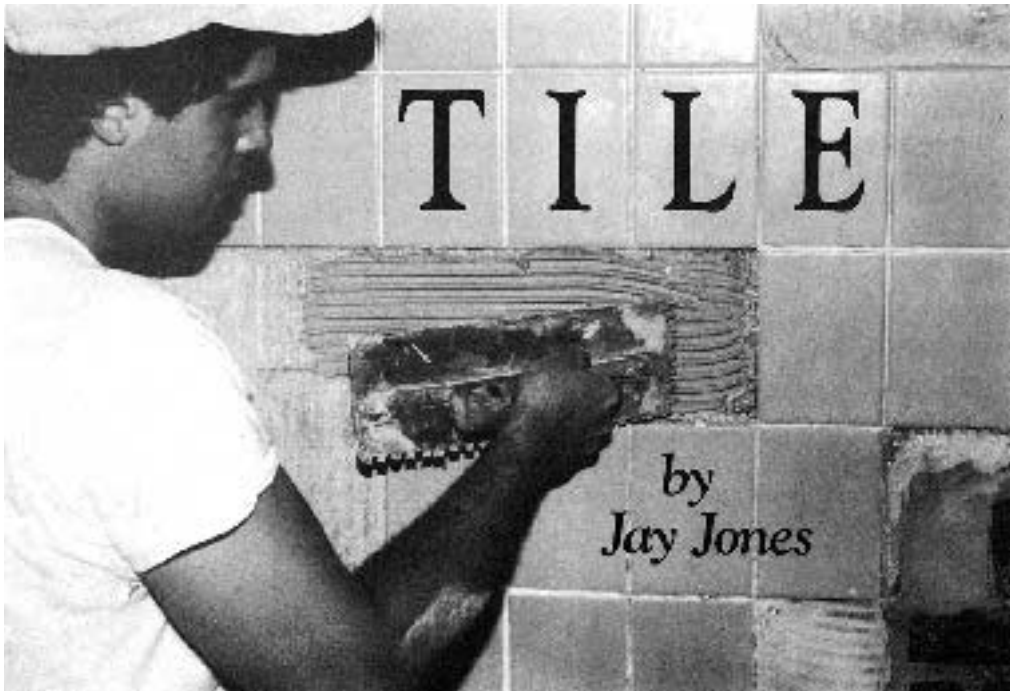
Tips for Trouble-Free



Mark Pedersen

What makes a good tile job? You need the right tile, good backing, a secure bond, and a good layout. Take shortcuts on any of these, and you'll have problems with the tile installation. I've found that many problems can be traced to the customer or contractor who selected the tile because "they liked the color." But picking tile based on its color is like choosing a boyfriend or girlfriend because of hair color. You can get in a lot of trouble if you don't stop to think about the rest of the package.

Ceramic tile is made from a mixture of clay and other materials. The clay is formed and fired at high temperatures and can be glazed or unglazed. The unglazed tile, called a "bisque," has the same color on the surface as it does in the body of the tile. But with glazed tile, the beauty is only skin deep; below the glaze lies a plain-colored bisque. To choose the correct tile, you need to know about the physical properties of the bisque and the glaze.

Choice of Tile

As you make your selection, you have three criteria to consider: water absorption, glaze hardness, and glaze wearability. Water absorption only pertains to the bisque; it tells you whether the tile behaves like a sponge or not. Since all glazing is non-porous, glazed tile is impermeable to water penetration from the surface; you can use any glazed tile in a shower, even if the bisque absorbs water. But water absorption of the bisque will be important if the tile goes outdoors, where freeze/thaw action can break it into pieces.

If the tile is glazed, you may need to know whether the glaze can stand up to scratches and heavy foot traffic. Glaze hardness scales and glaze wearability ratings can give you pointers here. Look on the tile packages. If nothing is listed, you can assume that the wearability and hardness are low.

Water absorption. When the tile bisque is fired in the kiln, the clay solids and other ingredients in the mix melt, turn to liquid, and reform as a harder material. Some tile is made of clay that partially or completely turns to glass when it is fired. The percentage of glass in the bisque determines the tile's water absorption. There are no voids in glass, which means the tile bisque won't absorb moisture. Also, a more "vitreous" (or glasslike) tile often makes a stronger tile.

Tile manufacturers divide tile into four groups, depending on the tile body's ability to resist moisture.


Durock

Figure 1. *Check the glaze hardness before choosing an Italian tile. On counter tops, the hardness should rank in Group III or IV. This tile is set on Durock backer board and uses a strip of wood edging.*

- Impervious tile: less than or equal to 0.5% absorption. Mosaics and glass tile are impervious, and these are generally unglazed.
- Vitreous tile: more than 0.5% but less than or equal to 3% absorption. these are glazed or unglazed floor tiles.
- Semi-vitreous: more than 3% and less than or equal to 7% absorption. Quarry tile falls in this category.
- Non-vitreous: more than 7% absorption. The typical 4x4 bathroom-wall tile is non-vitreous.

Glaze hardness. Manufacturers also provide information about the hardness of the glaze. You'll want a hard glaze for kitchen countertops and high-traffic floors.

The "Mohs" scale gives you a hardness rating from 1 to 10. If the surface only resists scratches from soft minerals (such as talc), the tile rates a 1. But if you can't scratch it with a diamond, it rates a 10. Most floor tile falls within a 6 or 7.

Glaze wearability. The industry hasn't agreed upon a standard method to rate glazed tile's "wearability," but some manufacturers have borrowed a European "Roman numeral" rating system. Wear resistance is done by visual inspection, on a scale of I to IV, with I the lowest. If you're thinking about Italian tile, keep this rating system in mind (see Figure 1).

- Group I: glazed tile for light-residential traffic, baths, or bedrooms where slippers are worn.

Select the type and installation method that best fit the intended use.

Tile Backers: Alternatives to Mud

The house was barely two years old, but the tile wall in the master bath—the outside wall of the tub/shower enclosure—was simply rotting away! The base of the tile had turned black, the black had slowly crept up the seams, and no amount of scrubbing could get the clean white luster back. The bottom of the wall felt soft, and you could push the tile in.

When the homeowner called Matt Oglesby, a professional tiler, he didn't even have to see the job to know what had caused the problem. Matt has been in the ceramic tile business for 42 years. This particular problem is one of his pet peeves, one which he has been pointing out to the area Homebuilders Association and Tile Layers Union for years.

Builders and drywall contractors continue to hang drywall over a polyethylene vapor barrier, effectively trapping moist air between the tile and the plastic.

This example illustrates the importance of the material beneath the tile. Drywall is not the best material to use because the gypsum core can be damaged by water vapor or water itself. But there are several products on the market that provide low-cost, water-resistant backing for tile.

Wonder-Board, Durock, Hardibacker, and Dens-Shield are rigid, water-resistant boards that reduce flexing of the applied tile or grout. Tile contractors can use any one with a strong back to set the underlayment, freeing the experienced tile setter to do a careful layout.

Wonder-Board

A few years ago, Modulars, Inc., of Hamilton, Ohio, developed a fiberglass-mesh reinforced-concrete panel that is unaffected by water or water vapor. Dimensionally stable, the panels are 7/16-inch thick and come 3x4 feet, 3x5 feet, 3x5 feet 4 inches, and 3x6 feet. At just under four pounds per square foot, this tile base weighs about one half to one third less than a troweled mortar bed.

Wonder-Board soon became the sweetheart of the industry. The name is easy to remember, and the installation is quick and simple. To cut, you just score with a Wonder-knife, snap, and cut the glass mesh on the other side. For holes, you beat the edge with a hammer, or if you're a masochist you can cut it with a saw, using a mortar blade. it looks like a sandstorm!

Durock

Durock was created by U.S. Gypsum, and it is similar to Wonder-Board in cross section. Both use fiberglass reinforcing mesh and a cement filler. Durock weighs 12 to 15 pounds less per sheet because it mixes in polystyrene beads with the cement. Durock is also a full 1/2-inch thick and has rounded edges.

You laminate Durock to a minimum 1/2-inch-thick plywood base, using Durock Latex-Fortified Mortar or Durabond Type-1 Tile Mastic. On floors, you should line joints up with joists and stagger the joints. The cement boards are fastened to the subfloor with 11/2-inch galvanized roofing nails or wood screws. You have to fill the joints between panels with the adhesive or mortar used to set the tile, and you embed mesh tape in the adhesive, much like thin-coat plaster or joint compound (see Figure A).

Durock is unaffected by water intrusion, as demonstrated by Don Evans, a salesman with Dal-Tile, in Lenexa, Kan. He has a section of Durock that has been in a bucket of water for nearlythree years. If you pull the piece out, within minutes it appears totally dry. These cement-board products will wick a certain amount of water, but water doesn't degrade them. Because Durock and Wonderboard are not harmed by water, you can use vapor barriers without worrying about future damage.

Hardibacker/Hardiliner

Two new kids on the block are made by James Hardie Building Products, an Australian company that has enjoyed much success "down under." One of them is called Hardibacker, and it's sold with a companion product called Hardiliner. They're similar products, the difference being that Hardiliner has beveled edges, like drywall. These edges allow you to smooth seams with tape and filler. Hardiliner is designed for wall and ceiling applications and can be used with ceramic tile, paint, or wallpaper. Hardibacker can be used on horizontal surfaces, including floors, and comes in 3x5- and 4x8-foot sheets (see Figure B). It weighs half as much as the other cementitious backer boards, but then it's only half as thick, at just 1/4 inch. Hardie Builder Products claims that the seemingly thin sheets hide their strength, and that when installed over a 1/2-inch exterior plywood subfloor, the sheets are a permanent, stable backer for tile, marble, or other slab-type surfaces.

The Hardi-family of products are made up of wood fiber, sand, portland cement, selected additives, and water. These selected additives, according to Dawn Wimer, of the Florida sales office, are secret Australian herbs and spices. Perhaps some Vegemite?

Dens-Shield

The most recent product to join the backerboard ranks is Dens-Shield, a paperless gypsum product from the Georgia-Pacific Corporation. Dens-Shield was developed as a low-cost, water-resistant tile backer for wall and ceiling applications, but it has a gypsum core.

Dens-Shield covers its gypsum core with a fiberglass-mat face and a water-resistant coating. Its beauty is that it works like regular drywall, is lighter than the portland-cement backer boards, and is cheaper. The manufacturer claims that it can compete with Wonder-Board and Durock when used in shower and tub surrounds. No special tools are required, and it comes in 4x5- and 4x8-foot sheets (see Figure C).

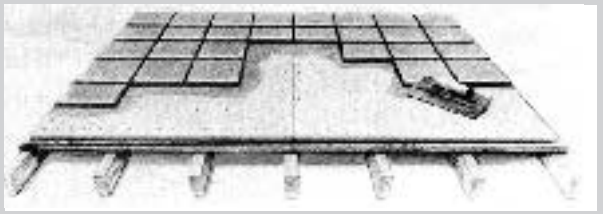
Tile installers I have talked to think it's a good product as long as it's protected from direct contact with water. One said that the product doesn't seem to wick much, but it swelled slightly when soaked in water.

I had a sample so I decided to see for myself. I cut a 2x6-inch piece and stuck it in a cup of water for 24 hours. Lacking laser measuring equipment at the house, I used a magnifying glass and a ruler graduated to 64ths of an inch. When I remeasured the perimeter, I found the product had swollen less than 1/8 inch. Perhaps this wasn't a scientific test, but it proved the product isn't a sponge. Soaking the product isn't the way the factory recommends testing it, but the men in the field have to satisfy themselves, and in my kitchen sink, Dens-Shield performed as promised.

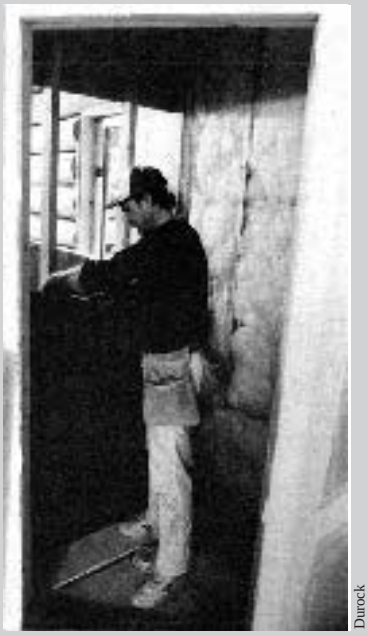
Competition is tight in the tile backer industry. All of the products reviewed for this article seem to do the job when used in the correct application. It's up to the contractor to decide what is best for the situation and to search out the supplier with the best price. Used inappropriately, any of the products could prove to be very expensive in the long run.

— Jim Cavanagh

Georgia Pacific



James Hardie Building Products



Durock

A. (Top): *Durock cement backer board uses polystyrene pellets in the concrete core to reduce the weight somewhat. Panel edges have to be level, and joints must be staggered and located over joists.*

B. (Middle): *Lightweight Hardibacker scores easily because it's thin—only 1/4 inch. It goes on top of 1/2-inch plywood subfloor, but is largely untested in this country.*

C. (Bottom): *Dens-Shield is a paperless, gypsum-core backer board with a waterproof coating. It installs like drywall and is designed for showers and tub surrounds.*

Jim Cavanagh remodels kitchens in the Kansas City, Missouri area.

- Group II: general residential use, except kitchens and entrances. Tracked-in grit or a dropped pan may damage the glaze on this tile.
- Group III: glazed tile suited for use anywhere in the home.
- Group IV: glazed tile for medium to heavy commercial traffic, such as restaurants or lobbies.

Manufacturers generally give verbal clues too with such labels as "residential", "extra heavy duty," or "commercial."

Matching Tile and Location

To select a tile for good long-term performance, you'll need to think about where the tile will be used. You can use any kind of tile on a wall if the wall is purely decorative. But if the tile will be located in a bath, on the kitchen counter, or on the floor, you'll need to be selective.

Bathrooms. For showers and tub surrounds, you'll want an impervious (or vitreous) tile, or a glazed tile. Slip resistance isn't a factor on bathroom walls, but on floors, you'll be better off with an unglazed tile, which isn't as slippery

Mark Pedersen

Figure 2. *Unglazed porcelain tile was used on the floor in this gym shower room, but the walls take a glazed tile. Porcelain tile is a low-absorbency, vitreous tile.*

when wet (see Figure 2). Many glazed tiles (and unglazed tiles too) now add an abrasive grit to the surface to improve slip resistance. The standard nonvitreous 4x4 glazed tile can work fine for bathroom walls, but this tile cracks or chips when used on kitchen counters.

Countertops. A kitchen counter takes a lot of abuse: pans drop; knives mar the surface; and food acids (such as tomato juice) may etch the tile. You can head off these problems with a vitreous tile or a glazed tile with a Mohs rating of 6.5 or above. I prefer the equivalent of an American Olean Crystalline, which has a good glaze because it has been fired at a higher temperature and is a harder tile. The American Olean Crystalline will take more abuse than the bright and matte tile. This tile comes in 41/4- or 6-inch squares.

Other choices for countertops are glazed or unglazed porcelain tile, porcelain paver tile, or hand-crafted floor tile. Porcelain tile is generally high quality; it is very hard, it is fired at a high temperature, and it has low absorption. Porcelain tile comes on sheets of 12x12-inch mesh. Porcelain pavers range from 4x4 to 12x12-inch. Porcelain tile is very durable, but owners don't always pick a product for its durability. If the customer leans toward the handcrafted look, encourage them to pick a handcrafted tile rated for floor use rather than one that is purely decorative.

Scott Duncan

Figure 3. *With thick-set mortar, you can level or plumb uneven framing and contour the mortar bed to any angle. Mortar is applied over wire or mesh lath.*

Floors. Most floor tile has higher Mohs and wearability ratings than wall tile. This is because floor tile must withstand the grit and water tracked in at entries. If you're using tile in a kitchen or dining room, the tile must also resist scratches from chairs scooting away from the table, or from a portable dishwasher rolling across the floor. Safety is a concern as well. You don't want the family slipping on a wet floor. Unglazed tile provides better slip resistance, and some manufacturers add a surface sprinkling of grit to improve traction.

For entrances and high traffic areas, many clients like quarry tile. This isn't a good tile for countertops, but it is attractive when used in other parts of the home. immediately after installation, the tile should be treated with a sealer to prevent spills or stains from getting into the tile.

If you prefer a glazed floor tile, choose one with a Mohs rating of 6 to 7 or more, plus some added slip resistance. Be especially careful with glazed Italian tile; many have very thin glazes. Make sure you look through the product literature to find one with abrasion resistance of III or IV.

Tile Backing

For a shower or a full tile wall, the best job is still done with mortar: a 3/4- to 11/4-inch bed of cement-sand mortar applied to a metal lath or mesh base. For sloped or angled surfaces, this is the way to go because you can shape the mortar to any contour (see Figure 3). But if you only do an occasional tile job, you'll be better off with a "thin-set" method, using a base of drywall, plywood, or cement backer board (see "Tile Backers: Alternatives to Mud").

Floors. The main thin-set methods for floors are shown in Figure 4. If the building does not have a lot of moisture in the crawlspace or basement, you can lay tile over plywood. You must have at least 1 inch of wood below the tile. Adjacent edges of the plywood sheets can't be more than 1/32-inch above or below each other, and when you have large areas, you'll also need expansion joints. After preparing the floor, you set the tile in organic adhesive (tile mastic). Make sure the adhesive meets ANSI A136.1, an industry spec that means the adhesive is appropriate for a tile job. Only use this method for light residential jobs. The system won't stand up to wheel loads, and it's not recommended for wet areas.

For higher quality residential work, with some water resistance, use an epoxy mortar and grout over a plywood base. Make sure you fill the gaps between sheets with epoxy. Use an epoxy mortar that meets ANSI A118.3 or a modified epoxy-emulsion mortar. Epoxy mortar uses epoxy resin and hardener; modified epoxy-emulsion mortar uses epoxy resin and hardener plus portland cement and sand. The only disadvantage to this system is that it is more expensive, and you have to clean up immediately.

For a third alternative, you could use cement backer board. In this system though, you'll need to put 1/2-inch exterior grade plywood on your subfloor, making sure the plywood level doesn't vary more than 1/8 inch over 10 feet. Your tile job will only be as flat as the subfloor it is put on. Line up the cement backer board on the joists, staggering the joints, and use adhesive between it and the subfloor (see Figure 5). The adhesive should be a Type 1 waterproof construction adhesive. Fasten the board with galvanized or screw-type nails, but make sure the fasteners are corrosion resistant. To lay your tile, use a dry-set mortar (a mixture of portland cement with sand and additives) or a latex portland-cement mortar (a mixture of portland cement, sand, and a latex additive). I always use a latex-portland-cement mortar when laying impervious tile because it has a better bond strength. Fill the gaps between sheets as you go. Some companies also recommend that you use mesh tape over the joints. This system gives you good water resistance, but it's not totally waterproof.

I use the backer-board or traditional mud system beneath impervious tile and Italian tile because of special problems with these tile. Impervious tile is so glasslike that you need the extra bond strength of a latex portland-cement mortar (or epoxy mortar) to hold it securely. Italian tile, though often not impervious, also requires a dry-set or latex portland-cement mortar rather than an organic adhesive.

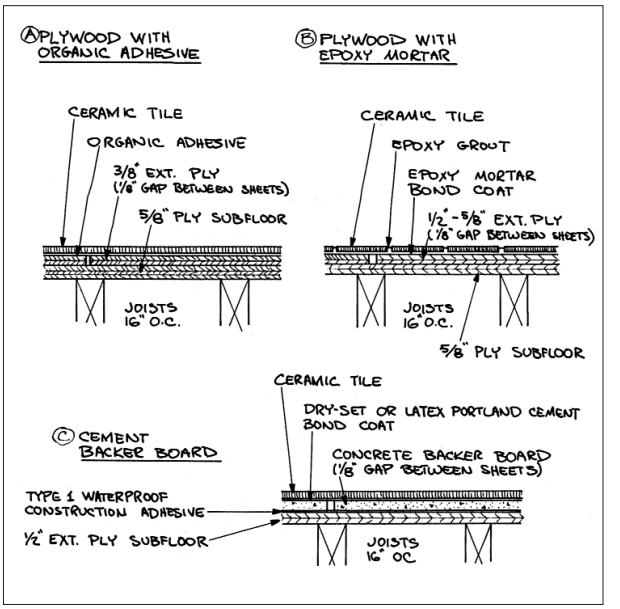


Figure 4. *Thin-set floor options. On light-residential floors under dry conditions, you can use mastic over plywood (A). For better quality with some water resistance, upgrade to an epoxy mortar and grout (B). For better quality and water resistance, use a cement backer board with a dry-set or latex-modified mortar (C).*

Durock

Figure 5. *Cement backer board must be laminated to the subfloor beneath it. Use an approved water proof adhesive and apply it to fully cover the plywood surface.*

This is because Italian tile is thin—about 1/4- to 3/8- inch thick—and if you use an organic adhesive, which can stay plastic for a longer time, you run the risk that someone will step on the tile and crack it. Also, since Italian tile has lugs that project from the back, you should use a trowel with 1/2-inch notches to spread your mortar. This gives you good contact between the bedding mortar and the back of the tile.

Sometimes the floors on a remodeling job will be very uneven. In this case, I use 5/8-inch exterior plywood as a backing system (4x8 sheets, or longer, depending on the length of the room). The longer sheets mean I can span high and low spots. I put dry-set or latex portland-cement mortar under the plywood to take the dips out, and I put wood screws through to the joists every 6 inches. The tile goes down with epoxy mortar or a modified epoxy-emulsion mortar. If I'm really pressed to save floor height, I use 1/2-inch exterior plywood and lay the tile with organic adhesive.

Concrete floors. Concrete floors, while they provide solid backing for tile, can also present problems. If you have a crack in the concrete, it will come through the tile. Fortunately, there are new membrane products that allow you to bridge over cracks.

The surface of the concrete, ideally, should be extremely clean. Any paint spilled by painters must be removed because the tile and the bonding agent will not stick to it. To make sure concrete is clean, I wash down the floor with a solvent. I use muriatic acid, but be careful with this stuff. It is very dangerous to work with because it can burn you. It gives off fumes that are hazardous (I wear a mask when I use it), so you must be careful to warn those around you when you use it. It also etches the concrete and gives it "tooth." I then use a latex portland-cement mortar to give a good bond. But on jobs that can take an extra inch of floor height, I prefer to use a 1-inch mortar bed over the concrete to ensure a totally level and appropriate surface for my tile.

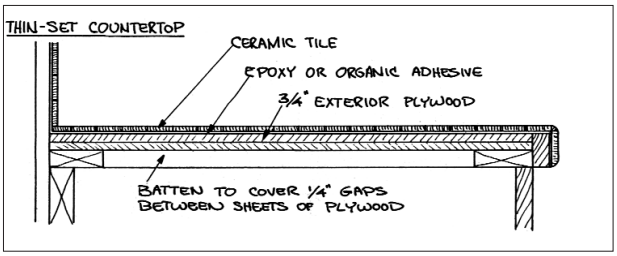


Figure 6. A 3/4-inch plywood base with an epoxy or organic adhesive can provide a suitable countertop.

Walls. Over wood or metal studs, you can use the cement backer-board system described above. The Tile Council of America (TCA) approves cement backer board as a substitute for a full thick-coat mortar ("mud") job. The installation requirements for this system are described above, with the exception that you do not have to use a plywood base. This is the system I would use around bathtubs or in showers.

For walls you know will stay dry, such as those in dining rooms or around fireplaces, you can set the tile on drywall with either organic adhesive, dry-set, or latex portland-cement mortar. Make sure you use regular drywall, not water-resistant, if you're setting the tile with dry-set mortar, or the mortar will not bond.

Counter tops. Although I prefer a thick-coat mortar job for countertops, my second choice would be a cement-board underlayment, following the methods outlined for flooring (see Figure 6).

You can also use a 3/4-inch exterior plywood base, but you have to measure carefully and make sure you trim out the countertop in such a way that a built-in dishwasher will still slide in. You need to leave a 1/4-inch gap between sheets of plywood to allow for natural expansion and contraction, and put a batten underneath this gap. You can use either a Type 1 organic adhesive or an epoxy mortar. With epoxy mortar, make sure you completely fill the gap between sheets. If you use an epoxy mortar, you'll get better resistance to chemicals and higher bond strength.

Concrete floors provide solid backing for tile, but this can create problems. If you have a crack in the concrete, it will come through the tile.

Layout and Installation

Tile setters need time to plan a good layout. Rushing through this phase of the job can lead to problems. The tile setter starts by figuring out the center lines for walls, counters, or floors. It's best to begin setting the tile from the center as well, taking up any slack with slightly wider grout joints as you move to the corners. If you don't plan ahead, you may end up with half a tile (or less) at the inside corners. By starting in the center and planning the spacing carefully, you can avoid those awkward 3/4-inch strips that break up the even look of a quality job.

Also, plan your layout so you can work in a small area at a time. Whether you're working with cement-based mortar, organic adhesive, or epoxy, you don't want the setting material to skin over before you embed your tile. If you've planned the layout carefully, you can work without having to stop and think or make time-consuming cuts of fractional tile.

Grout

The two types of grouts are sanded and non-sanded. Use non-sanded grout in joints 1/8 inch or less, and sanded grout in joints 1/8 inch or larger. Grout comes in many colors. With lighter grouts, however, you can have difficulty maintaining a consistent color as the grout dries. This shading is especially likely if you are using tile that absorbs water (semi-vitreous or non-vitreous). The edges of absorbent tile act like a sponge and soak up moisture from the grout. If the setting mortar or organic adhesive squeezes into the tile joints, the mortar will keep the tile from absorbing moisture evenly. To avoid this, wipe out any excess dry-set (or other) mortar before you begin grouting so that the grout will dry uniformly. If you use a grout with an acrylic latex additive, you may be able to avoid the shading problem.

Be sure to follow the mix proportions outlined on the grout package. A common mistake is to add too much water to the grout. Apply the grout with a rubber float or squeegee, pushing it into the joints, and working on an area no larger than 20 square feet at a time (see Figure 7). After about 10 minutes, clean the surface of the tile with a damp (not wet) sponge.

For three or four days after the installation, the tile should be washed down once a day with a damp sponge or damp-cured by covering with kraft paper after spraying with water. If you've used a latex-additive grout, the instructions will tell you that you can skip the damp curing.

If mortar deposits remain on the tile's surface after the grout cures, you can clean off the residue from glazed-tile surfaces with a dilute solution of white vinegar and water. For unglazed tile, you can use a dilute solution of sulfamic acid; mixing proportions vary, so check with the tile store. Don't apply either of these solutions in direct sunlight, and make sure to rinse them off completely.

A good tile job takes time, and shortcuts can lead to future problems. By consulting the tile setter before the job, the general contractor can help the work go more efficiently and successfully.

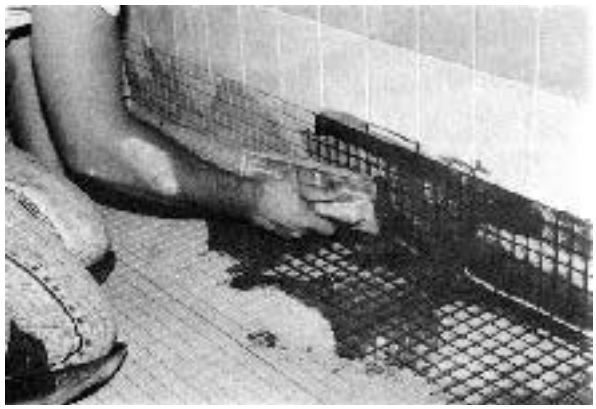


Figure 7. *Apply the grout with a rubber float, and work in an area no larger than 20 square feet at a time.*

For Additional Information

For more information, contact the Tile Council of America, Box 326, Princeton, NJ 08540, or the Tile Heritage Foundation, Box 1850, Healdsburg, CA 95448. ■

Jay Jones Tile, located in Baldwin Park, Calif., services both southern and northern California.