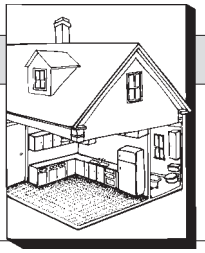


Substrates for Ceramic Tile

by Paul Turpin

The long-lasting performance of a tile job depends on the substrate it rests on. Most tile callbacks have to do with cracking or loose tiles caused by movement of the substrate, and usually this is the result of an inadequate substrate rather than undersized framing or settlement in a house.

Wood and drywall are not good tile substrates. The best options are a mortar base, a cementitious backerboard, or a rubber cleavage membrane. Here's a look at the different options.

Mortar Bases

Of all the substrate options, a two-coat mortar base (scratch coat and brown coat) is the strongest and most durable. Use a mortar base under tile in wet locations and on high-traffic floors where durability is most needed.

A mortar base should be *at least* 3/4 inch thick for walls and 1 1/4 inches thick for floors (see Figure 1). Mix equal parts of sand and portland cement for both the scratch coat and the brown coat. Use wire-reinforcement — mesh for floors and either metal diamond lath or paper-backed lath for walls over open studs. Let the mortar base cure overnight before laying down a thinset mortar to bond the tile to the base.

Thinset mortar is very creamy and plasterlike. It is available premixed, and includes an aggregate that is finer than sand. Spread the thinset with a notched trowel. Usually the tile or thinset manufacturer will recommend a notch size for a specific tile. Commonly, 4x4 and 6x6 tiles require a 1/4 x 1/4-inch notched trowel, while large floor tiles may use a 1/2- or 3/4-inch notched trowel.

A mortar base does have a few disadvantages, however. It is the most expensive alternative, due to the labor involved. Also, the thickness can be a problem on retrofit floors when you are trying to match the floor level to adjacent rooms. In this case, keep in mind that even a thick mortar base on a floor won't add to the load-bearing capacity of the floor structure. On the contrary, the added dead load and the need for a stiff, non-flexing surface for the tile usually requires larger floor joists than might already be in place.

Cementitious Backerboards

Cementitious backerboards are excellent for use in low-stress areas, such as shower surrounds and low-traffic floors. In recent years, a number of different backerboards have become available. Among the most widely available are *Wonderboard*, (Glascrete, Seal Beach, Calif.; 800/272-8786), *Durock* (U.S. Gypsum Corp., Chicago, Ill.; 800/621-9622), *Util-A-Crete* (W. R. Bonsal, Charlotte, N.C.; 800/888-1621), and *Hardibacker* (James Hardie Building Products, Fontana, Calif.; 800/788-4051).

Backerboard is so easy to work with, people tend to expect too much from it. It is not a structural floor sheathing. On floors, I prefer a full mortar bed, but if you choose a backerboard, install it over a structural subfloor. And while backerboards are resistant to moisture damage, in wet locations you must install a moisture-barrier behind the backerboard to protect the framing from moisture.

Use galvanized screws to attach the backerboard to wall framing or structural floor sheathing. Apply fiberglass tape over the joints and then apply a thinset mortar with a notched trowel.

Bonsal recently introduced a 1/4-inch-thick backerboard that can be bent around a 24-inch radius. This would be useful for curved walls or showers. I would use two layers in a shower, however, in addition to a closer stud spacing, which is needed to define the curve (see Figure 2).

Trouble Spots

No matter what substrate you use, some details must be handled with care.

Because wood and cementitious materials move at different rates, tiles connected to a wood substrate are prone to failure. The most common failure is cracking along the grout line in a corner. A common example is where the tile on a countertop turns up into the backsplash. Even when the base cabinets below are screwed solidly to the wall framing, there can still be enough movement to crack the grout. There are two ways to avoid this: Use a reinforced mortar base that turns the corner underneath the tile, creating a monolithic substrate, or make the joint flexible by using caulk instead of a mortar-based grout.

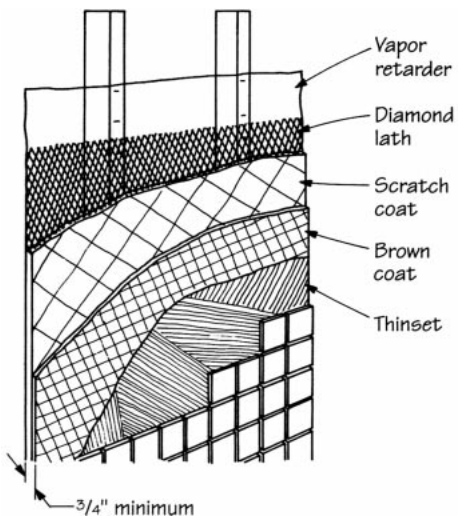
Tile manufacturers are wise to this, and there are now dozens of caulks made to match grout colors, including sanded caulks that have the same texture as the grout. If you plan to use a flexible joint at the back corner, I see no reason why backerboards shouldn't perform as well as a mortar bed.

Ordinarily I would never, ever install tile over wood. But, in fact, there is one place where I do use tile on wood. Where a countertop dies into the side of a cabinet, I terminate the counter with a bullnose tile that attaches to the cabinet side. This protects the wood from cleansers, making it easier to scrub the counter clean. The wood has to be sealed before the mastic is applied, and you must use caulk at the joint between the tile and the cabinet.

Moisture Barriers

While glazed ceramic surfaces are waterproof, the grout between them and the substrate they rest on are

Mortar Base on Walls



Mortar Base on Floors

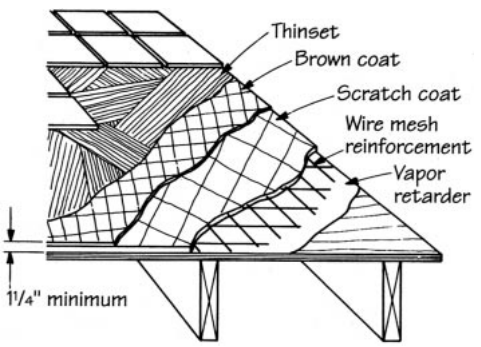


Figure 1. *Use a two-coat mortar base under tile in wet locations and on high-traffic floors where durability is needed. On walls, the mortar should be at least 3/4 inch thick and include either metal diamond lath or paper-backed lath over open studs (left). On floors, this base should be a minimum of 1 1/4 inches thick and include wire-mesh reinforcement (above). In both cases, use a thinset mortar to bond the tile to the base.*

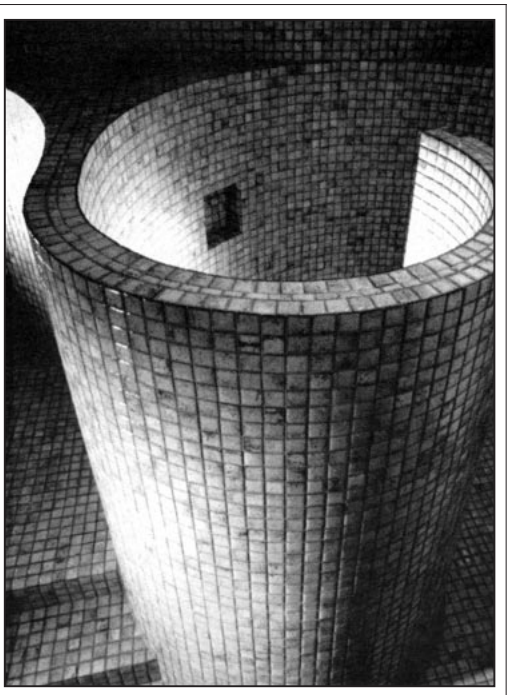


Figure 2. *Util-i-Crete — a 1/4-inch-thick backerboard — can be bent around a 24-inch radius to form a curved tile wall, like this shower stall.*

porous. You must install an additional barrier to keep moisture away from the framing, regardless of whether you use a mortar bed or a backerboard. Even backerboards that are advertised as waterproof have seams where water can seep through to the framing.

On floors and walls, use at least 15-pound asphalt-impregnated felt or a 6-mil (minimum) poly sheeting. Felt is an old standard on walls, and the only time I have seen it fail is when the joints were lapped to collect water rather than shed water. Sheet plastic works well for countertops, because the width of the roll covers the fronts of the base cabinets nicely, protecting them until the job is done. I also run the poly behind tiled backsplashes to provide moisture protection and to isolate the wood and cement surfaces. Shower pans and other water-holding areas, however, need a sturdier waterproofing membrane.

Cleavage Membranes

There are two basic types of cleavage membranes. Both are thick thermoplastic sheet materials that provide a flexible joint between the tile and substrate. These help prevent cracks in the substrate from telegraphing through to the tile surface. When the joints are sealed, these membranes form a waterproof barrier to protect the supporting structure as well.

Thinset applications. One type of cleavage membrane is embedded between two layers of thinset. I have used *Noble-Seal TS* (Noble Co., Grand Haven, Mich.; 800/678-6625) and *Dal-Seal TS* (Dal-Tile Corp., Dallas, Texas; 800/535-8453). Both are about 30 mil thick and work well for bathroom floors and other high-traffic areas that are subject to a lot of water. The membrane is installed by setting the sheet into a bed of thinset mortar and "squeegeeing" out the air bubbles. After curing, a second layer of thinset is spread onto the membrane to bond the tile. Seams must be solvent-welded in critical waterproofing situations.

Bostik (Boston St., Middleton, Mass.; 800/726-7845) makes a trowel-on membrane called *Ultra-Set*. Typically this is applied with a V-notch trowel and then smoothed flat to a thickness of 30 mil. I have had good results using this for spot repairs in old tile walls and floors.

Shower pans. A thicker cleavage membrane can be installed beneath a full mortar bed, in much the same way old-timers used to use lead or copper to form a shower pan or anything designed to hold water. Noble Company makes *Chloraloy 240* — a 40-mil-thick chlorinated polyethylene — for this "thick-set" method. As with a metal or hot-mopped pan, structural sheathing is needed beneath the membrane. The corners must be folded over and solvent-welded, or you can weld preformed corners to the field membrane. Noble Company has recently finished a video for new installers, which will take some of the guesswork out of the project for people who are new to the product. Compotite Corporation (Los Angeles, Calif.; 800/221-1056) makes *Compo-Seal* — a 40-mil PVC liner that also uses preformed corners and solvent-welded seams. ■

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