
Ceramic Tile Grouting

A successful grout job starts with good prep work, a proper mix, and an experienced hand

by Michael Byrne

There are few contractors who cannot recall a horror story about ceramic tile grout, and many homeowners have sworn off tile because the grout was so difficult to keep clean.

But it doesn't have to be that way. With the right grout and installation, tile work is durable and needs little maintenance. In new construction, the *right grout* means one with an additive—typically latex, acrylic, or epoxy. Additives enable the grout to withstand the additional flexibility and movement of today's houses. Many companies now supply the additives already mixed with the grout—you just add water.

A new generation of grout, referred to as "100%-solids epoxy grout," contains no cement at all—just epoxy resins and colored filler powder (see "Super Grout," next page).

This article will explain how to get the most from any sack of grout and, I hope, dispel some misconceptions about the process of grouting.



With plenty of fresh grout under the trowel, the author forces the material into the joints. The key is to apply ample force and work the trowel from several directions, holding it at 15 to 25 degrees.

Setting Bed

It makes little sense to skimp on the base, since a bed of tiles will never hold together a concrete slab that is cracking or a wall that is falling apart. If you're not sure of the correct specifications, get a copy of *Handbook for Ceramic Tile Installations* (available for \$1.00 from the Tile Council of America (P.O. Box 326, Princeton, NJ 08542; 609/921-7050)).

If the substructure is designed and built properly, the adhesive layer becomes the next weak link. Although the official specs allow some tolerance here, each tile should be bedded 100% into the adhesive, with no gaps or voids and a minimum of $\frac{3}{32}$ inch between the tile and the setting bed. For the purposes of this article, let's assume that the adhesive has cured and we are ready to grout.

Prep Work

The tiles should be pre-conditioned before grouting. This includes the obvi-

ous, like removing plastic spacers and scraping excess adhesive from between the tiles (the depth of all the joints should be uniform to ensure consistent color), vacuuming the surface, and misting or sponging (see Figure 1).

But there is another condition that is frequently overlooked—temperature. Direct rays of the sun will quickly cook the moisture from fresh grout, ruining the cure. Block direct rays, even in the dead of winter, and if any areas have been overheated by the sun, you may need to let the tiles and substrate cool down.

Low temperatures can be just as harmful. Cement will not cure below freezing—so in installations where tiles butt against an outside doorway, you may have to stuff some insulation between the door and threshold to keep the chill away from the fresh grout. Room temperature must be maintained until the curing period is over (no moisture left in the grout).

If you're working with tiles or a set-

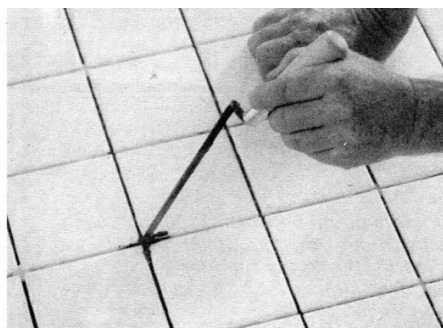
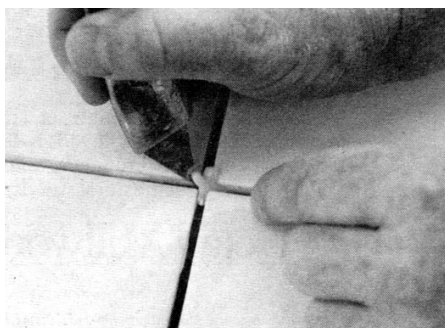


Figure 1. Before grouting, spacers must be removed (left) or the grout around them will be weak and discolored. Use a dental pick, utility knife, or thin margin trowel to clean out the grout joints (right).

Super Grout: 100%-Solids Epoxy

This epoxy grout gets all its strength from epoxy resins instead of cement; thus the "100% solids" in the name. The filler powder used is simply finely graded sand and a coloring agent. Accelerators are available to shorten the curing and hardening time, but if you are using this grout for the first time, it would be wise not to be in a hurry.

Epoxy grout is similar to cement-based grout in that it needs thorough and careful mixing and it needs to fill each joint completely. You must take the same precautions with temperature extremes, and you still need (more than ever) to use a grout trowel. But the method of application is completely different.

First of all, until the grout material has been placed in the joint and given a chance to set up, water will quickly and totally ruin this kind of grout! So don't do any misting or sponging of the tiles or setting bed. For the grout to stick and hold, the edges of the tiles must be bone dry, and there must be sufficient time for the adhesive layer to dry out before grouting can begin (this is important regardless of the type of grout used).

The first difference comes with mixing. Proportioning here is critical. In some products, the liquid resin and hardener do not mix in equal proportions and manufacturers usually say to mix all of both liquids. If you're using less than the entire unit, this can be tricky.

Begin with a clean mixing bucket, a clean mixing trowel, a clean grout trowel, a couple of mixing sticks, a Scotchbrite pad (included with some 100%-solids kits), buckets of fresh, room-temperature cleaning water, and a sponge. In addition, have the tiles immediately ready for grouting. The temperature must be maintained at room levels for the grout materials, the tiles, and the surrounding environment from the time mixing begins until curing ends.

The first step is to mix each liquid component in its own container and then pour each into the bucket. Keep all mixing sticks separate to avoid a premature curing reaction. Then combine the two liquids together for a minimum of three minutes and add about 75% of the supplied powder and begin mixing. Add more powder until the consistency is right. The body of this grout is different than that of cement-based grouts; the desired consistency will be something like hot peanut butter. You will not be able to get the mix "stiff" like cement grout. And because 100% solids is very sticky, you will need to adjust your movements with the grout trowel.

As soon as the grout is mixed, begin packing immediately (no slaking). The grout should pour out of the bucket slowly. Dump a pile out, hold the trowel at a low angle (15 to 25 degrees), and pack, force, coerce, and intimidate the grout into the joints. If there are any voids under the tiles, the grout will flow in until the voids are full. Keep packing until the pile of grout is used up and repack any voids or holes that show. Do it now, don't wait!

You will have, at room temperature, about 45 minutes to spread and clean a small unit (about 2 to 3 gallons). When you finish packing an area—about 10 square feet—hold the

trowel at a 90-degree angle to the surface and 45 degrees to the direction of the joints and scrape away the excess. Don't rake the grout from the joints, but don't be too concerned about rough joints—they will smooth out in about ten minutes. Keep packing and scraping until all the grout is used up. Then, wait until the grout begins to stiffen in the joints. Test it with the tip of a margin trowel. If it has resistance and feels like it is beginning to harden, you are ready to begin cleaning. Don't wait until the grout feels hard—by that time, it's too late.

The initial cleaning is done with the Scotchbrite pad and water. The pad is stiff enough to bridge from one tile to another without digging out the grout in the joint. But to clean, the pad needs water to lubricate it against the tiles and to help break the epoxy on the surface away from that in the joints. Once the epoxy particles are encapsulated within the slurry of water, they cannot reattach themselves to either the tiles or the grout in the joints.

To begin, dip the pad in the water, let some drain off, and then dribble enough water on the tiles so that the pad moves freely on the surface. Concentrate first on the surface of the tiles and add more water to the surface if necessary. Move the pad lightly with a circular scrubbing motion and when the bulk of the excess is removed, turn your attention to the joints. Go lightly here as well, and keep the sponge from pressing into the joints and removing too much. The trick, here, is to scrub until the edges of the tiles are clean and the water begins to foam. Scrub down about 10 square feet with the Scotchbrite pad and then use the sponge to remove the foam.

Remember, the pad cleans the surface and shapes the joints, and the sponge removes the excess from the surface. It is not essential that you remove 100% of the excess from the surface at this time, but it is important that you at least mix all the excess with water. You will need to change the cleaning water frequently to reduce the concentration of epoxy material on the surface of the tiles. You may have to change the Scotchbrite pad as well if the fibers begin to fill up.

If you need more than one batch of grout to finish a job, don't clean up all the grout. Keep a narrow strip between the old and new batches uncleaned so that the new stuff sticks to the old (water will prevent a bond). Also, don't mix a new batch in the old bucket because the old stuff will cause the new batch to harden prematurely.

When all the tiles have been grouted, scrape expansion or perimeter joints clean and let the grout harden overnight—don't worry about any haze on the surface.

The next day, after the grout has hardened, there will be a sticky film left on the tiles. This can easily be cleaned with a sponge and a handful of dishwashing detergent added to a bucket of lukewarm water. A word of caution here: Protect the floor with clean walking boards. At this point, you will not harm the shape of the joints by walking on the tiles, but any loose materials clinging to your shoes (or sock fibers) will stick permanently to the joints. Once this bit of clean-up is finished, the tiles are ready for traffic.

—M.B.

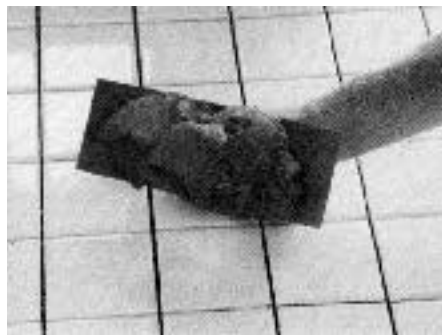


Figure 2. After allowing the grout to slake, load the trowel full with grout. The grout is too wet if it pours from the bucket, too stiff if it does not spread easily.

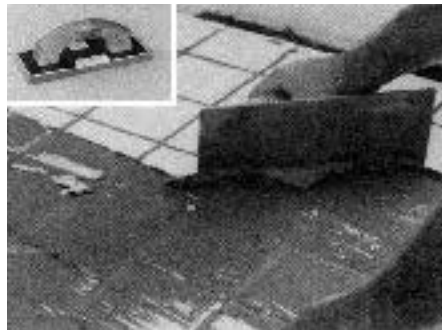


Figure 3. After spreading about 10 square feet, scrape the tile clean with the edge of the GROUTMASTER trowel (shown inset). Held diagonally to the tile and tipped at 90 degrees, the resilient edge of the trowel will cut away most of the excess grout.

ting bed that can absorb water, this can prematurely dry out the grout. To avoid this, wash the tiles down with a sponge and clean water. Make sure all parts of the job are moistened—top and sides of the tiles, and the exposed adhesive at the bottom of each joint. Many production crews use a garden sprayer to mist the tiles. The trick is to keep the misting or sponging uniform. Puddles or dry spots can cause the grout above to discolor or powder.

If neither the tiles nor setting bed absorb water, misting or sponging may not be necessary. But it is still a good practice to wipe the tiles with a damp sponge just prior to dumping on the grout, and it makes cleaning a lot easier.

The Right Mix

All grout, whether it is cement based or epoxy based, needs to cure properly if it is to last. With cement grouts, the correct proportion of water to dry mix is vital for this.

Joint size will determine the kind of grout to use. With narrow joints, $1/16$ inch or less, use unsanded grout since there is no room for sand. For larger joints, sand is important, primarily to reduce shrinkage and add strength. Some grout is available with custom grades of sand for joints wider than $3/8$ inch. Whichever cementitious grout you use, the same results are desired: it should be smooth, dense, and with a clean appearance.

Start with a clean bucket, fresh water that is room temperature (never use hot water in cold weather), and clean mixing tools. Cleaning water should also be room temperature as should any additive you use to replace the water in the mix. Usually dry mix is poured into the bucket before liquid is added. Most grout bags have guides for determining amounts. Add only about 75% of the liquid required to begin.

A margin trowel makes a good mixing tool but I use a paddle mixer mounted in an electric drill and run it around 300 rpm. The paddle quickly smooths out the lumps if the blades are kept submerged. If the blades keep lifting out of the mix, or they rotate too fast, air is whipped into the mix, cutting the strength of the cured

grout as much as 50%.

Add more liquid until the mix has the right consistency, which is somewhere between so wet that it pours from the bucket, and so stiff that it has no plasticity. When the lumps are gone and the consistency is right, stop the mixer and let the stuff sit and "slake" for about 10 to 15 minutes. Now is the time to check the tiles if they were misted or sponged to make sure that there is no water standing on the tiles or puddling in the joints.

The last step is to remix the grout. The short slaking period allows the liquid to completely penetrate the dry ingredients, and the remixing ensures a lump-free grout.

Packing the Grout

Don't use a steel trowel or squeegee for grouting. A steel trowel will scratch the tile and a squeegee cannot force the grout into the joint. Instead, use a GROUTMASTER (available from American Clean and most tile suppliers) or a similar trowel designed specifically for grouting. These trowels are available in floor and wall models and have a resilient body and a sharp edge for cutting excess grout away from the tiles. The trowel allows grout to be forced into the joint under pressure while the smooth plastic edge safely removes the excess.

For floor grouting, dump enough grout onto the tiles that its weight and mass help force it into the joints (see Figure 2). Hold the trowel at about a 15 to 25 degree angle and begin packing with long sweeps of the tool. Back and forth, up and down, going over each joint at least three times. It helps to hold the edge of the tool slightly askew from the joints so the edge does not drop in and force grout out of the joints.

When all the joints appear full and dense, change the angle to about 90 degrees, grasp the handle with two hands, and cut away the excess, positioning the edge of the trowel diagonally to the joints (see Figure 3). Work a convenient area at a time, somewhere around 10 square feet. Make consecutive passes until each area is scraped clean. With large, smooth glazed tiles with crisp edges, you should be able to

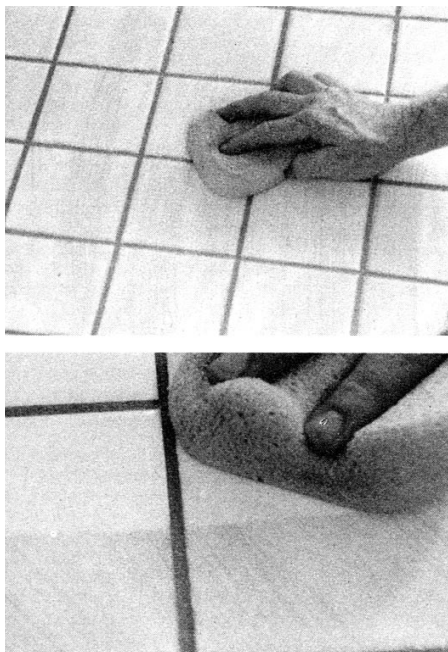


Figure 4. Once the grout has "body," loosen the material on the surface with a clean damp sponge using a circular scrubbing motion (left). Next shape the joints by working the sponge back and forth with moderate pressure, being careful not to scrape too much from the joints (below, left). Clean the sponge frequently and get as much water out as possible. On additional passes, draw the sponge one clean face at a time. Remove any remaining haze with a soft cloth when the surface dries.

remove all but a trace of grout using the trowel. With small or irregularly shaped tiles, or those with cushioned edges, more grout will remain. The trick is to hold the face of the tool as close to 90 degrees to the surface of the tiles as possible.

At this point, you must decide whether to sponge-clean the area just filled or to continue packing joints with grout. A number of factors will speed up the set and limit how much grout you can apply before sponge cleaning. These include temperature, air conditioning, dehumidifiers, and porous tiles or setting beds.

The fresh grout needs to have "body" before it can be safely cleaned. If it is too loose, the sponge will rake out the grout from the joint. It may be possible to pack hundreds of square feet before using the sponge. On the other hand, you may have to proceed 10 square feet at a time with some installations. The trick is to never let one step get too far ahead of another. As with most crafts, experience grouting many different types of tile is your best ally.

As the packing process continues on floor work, keep the perimeter or expansion joints free from grout and quickly backfill any voids (waiting can affect the color).

On large floor jobs, it is a routine practice for one worker to pack the joints and another to handle sponge cleaning. But for most grout work, the installer will do both.

Sponge Cleaning

Sponge cleaning has three phases. The first is to loosen and remove the excess grout on the surface of the tiles, the second is to shape the contour of the joint, and the third is to remove the water-borne particles of cement and coloring from the surface of the tiles (see Figure 4).

Begin with an area about 10 square feet and go over the tiles with a circular scrubbing motion. Wring all the excess water from the sponge and scrub until the pores of the sponge begin to fill up with grout. Depending on the edge treatment of the tiles, you will have to adjust the pressure against the tile faces. Rinse the sponge in the bucket and repeat until all the solid stuff has been loosened and removed.

Next begin working on the joints. They should be as uniform as possible. Pay particular attention to the edges of the tile. If they are crisp, it is easy to know where the tile stops and the grout begins. If the edge is rounded over, your eyes must be the judge. Avoid feathering the margins of the grout joint. These are weak spots that will chip off and catch dirt, making cleaning difficult and giving the job an unsightly appearance.

When the joints are finished, rinse the sponge and make parallel passes from left to right, using one side of the sponge per pass. Rinse after each use and repeat until all visible signs of cement or color are gone from the surface of the tiles. The trick with the sponge is to use the least amount of water possible and keep the moisture content of the sponge consistent from beginning to end. If you dribble water over colored grout you are cleaning, this can lighten the color of the cured grout and give it a mottled appearance. A ray of sunlight, moving onto fresh grout, will do the same thing.

These two operations, packing and cleaning, continue until the entire installation is grouted. If the tiles have a smooth surface and a shiny glaze, the residual cement haze can be easily removed within ten minutes or so by rubbing with a cheesecloth or other soft cloth. Some tiles may require an additional sponge cleaning for this.

A few kinds of tile may require special treatment before grouting can begin. An example of this would be a handmade unglazed, Mexican paver tile. The surface of these tiles is so porous that it is almost impossible to clean or even install grout unless the surface is treated with a release or a sealer. Some quarry tiles, when grouted with colored grout, need a coating of release if the body of the tiles is not to be permanently stained. On installations using large amounts of tiles like these, some manufacturers can apply a thin coat of wax to the tiles before they are packed away in cartons.

With cement grouts, it is important to do all the cleaning today. Never wait until tomorrow; by that time the grout has become rock. So once the haze appears, get it off quickly. If it doesn't come off with a cloth, hit it with the sponge once more and the next generation of haze should come off easily. Do

everything you can to avoid using acids or other harsh chemicals that can easily destroy the glaze.

If you must use an acid, make sure it is approved for use on tile, that the grout has fully cured, and that you follow the directions to the letter. Also make sure you adequately dilute the acid with several rinses of fresh water. Some municipalities have laws regulating the use of such products. And you should protect yourself with a vapor mask, glasses, gloves, and plenty of ventilation. Any wood or painted surfaces coming into contact with the acid, like baseboard molding or metal railings, should be either masked off or covered with a layer of petroleum jelly.

Finishing Touches

With the haze removed, the grout is installed but it is not finished. Now is the time to go over the entire surface and look for defects or voids, clean out expansion or perimeter joints, and clean up any grout on surrounding surfaces. If you find any voids, pack them now before the grout dries. Also, use the tip of a margin trowel or pointer to square up the grout at inside corners or where trim tiles meet other surfaces. Painters cannot do a good job of cutting an edge if the perimeter of the tilework is rounded with grout. Once the grout has set up (usually within 30 minutes), it is easily carved away and squared up with the trowel.

The next step is to cure the grout by keeping it damp and loosely covering it with kraft paper. This will take 28 days if you use a cement-based grout with no additive. Here is another area where grout additives keep the job economical. Typical latex additives can reduce the cure time to several days. And special additives called "accelerators" will reduce the cure time to as little as four hours and require no dampening and no covering at all. Whatever product you use, read the instructions and check with the manufacturer for specifics if they are not clear.

The last step is to set up enough barriers and warnings to keep others off the tilework until the grout has hardened (again, check the manufacturers instructions). The grout may look hard and durable after it sets up, but just a slight movement after the grout has lost its plasticity is enough to ruin the bond between the grout and the edge of the tiles. If you need to get on a freshly grouted floor, do so as soon as possible and use some 3/4-inch plywood walking boards to distribute your weight. If another trade needs to get on the floor to finish some work, tell them to come back tomorrow. If you don't protect the fresh grout, you will be responsible for any problems.

When Not to Grout

What you grout is as important as how you grout. Grout should never be applied to joints between tile and other materials such as wood, porcelain, or metal. Different rates of expansion and contraction will eventually tear these joints up, and no amount of regrouting will solve the problem. For these joints, as well as expansion and cove tile joints, a resilient caulk must be used. And to ensure that the caulk can do its job, make certain that joints to be caulked are free of adhesive or grout residues. ■

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