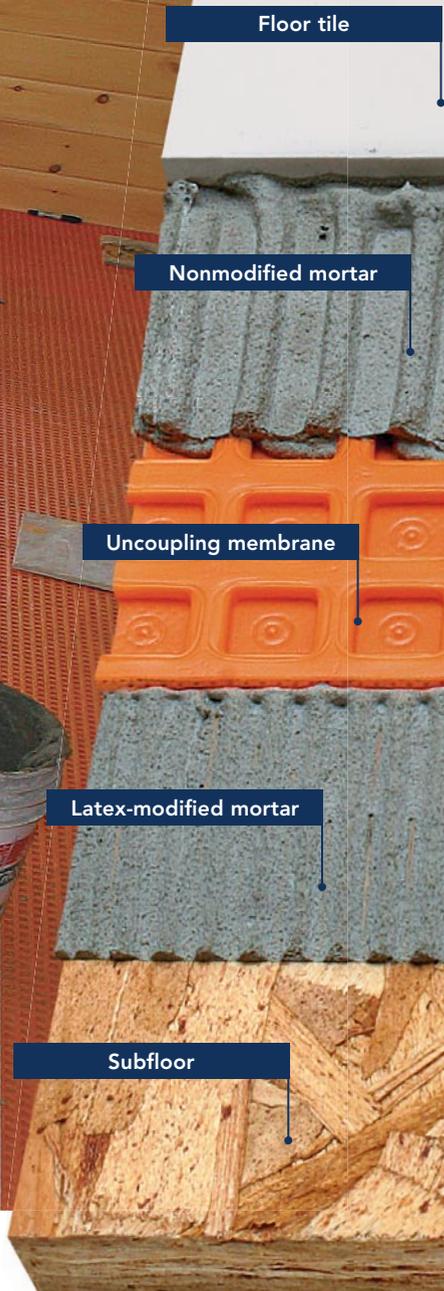
## Both sides of an uncoupling membrane

Ditra, made by the Schlüter Company (800-472-4588; [www.schluter.com](http://www.schluter.com)), is an uncoupling membrane that allows the finished floor

surface (tile, thinset, and grout) and the substrate (floor sheathing or a floor slab) to move independently of each other. A

close look at Ditra reveals the way it works. A fabric backing on one side bonds to the floor, and a keyed plastic grid system on the other side bonds to the tile. When the floor moves, the fabric allows the plastic sheet above it to move without breaking the bond of the tile.

Ditra retails for \$1.54 per sq. ft. It cuts easily with scissors or a utility knife, and it can be pieced into smaller areas without losing effectiveness.



Whenever possible, I check the framing below the floor to make sure the size and spacing of the joists are correct for the span of the floor. I've even been known to add extra support columns under bouncy floors.

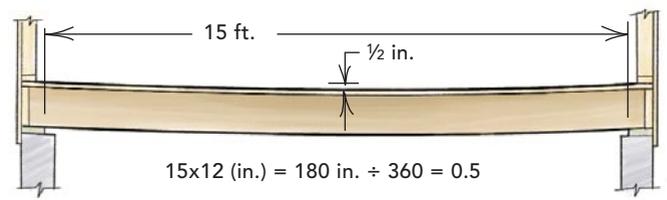
### The membrane goes down quickly

Before I begin installing tile, I roll out and cut pieces of membrane for the whole floor (top photo, p. 76). It's OK to use small pieces in areas such as thresholds to make the installation easier. If

### IS YOUR FLOOR STRONG ENOUGH FOR TILE?



The Tile Council of America's ([www.tileusa.com](http://www.tileusa.com)) standard formula for measuring maximum deflection under a tile floor is called L-360. Divide the total span of the floor joists by 360 for the maximum amount the floor can give in the middle under a live load of 40 lb./sq. ft., plus any long-term deflection due to



the weight of the floor. For example, the maximum allowable deflection for a joist span of 15 ft. is 1/2 in. The L-360 standard applies to most ceramic, porcelain, and hard stone. But for certain soft-stone tile, such as limestone or light marble, the L-720 formula applies, cutting the maximum allowable deflection in half. Ways of reducing deflection include adding extra layers of plywood underlayment or installing additional support under the floor framing.

## SPREAD OUT THE MEMBRANE



**Test-fit first.** Cut membrane to fit the floor with scissors or a utility knife. Cover the subfloor completely.



**One course at a time.** Spread only enough mortar for one course of membrane, then roll out the precut pieces.



**Make a good impression.** After the membrane is rolled out flat, a wooden float ensures a good bond with the mortar.

I'm putting down a heat mat for a radiant floor, I install it before the membrane (FHB #159, pp. 72-75). The membrane helps to distribute heat from the mat, and it protects the mat if a tile ever needs to be replaced.

I snap chalklines for each course of tile before it's installed to help guide me so that I don't spread more thinset mortar than necessary. For an installation over a wood subfloor, I use a latex-modified thinset that bonds well to the fabric side of the membrane. I start with a skim coat of thinset, pushing it into the pores of the wood with the straight edge of the trowel. Right away, I spread a second layer of mortar with a  $\frac{3}{16}$ -in. by  $\frac{1}{4}$ -in. V-notched trowel.

I keep the trowel lines going in one direction so that pockets or voids don't form, which could prevent the membrane from bonding properly. Then I roll the membrane into the fresh mortar and push it out flat (center photo). Once the membrane is in position, I use either a 75-lb. linoleum roller or a wooden float to press it into the mortar and establish the bond (bottom photo). Push out any excess thinset that may make the floor uneven.

## Plan tile layout for best look and least waste

Once the first tile goes down, there's no turning back, so I take as much time as I need to get the layout right (drawing and photos, right and facing page). This floor tile is 12x12 Turkish slate. It varies slightly in size and thickness, and has an uneven cleft face.

In this room, the focal point is the sliding door, so I began my layout there by measuring three courses from that wall and snapping a chalkline across the room. Next, I dry-fit a row of tiles in front of the door to see what cuts I'd end up with beside the slider and at the two sidewalls. I

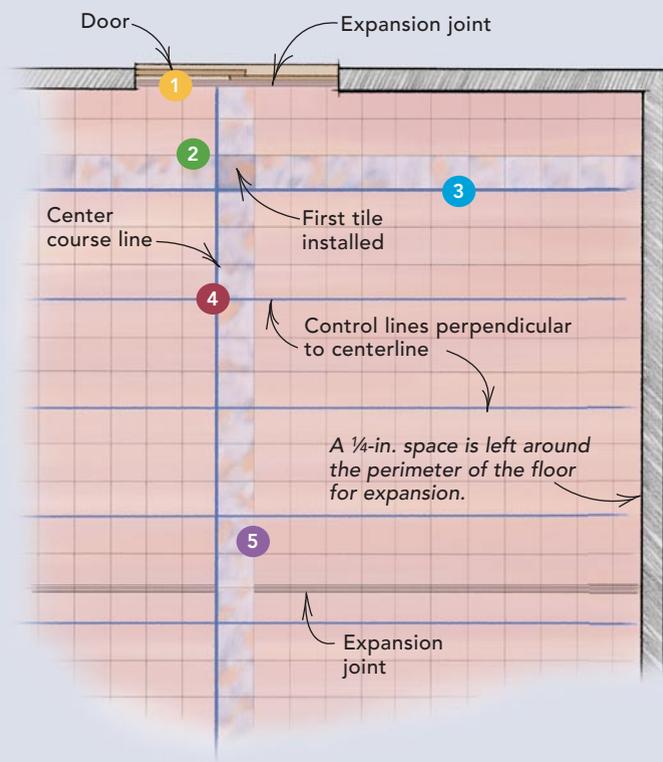
# LAYOUT

## TILING STARTS WITH CAREFUL LAYOUT

Dry-fitting a couple of tile courses enables you to determine the best layout and mark up the floor with layout lines.



- 1 After tiles are dry-fit in front of the door, measuring the width of the room determines whether the layout should be centered on a tile or on a grout joint for the best use of materials.



- 2 Mark the edge of the center tile course.
- 3 Measure three tile courses off the wall, and snap a chalkline across the room.
- 4 After marking the edge of the center tile, use a large folding square and a straightedge to extend the layout into the room. Measurements to the wall guide the center course line to the other end of the room. Straightedges confirm that the layout lines are perpendicular to each other.
- 5 A dry course of tile on top of the membrane confirms the side-to-side layout, and another course along the center course line sets the installation spacing every three courses.



found that centering the tile on the middle of the door left 11-in. pieces on both sides of the room for minimal waste. Before lifting the tiles in front of the door, I marked the center tile's edge.

Once I have the line across the room and the line for the center course of tile, I project a perpendicular line down the middle of the room (photo 4) with a straightedge and a 3-4-5 A-Square (C.H. Hanson Tool Co.; [www.asquaretools.com](http://www.asquaretools.com); 800-827-3398). Measuring off the sidewalls, I extend the centerline to the other end of the room and snap a chalkline. I confirm that the line is perpendicular to the first line between the sidewalls, and when I'm satisfied, I trace over the chalkline with a waterproof marker.

As a final check, I lay out one course of tile along both perpendicular lines without mortar. As I pick up the tile, I mark every three courses and snap parallel chalklines at each mark to keep the courses running straight and true.

### Tile locks into membrane

I install the tiles over the Ditra using a dry-set thinset mortar instead of latex-modified thinset. Dry-set, or nonmodified, mortar is easier to work with, is easier to clean up, and is about one-third the price of good latex-modified thinset mortar.

Because the slate is uneven and has voids in its surface, I spread the thinset with a coarse  $\frac{3}{8}$ -in. square-notched trowel. Before I comb it with the notched side of the trowel, I push the thinset with the straight edge of the trowel to key it into the recessed dovetailed edges of each square in the membrane. Then I go back over the thinset with the notched side of the trowel, again keeping the lines moving in just one direction.

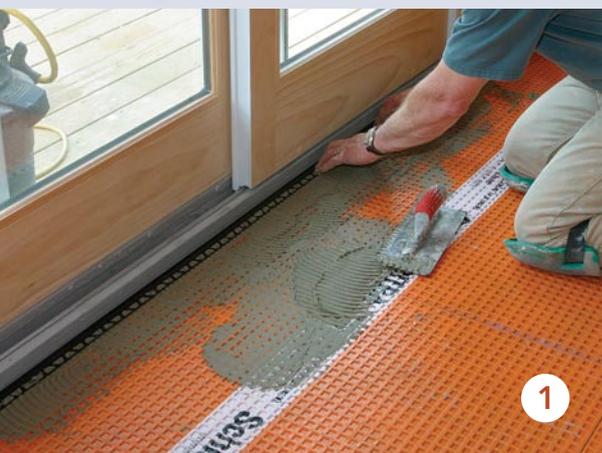
The first tile determines the position of every tile in the floor, so I set it at the point where the

# SETTING TILE

## EXPANSION JOINTS LET A BIG FLOOR FLEX

Expansion joints, recommended every 20 ft. to 24 ft. or wherever tile butts against a wall surface, such as in front of a sliding door, allow the tile to expand and contract with changes in temperature.

L-shaped expansion joint



- 1 An L-shaped joint goes against the door. After caulking the edge of the joint with silicone, press it into the mortar and against the door.
- 2 The first tile set at the intersection of the layout lines establishes the position of every tile in the room.
- 3 A T-shaped expansion joint goes between tile courses. First, position the joint, then apply a thin layer of mortar over the flanges to keep the joint in place while you set the tile.

T-shaped expansion joint



two layout lines intersect (photo top right). As I work down the floor, I apply thinset to an area in which I can set tile within about 15 minutes, usually about 30 sq. ft. at a time. For each set of courses, I install the first tile at the intersection of the layout lines. As each tile goes in, I apply a little downward pressure and slide the tile into place, which helps to lock the tile into the layer of thinset.

Because these tiles vary in thickness, I butter the backs of thinner tiles with a little thinset to bring them to the height of the other tiles. If a tile is extremely irregular in either shape or thickness, I put it aside for cuts or to be used in a closet.

As with most stone tile, each piece varies in shade and color. To keep color variations consistent across the floor, I work with tile from several boxes at a time.

# GROUTING

If a tile happens to have a color that is too extreme, I set it aside.

## Expansion joints give tile extra breathing room

In large floors, expansion joints should be installed every 20 ft. to 24 ft. Without expansion joints, there's an increased risk of cracks as the tile expands and contracts due to temperature changes.

The expansion joints I use (also made by the Schlüter Company) are available L-shaped for along walls, or T-shaped for between tile courses (photos facing page). A section of L-shaped expansion joint was needed in front of the sliding doors, where it also helps to prevent the tile and grout from cracking as the door is opened and closed repeatedly.

Because this room is just over 24 ft. long, I put a T-shaped expansion joint between two courses roughly in the middle of the room. Once I determine where the joint will be, I press it into the thinset, measuring to keep the joint at the right distance from the previous course. I trowel a little thinset over the flange before setting the tile.

I like to lay tile before baseboard goes in, so I leave a ¼-in. expansion gap along the walls for seasonal tile movement. The baseboard will hide the gap when it's installed. If the base is in before I tile, I can put L-shaped expansion joints around the perimeter of the floor.

## Seal tile before you grout

After all the tile is in, but before it's grouted, I give the floor a thorough cleaning. I not only wash the surface of the tile, but I also remove any thinset that is too high in the joints between the tiles. The thinset should be at least ⅛ in. below the surface of the tile.

After the tile is clean, I wipe the first of two coats of sealer onto the tile with a rag to avoid getting sealer into joints (photos right). I prefer Miracle Sealants Porous Plus (800-350-1901; www.miraclesealants.com). Because slate is porous and has an irregular surface, the sealer makes cleaning off grout easier.

To spread the grout and push it deep into the joints, I begin with the grout trowel at a 30° angle (drawing right). Next, I scrape the residue off the tiles with the trowel at a 60° angle. Finally, I remove excess grout by dragging the trowel across the tiles and joints at a 45° angle to avoid pulling the grout out of the joints. Because of the uneven edges of the slate tile, I use the palm of my hand to bevel the grout between tiles as I spread it.

After the grout has set up, I wipe down the tile with terrycloth to remove grout crumbs. Then I clean the tile with cool, clean water and a sponge. Cleaning requires extra diligence to remove all the grout from the uneven surface of the slate. Finally, after I've finished cleaning the floor, I let it sit for 24 to 48 hours, then apply a second coat of sealer with a sponge. On a large floor, I usually use a pump sprayer on the final coat. □

Based in Harwich, Mass., Tom and Lane Meehan are the authors of a new book in The Taunton Press's *Build Like a Pro* series: *Working With Tile*. Photos by Roe A. Osborn.

## SEAL, GROUT, THEN SEAL AGAIN

Sealing stone tile before grouting helps to keep the grout from sticking and makes cleanup easier.

1 Applying the first coat of sealer with a rag keeps it from going into open grout joints.

2 The author pushes a large volume of grout to make sure it is packed deep into all the joints.

3 To bridge the uneven edges between the stone tiles, a gloved palm shapes the grout into a bevel.

4 The second coat of sealer seals the grout and adds extra protection to the stone tile.

