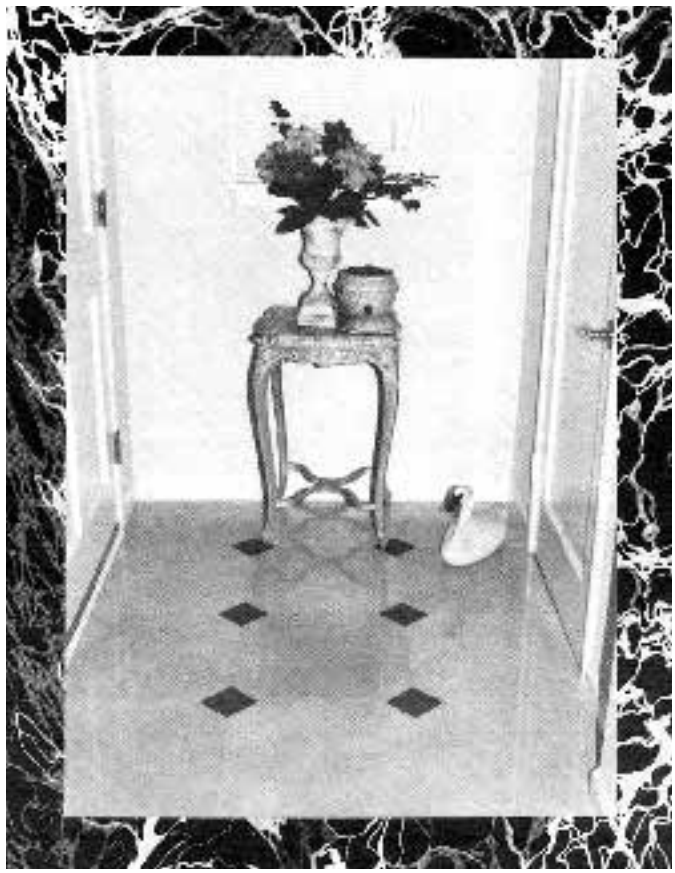
LAYING MARBLE AND GRANITE TILES



Stone tile can lend an air of elegance to even a small space like this entry hall. It is laid with 18x18-inch "Crema Marfil" marble with "dots" of Verde green.

by Scott Duncan

Although marble and granite were prized building materials long before any of us were building, they fell out of favor in the early '60s and remained out of favor for a long time. But judging from my last few years of invoices, stone is back in style. What was only an occasional request ten years ago now makes up nearly half of my business as a tile contractor.

Since these materials were ignored for so long, many contractors and suppliers aren't as knowledgeable as they might be. This can lead to problems because marble and granite are individual products of nature; they do not come off of an assembly line. They vary a lot in quality, and this puts a premium on knowledge and experience from the importer right on through the tile contractor, and the G.C. he's working for.

Turning to Stone

There are at least a couple of reasons for marble and granite's current popularity. Compared to the manufactured look of ceramic tile, stone offers a formal, rich appearance that fits the current emphasis on traditional architecture and upscale interiors. Also, with the advent of new quarrying, cutting, and polishing methods, the price of marble and granite—particularly in tile form—is competitive with other finishes and coverings on higher-end projects.

Here's a rough comparison from my area. I set ceramic tile for anywhere from $8 to $30 or more per square foot (labor and materials) depending on the tile and the job. Although a marble slab installation is out of reach for most clients at $60 to $120 per foot, I can lay marble tile for $18 to $35 a foot. Granite runs a little higher at $25 to $45. Something simple like an entry would be at the low end.

However, the price for either marble or granite can climb dramatically if there is a lot of edge work. Unlike tile, you have to fabricate your own exposed edges in stone. This can involve shaping one of several classic profiles, or just rounding over the

Variations among tile can create beauty for the client—but pitfalls for the installer

Figure 1. *Unlike ceramic tile, exposed edges in marble and granite tiles have to be fabricated with grinding and polishing equipment. Here, Duncan polishes a standard flat edge on a marble tile using diamond pads chucked in a drill motor.*

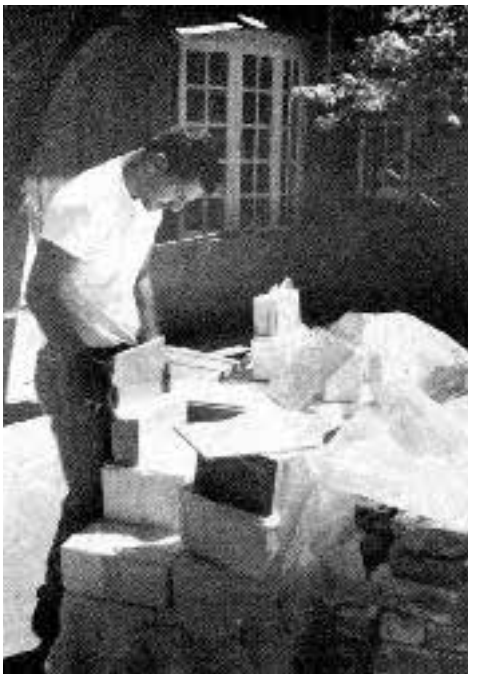


Figure 2. *With marble and granite, it's important to inspect carefully and sort the material because of the wide variations with any batch. The tile setter's judgment determines which individual tiles will look good together in terms of their shading, veining, and grain direction.*

edge and polishing (see Figure 1). Either way it's a lot of precise hand work that requires time and care.

Because of its hardness, granite is particularly expensive when it involves a lot of edge detail as in a countertop. Although it's more costly, granite has the advantage of being much less fragile than marble, which results in less breakage. It's also more even in color and grain so there's less "matching" of tiles involved.

Marble and granite tiles are typically 3/8 inch thick, 12 inches square. They have a very slight bevel on all four top edges. Well, at least this is true in theory. In practice, one of the biggest problems we deal with is the variation in dimension, thickness, and chamfer width in stone tiles. Because granite and marble tile should be laid with a minimal grout joint—1/16 inch—there is no easy way to make up for these discrepancies in the material. As a result, it takes experience to produce a satisfactory job.

In addition to 12x12 tiles, marble and granite also come in 6x6 (typically 5/16 inch thick), and occasionally, 18x18 and 24x24 (these are usually 3/8 inch thick but use a sand-embedded, fiberglass backing for strength). Slab marble and granite are most often 3/4 inch thick, but you can special order thicker material.

Marble and granite tiles also come with different surface treatments. The most common is polished, which is beautiful, but shows scratches easily. This can be a problem with marble and its limestone cousins because of their softness. A *honed* surface, produced either by grinding or an acid processing, produces a matte look that doesn't show scratches and also has good non-skid qualities. It's often recommended for shower and bathroom floors. (Although it depends on the age of the occupants and how they use the space, I haven't found polished marble floors in wet areas to be a problem for most of my clients. However, I cut the stone to 5x5 or 4x4 squares and lay them diagonally to offer more for toes to grip.)

Granite is sometimes sold as *flamed*. This is a heat process that actually spalls the surface of the stone. It gives the tiles a very uneven, natural look. Because of its superior slip resistance, it's used in commercial work quite a bit. However, it's difficult to keep clean indoors because of its very rough texture.

Purchasing Tiles

Most ceramic tile supply houses carry marble and granite tiles, but I prefer to deal with companies that specialize in stone. Beside having a broader selection, they know the color/veining variations and idiosyncrasies of each type of marble, limestone, and granite. Also, marble and granite tiles can offer specific advice about which ones match up best for certain uses, and what precautions should be taken in laying them.

This help is important since marbles and granites vary a lot from quarry to quarry, and region to region. And because of the current popularity of stone, they are coming to distributors from lots of small sources all over the world with little agreement on the qualities—and even the names—of the hundreds of different varieties.

For instance, green marbles, which are sold as "Antique Green" or one of dozens of exotic names that begin with "Verde," can come from Italy, Spain, Portugal, France, Guatemala, Vermont, or Taiwan. In my area, the majority come from Taiwan. Although the Asian product can run to shades of yellow, in dark green it's hard to tell it from some of the others (except sometimes by price). But Taiwanese green marble can spall and warp badly when laid with standard, portland cement thinset. If you don't know that, you're looking at a potential nightmare; if you do, it's relatively easy to prevent.

The other complication in buying stone tiles is their incredible variety in color and veining. The fact that no two tiles are alike is a key reason the material is so stunning, but it can also create major problems unless the client is expecting a lot of variation. These differences aren't just between regions or quarries. Often a single box of marble tile will contain examples with very different hues, grain directions, and accents (see Figure 2). Although designers and homeowners are becoming aware of this in my area, it's still very important to get approval on two or three typical tiles from the pallet you plan to buy from. If you delay the purchase too long, the next batch may look like an entirely different stone. Stone suppliers will help by opening a few boxes to make sure that you've got material you can work with, but the days of hand-picking are over.

For example, Carrara marble can be 70% gray veins or only 20% depending on where in the mountain it was quarried, and where in the block it was cut. Travertine can run from brown to very light beige; it can also vary from straight, pronounced veins to subtle swirls. There are also varieties, such as "Crema Marfil," that I have found to be relatively consistent in shading and veining.

This variation may sound unimportant, but it can have a surprising impact. A lot of heavy veining can visually dominate a room and clash with wallpaper or other finishes. In addition, even subtle changes in color from one tile to another can be very noticeable in blander tiles.

To complicate matters, this is all subjective: What looks good to one client looks awful to another. As careful as I am about laying out the job aesthetically, I'd love to be able to bill for all the time I've spent prying a marble or granite tile off the wall or floor because it looked out of place with the others to the designer or homeowner.

Prep

Even more than ceramic tile, stone requires a substrate that is rock solid and dead flat. Most of the failures and just plain "bad jobs" I've seen with stone have been the result of thinsetting the tiles directly to plywood and concrete slabs. As a result, I float almost all my stone tile installations—walls and floors—with mortar.

Because limestone and some marbles are already laced with natural fault lines, you can't afford *any* movement beneath them. Even if they don't crack outright, they can develop an almost invisible crazing of the surface known as *indentured* cracking. (This can also be caused by using more than 1/8 inch of thinset between the tile and the substrate.)

A flat surface is just as important. In addition to needing even support beneath the stone, you'll be setting the tiles close together. This makes variation in height from one tile to the next—called *lippage*—very noticeable. The rule of thumb I use is to keep this variation down to 1/32 inch or less. That means starting with a pretty flat surface.

I use a little heavier reinforcing than usual in my mortar beds. Although 20 gauge, 1-inch-mesh "chicken" wire is standard in my area, I've gone to 17 gauge, 1-inch mesh on floors under 100 square feet and on most walls; and down to 16 gauge, 1-inch welded wire for larger floor areas. I also use "pencil rod" reinforcing around sink and cooktop cutouts, and anywhere else where I feel it is necessary. This extra strength is cheap insurance against cracking with the softer marbles.

In vertical applications like shower walls, I keep the float—vapor barrier, mud, and reinforcement—independent by stapling the mesh to the gypboard. Some tile setters argue that it should be nailed through to the studs, but I don't like the idea of a direct connection between my tile and the inevitable movement of the wood.

When I can't afford the thickness of a float—about 3/4 to 1 1/4 inches in the case of a floor—I'll use one of the cement boards (Wonderboard, Durock, etc.). But I actually find it takes me longer to lay stone tiles on it because of the seams and the fact that the board follows the variations in the studs or subfloor beneath it. I also feel that cement board is more likely to create cracks at inside and outside corners, even when it's taped according to specs.

I try not to thinset marble directly to plywood, but it can be done if two layers of at least 1/2-inch material are used, and it's well fastened with staggered joints. I also avoid setting directly to concrete slabs. I find they are frequently not flat, and almost always have cracks that can transfer through the marble in a thinset application. Consequently, I use a cleavage

membrane (15-pound felt) and a wire-reinforced mortar bed.

I will thinset to fireplaces if the surface for the surround is flat and true (see Figure 3), or to interior gypboard in an application that won't get much water, such as a bathroom wainscotting. But in any application where you're not floating with mortar, you need to check carefully for flatness, and then fill in low spots with a leveling compound or thinset.

One problem I constantly fight in floating a mud base with marble or granite is plumbing fixtures. Plumbers are in the habit of setting valves for ceramic tile—leaving an inch from the face of the gypboard to the finished surface of the tile. But I find most walls, particularly ones that aren't plumb or square, require at least 1 1/4 inches for the mortar and stone. That missing quarter inch can be very costly for everyone on the job since it requires getting back into the wall and repositioning the values.

Any necessary edge shaping and polishing is done before setting the tile, and there are as many methods as people doing it. For a standard, polished flat edge on marble, I typically use a belt sander with silicon-carbide belts, and keep the marble wet. I work through 120, 220, and 400 grits with the sander before using a rag to apply a polishing compound that works chemically. If I want an even higher polish, I'll use 800- and 1,800-grit diamond buffing pads on the edge before going to the liquid. For granite, I use diamond pads (wet) that I chuck into a 3/8-inch drill motor. I go through the same grits, but it takes a lot longer.

If the edge requires a profile—ogee, demi-bullnose, chamfer, etc.—the choices are diamond-edged bits and a router, or sending it out to a shop. I find it's cheaper to send it out.

Installation

The first thing I do is to break open the boxes of tile and begin to match them for color and grain variations. The ones that are very different have to be set aside to be used for cuts or in less visible areas. Most of the others can be worked together, but you have to exercise a bit of artistry in judging which tiles look good next to each other, and whether the grain of the tiles should be run in the same direction or alternated in a pattern. Depending on the level of involvement of the client or the designer, I often get their approval early on.

There's no mystery to making cuts on stone tile. I use a standard water-cooled, tile saw with a diamond blade (see Figure 4). I also have a 4-inch grinder on the job fitted with a 4-inch dry-cutting diamond blade for maneuverability. Drilling the tiles requires either carbide or diamond bits depend-

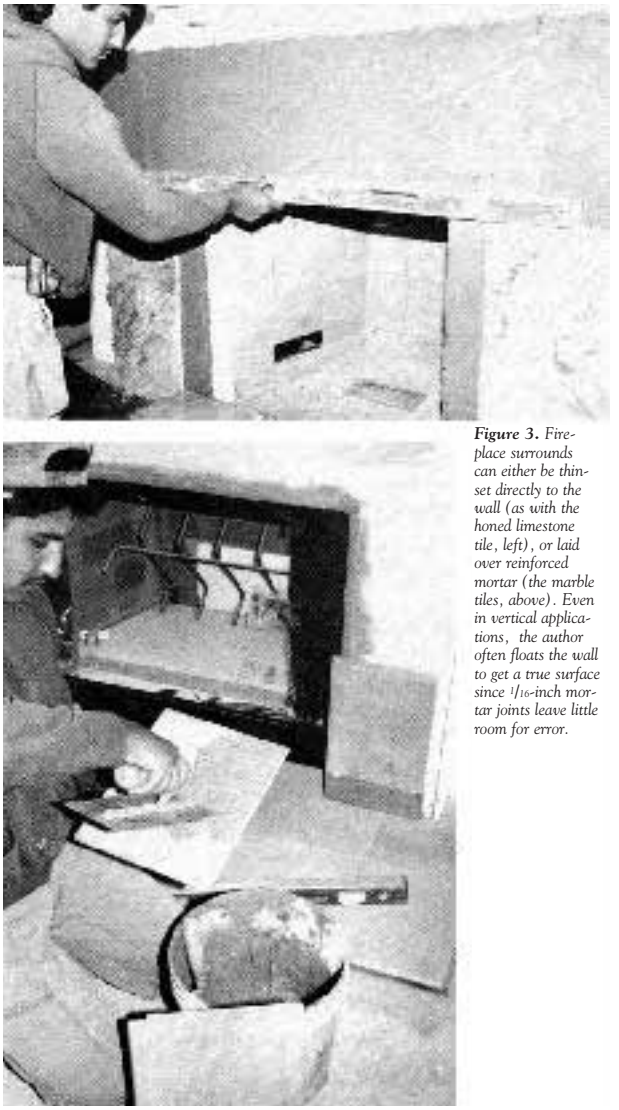


Figure 3. *Fireplace surrounds can either be thinset directly to the wall (as with the honed limestone tile, left), or laid over reinforced mortar (the marble tiles, above). Even in vertical applications, the author often floats the wall to get a true surface since 1/16-inch mortar joints leave little room for error.*

Figure 4. *The author freehands a bevel cut on a marble tile using a water-cooled tile saw with a diamond blade. Granite is handled the same way, although cutting (and shaping and polishing) go slower because of the density of this volcanic stone.*

Taken for Granite
Not All Stone Is Created Equal

Although limestone, marble, and granite are all quarried stone, there's a great deal of difference in their hardness, porosity, and durability. Thinking of them in the same category is a little like considering pine the equivalent of walnut, oak, or hickory.

Granite. This volcanic rock (primary minerals are quartz and feldspar in crystal form) is about as close as you can get to a perfect surface in my mind because it is extremely hard and basically impervious. It's great in horizontal applications—floors and countertops— because it doesn't stain easily and will take tremendous amount of wear and abuse with minimal maintenance. Because granite tends to be dark (it can range in color from pink to dark gray), the matching grout joints don't show grease and dirt as easily. However, on the whole it is more expensive than marble, less colorful, and more difficult to shape, polish, cut, and drill.

Limestones and marbles. Marble is a metamorphic stone (it's essentially limestone that has been transformed by tremendous heat and pressure over time) that comes in almost every color of the rainbow. It ranges from having no visible veining to prominent stripes and swirls. The most brightly colored, highly veined marbles are the most popular, but they are typically the least durable according to The Marble Institute of America (MIA). Although it's no longer used by all suppliers, the MIA uses the letters A through D to describe the soundness of a piece of marble or limestone:

Group A: Most sound and uniform.

Group B: Some natural faults, but little filling necessary.

Group C: Many geologic flaws, voids, veins, and lines of separation, requiring much filling and repair.

Group D: Even greater number of faults requiring even more filling and reinforcement. Most highly colored marbles fall in this category. They are the most expensive.

Limestone is a sedimentary rock that is softer and more porous than its cousin, marble. However, there are a number of crystalline limestones that will take a polish, and they are sometimes sold commercially as marble. Travertine is one of these.

Because limestones and marbles are both relatively soft and porous, care should be taken in selecting the right stone for the application. The first problem is staining. Some marbles are so porous that the ink from a felt tip marker used to number the back of them will eventually work its way through to the surface. I don't recommend light-colored marble, or the light-colored grout you use with it, for kitchen counters, for instance. In addition to staining, marble is also easily etched by acidic fruit juices. Although you could seal it, you would be building in a maintenance problem and putting potentially toxic chemicals on a surface where you prepare food. The most practical way to get the color and grain of marble in kitchen counter areas is to use it on the backsplash.

These stones can be used on the floor in most instances, but your supplier may require sealing some of them. Limestones and travertines, for instance, require a high-quality surface coating when they're going to be subjected to a lot of traffic. Marbles even work well for kitchen floors as long as they are sealed after installation to prevent staining problems.

Still another category of stone tile that deserves a mention is the *agglomerates*. These are manufactured tiles that are about 90% marble in the form of chunks (these lend a kind of terrazzo look) or chips (these look more like granite) held together by resin. Agglomerates are made in large blocks and then sawn into tiles and polished. They are durable and somewhat less expensive than marble, but don't offer the infinite variety of natural stone.

—*S.D.*

Figure 5. *Here, the author butters a 12-inch Thassos marble tile with a 1/4-inch notched trowel. This Greek stone is stark white, requiring the use of white thinset. It will be set in place in the shower just 1/16 inch from neighboring tiles using small, wedged-shaped plastic spacers.*

ing on the hardness of the stone.

Laying stone tiles is somewhat more tedious than setting ceramic tile, but it's similar. I keep grout joints to 1/16 inch with wedge-shaped plastic spacers so the tiles' varying degree of edge chamfer give the impression of a fat 1/16 or 1/8 inch.

The choice of thinset is also a little trickier. Because some petroleum adhesives will bleed through marble (and are also fast disappearing due to air quality regulations), I usually use white thinset for all marble and granite just to be safe. This is particularly important with white marble. I also don't use a latex additive with my thinset; given today's mixes it would be overkill, and there's a slight chance of *latex leaching* if water should find its way behind the tile and stay trapped there.

The one time I don't use a standard water-based, portland-cement thinset is when I'm laying green marble. As I mentioned earlier, some green marbles will warp and even spall when applied this way. This sounds a little unbelievable until you've watched the edges of 12-inch tile curl up more than 1/8 inch within 20 minutes of applying the thinset to the back. What I *now* know to do is to use 100% solids epoxy. The stuff is costly and a pain to work, but it beats the alternative. I also apply a sealer to green marble when it's being used in a wet area.

Coverage (the amount of the tile back that is covered by thinset) can be another important factor in laying the more brittle and porous marbles. On exterior applications and other heavy moisture areas, 100% coverage prevents water from becoming trapped behind the marble which can result in staining as it bleeds through. Nearly 100% coverage, particularly at the corners of each tile, is also advisable with softer marbles on floors to provide full support against women's high heels. But for most other applications, I use a 1/4-inch notched trowel, and butter the back of the tiles thoroughly (see Figure 5).

Grouting and Sealing

I try and match the color of the grout as closely to the stone as I can so the joints nearly disappear. It takes a little extra care to force the grout into the narrow joints. I always use a non-sanded grout for 1/16-inch grout joints, but a sanded grout looks better if the joints are 1/8 inch or wider.

I sometimes use epoxy grout on granite countertops. Although it's a little harder to work, it makes the joints as impervious and durable as the granite itself. Where the stone tiles butt another material—wood flooring, Corian, etc.—I use caulk rather than grout for its flexibility in dealing with different rates of expansion and contraction.

I always seal limestone and some travertine because they are soft and porous, but I generally don't seal marble unless it's in a kitchen or some other area where it can get stained easily. If stone does need to be protected, I like a penetrating sealer manufactured by Aqua Mix (12940 Sunnyside Place, Santa Fe Springs, CA 90670; 213/946-6877). It's safe and easy to use, water soluble until dry, has no fumes, and it can even be applied when the material is a little damp. Aqua Mix also make a finish coat for a higher gloss. ■

Scott Duncan has been laying tile for 20 years. His tile contracting business, Classic Enterprises, is located in Saratoga, Calif.