Membranes for Ceramic Tile

by Michael Byrne

No tile job is waterproof unless it's backed by a trowel-applied or sheet membrane

Ceramic tile has grown more and more popular throughout the United States, due in large part to the development of thinset systems. These alternatives to tiling over a thick mortar bed have cut down on installation costs. But they've introduced new problems, as well.

The new thinner, more flexible substrates, including cementitious tile backerboards, are unable to protect the tile from seasonal movement in the structure, particularly in climates with wide temperature swings like New England. Even tile jobs set on thick mortar beds can have problems in modern construction because of excessive building movement.

Also, the new substrates do not protect the underlying structure from damage when water leaks through the tiles. To guard against problems with both movement and moisture, I rely heavily on membranes to protect my work and the customer's investment.

Membranes have always been part of the tile trade. The ancient Egyptians used melted lumps of crude oil or asphalt to waterproof surfaces covered with tile. And for thousands of years, different forms of asphalt have been used successfully to back up the typical mortar-bed installation.

In our business, we rely on two basic types of membranes: the old standby of asphalt and felt paper, and the newer chlorinated polyethylene (CPE). Most major tile outlets now carry some type of membrane. Each product has its merits, limitations, and methods of installation. Let me explain why a membrane should be a part of your installation.

First, there is the problem of waterproofing. The vast majority of tiles today find their way

Two-Part Membranes

First, a thick liquid is poured on the tile backerboard and troweled into place (left), followed by a fiberglass or polyester reinforcing fabric (center). The author then laps the fabric up walls and around corners, smooths it into place with a trowel, and follows with a second coat (right). This approach works well for waterproofing complex areas like stairs leading up to a tub.

into the bathroom, where we find water splashing over everything.

Tile itself may be waterproof and is usually not harmed by water. But the grout surrounding the tiles can be penetrated easily if it cracks (even a hairline), or if it is installed "thin" (not packed into the joint). Then there are the inevitable cracks in corners and around tubs, shower pans, and other plumbing fixtures. Once it has passed through the tile layer, water is free to penetrate the substructure and start causing trouble.

Moisture-resistant drywall was one attempt to solve the water-penetration problem, but did not prove up to the task. Now, the makers of such boards tell you *not* to use them under tile. Mortar beds produced without effective membranes behind them don't fare any better at preventing water from reaching and damaging the wood structure underneath.

The other major area of concern is expansion and contraction of the substrate. This is usually caused by seasonal movement in the house or sometimes by water that leaks into the wood structure and causes it to swell. Tile floors thin-set over plywood underlayments are the usual victims of building movement. The problem is that tile and cementitious beds (whether they are floated mortar or manufactured tile backerboards) have a relatively small rate of expansion and contraction compared with lumber products.

Fortunately, the problems of water penetration and building movement can often be solved with a single component: an *isolation membrane* installed between the tile and the substrate. Any isolation membrane will help, but not all membranes are created equal. Let's begin with the simplest.

One-part membranes are not really membranes in the true sense but rather liquid coatings that are poured, brushed, or troweled on (see product listing at end of article). These do a fair job of waterproofing the surfaces on which they are applied, but they can't be relied on as a complete water barrier. With enough substrate movement, these materials can eventually pull apart at a joint or crack in a corner, allowing water to penetrate. Consequently, one-part membranes might be good for a floor that gets occasional spills, but not for a shower stall.

Two-part membranes are composed of ready-to-use or site-mixed liquids and a fiberglass or polyester fabric. First, the fabric is trimmed to fit the area to be treated (lapping it up walls and around corners). Then it is removed and the liquid is applied. The fabric is then applied immediately over the liquid and smoothed into place with trowels, taping knives, or other tools. Specific instructions may call for additional coats of liquid to complete the installation. Although this type of membrane is not my usual choice for waterproofing or crack isolation, it may be the most practical choice when you are faced with waterproofing a complex area like a set of stairs leading into a tub or pool.

CPE membranes come in sheet form on rolls of different widths, lengths, and thicknesses. Technically, the material is a thermoplastic elastomer. We prefer this membrane for a number of reasons: The biggest one right now is that our company has been using it for

CPE Membranes

After troweling a thinset adhesive onto the tile backerboard (top), the author rolls out the flexible waterproof sheeting, here Nobleseal T/S (middle). He uses a trowel to work out any bubbles and achieve a good bond to the substrate (bottom). Another layer of thinset will go on top to bond the tile.

more than ten years with excellent results. There are two types — one is used as a water barrier on walls, floors, and countertops (Nobleseal T/S), and the other as a water container in shower pans and sunken tubs (Chloraloy 240).

Nobleseal T/S (T/S stands for thinset) has the advantage of a layer of spun polyester fiber-bonded to each side of the sheet. The fiber reinforcement helps the membrane bond to the thinset and gives the material added strength. The membrane is bonded to the substrate (wood, concrete, drywall, metal, cement backerboard) with a compatible thinset mortar, and the tiles are then thinset to the top of the sheet. We make an effective, long-lasting waterproof connection to the plumbing fixtures with the companion caulk, NobleSealant 150.

In addition to waterproofing, the layer of CPE between the two layers of polyester can absorb movement. It will "give" enough to let the substrate move underneath the tiles without disturbing them. Testing on the product has shown more than 1/4 inch of substrate movement per 8-foot run of tile with no damage to tiles or grout. The membrane has also proven very effective in eliminating grout-line cracks when it is lapped from a countertop onto the backsplash wall. However, on large surface areas (generally bigger than 15 feet across), expansion joints in the tile work are critical.

You can use Nobleseal T/S over any substrate that's stiff enough to hold tile (follow the specs of the Tile Council of America or the American National Standards Institute). We typically use T/S on countertops and floors, and on tub-enclosure and shower walls in premium jobs.

While specifically designed for thinset use, we sometimes use T/S with floated mortar beds as well. Depending on the application, the membrane can go above or below the mortar bed. When used beneath the mortar bed, it may be loose-laid or bonded to the substrate with an appropriate thinset mortar. When used on top of the mortar bed, the CPE sheet is bonded with a latex-modified thinset mortar.

The membrane used as a water container (Chloraloy 240) is a 40-mil-thick sheet of CPE. While not having all the properties of T/S, it has been the most effective and economical alternative to hot-mopped or metallic pans. Hot-mopped pans are hazardous to deal with, can support only a limited amount of weight, and can dry out and crack. Metallic pans are expensive, difficult to fit, and are usually destroyed by electrolysis around the drain within several months. A pan made of Chloraloy can be built on-site and attached to framing with staples and to masonry with NobleSealant 150.

Asphalt membranes. The cold-patch asphalt gum used with roof flashing can make a reliable membrane when used with 15- or 30-pound asphalt-impregnated felt. We use this type of membrane as waterproofing behind mortar beds or cement backerboards. It functions as an isolation membrane and as waterproofing. Also, by lapping the felt over the lip of the tub or shower pan, it can form an effective watershed. And when lapped up a wall from a floor, it can keep water from leaking in and damaging subfloors.

This kind of membrane is simple to apply. Comb out a thin layer of asphalt gum with a notched trowel (1/8-inch notches or smaller) and cover with the felt paper, smoothing out the air pockets and giving corners nice tight creases. Then cover it with your wire mesh and mortar or with cement backerboard. For a premium job, you can then add a CPE membrane before tiling.

Membranes may seem like an extravagant expense, but over time they are cheap insurance for both your pocket and your reputation. ■

Michael Byrne is a master tilesetter, tile consultant, and a contributing editor to the Journal of Light Construction.

Sources of Supply

H.B. Fuller Co.
315 S. Hicks Rd.
Palatine, IL 60067
800/323-7407
(Latex and acrylic thinset adhesives)

Laticrete Intl.
1 Laticrete Park North
Bethany, CT 06525
800/243-4788
(Two-part membranes, Laticrete 301/335, Latex and acrylic thinset adhesives)

Mapei Corp.
1350 Lively Blvd.
Elk Grove Village, IL 60007
800/992-6273
(One-part membranes, Planicrete W, Latex and acrylic thinset adhesives)

The Noble Co.
614 Monroe St.
Grand Haven MI 49417
616/842-7844
(CPE membranes, Nobleseal T/S, Chloraloy 240)

Asphalt Membranes:
Commonly available as cold-applied asphalt or plastic roof cement. Use material with the consistency of tile mastic, not the thin, paint-on variety. Also, choose the fibered type, if available, to increase crack resistance.