

(Excerpted from a presentation by Henry M. Rothberg, Chemical Engineer, B.S.Ch.E., A.I.Ch.E., A.C.S. to the Tile Contractors Association of America)

When I started over 40 years ago in the tile, marble and terrazzo business...things were much simpler than they are today. Installation materials were simple...we had only to learn to mix cement and sand to make floor mud (mortar/screed) and cement sand with some lime to make wall mud (scratch & float coat/render). This could be learned very quickly by any helper...there was little requirement for judgment or selection of materials. Ceramic tiles were limited to 4 1/4"(100 x 100 mm) wall tile, 6" x 6" (150 x 150 mm) quarry tile and ceramic mosaics for floors. Marble was 7/8" (22 mm) or thicker tiles or slabs.

In the last 40 years there have been dramatic changes in installation materials and surfacing materials such as ceramic tile, marble and thin stone. Building structure have changed dramatically. Instead of the low, massive heavy concrete structures, we now have tall, thin light-weight, flexible buildings that move considerably and this movement is reflected in floors and walls.

Surfacing materials such as marble and granite have been reduced in thickness to 1/2" (12 mm), 3/8" (9 mm) and even 1/4" (6 mm). Ceramic tiles have increased in size from 8" x 8" (200 x 200 mm) to 12" x 12" (300 x 300 mm) and now we regularly see 16" x 16" (400 x 400 mm) and even 24" x 24" (600 x 600 mm) ceramic tiles. Ceramic materials have changed from dust-pressed quarry tile to vitrified porcelain-type, low absorption, large units.

Marble and granite have been reduced in thickness and have become much more common in the market place. These thin marble and granite tiles are increasing in sales and usage dramatically and have become common floor and wall finishes.

Even fragile marbles have been made available in very thin sections by reinforcing the back with resin or with resin and fabric.

Now the ceramic and marble installer faces more complex problems; Selection of finishing materials, adhesives, installation procedures and the examination and approval of the surface to be covered.

In addition to the normal problem of examining concrete slabs to determine if they have sealer, curing compounds or finishes that would prevent good adhesion, the installer now must make a decision from dozens of installation materials in order to choose a suitable installation material for the floor condition and the type of marble or stone selected to go up the floor or wall.

Therefore, in addition to examining the floor surface and determining if it is satisfactory for the installation of material selected as the finished surface. Most installations are now thin bed method, a decision must be made concerning which is the most suitable adhesive for the thin bed mortar installation.

To complicate the situation, a hidden danger is the matter of deflection. In the past, when we installed ceramic mosaics on thick bed mortar, we had heavy, strong, sound support for the tiles. Deflection was not critical when we had mosaics with 12 tiles per foot (30cm) and a 1/8" (3 mm) joint between each tile that could compress, crack or move without endangering the tile installation.

Now we are installing marble and granite tiles that are 12" or 24" (30cm or 60cm) across. These tiles cannot take deflection even as little as 1/360 of the span. The old standard of L/360 maximum deflection was developed more than 50 years ago, long before we had such large module tiles and long before thin bed installation with stone bonded directly to concrete and even plywood floors on wood framing. These are the beginning problems that a contractor must face.



Now...what about marble tile? Everyone knows what marble is and everyone knows what granite is, so that matter is simple...or is it?

Sound marble is usually diamond sawed and will contain a residue of dust on the back surface. This must be washed off and the surface must have a thin combing or prime coat of the mortar before each tile is placed. If the back of the marble is not treated this way, there will be a layer of dust between the mortar and the marble which eventually can cause delamination because the thin bed mortar or adhesive is not bonding to sound stone.

Fragile marbles will frequently have a coat of resin reinforcing on the back or a coat of resin with fiberglass fabric applied to the back. Now the questions is how good is the adhesion of Portland cement thin-set mortar to the resin backing ?

Do not assume that all resin backing is epoxy. Actually, the bulk of the resins used for patching marble and for reinforcing the back, with or without fabric, is polyester resin.

Why ? Because polyester costs 1/2 as much as epoxy and has most of the physical strengths of epoxy resin. For this reason, most boat-hulls, molded bathtubs and even automobile bodies are made of polyester resin reinforced with chopped glass fiber or glass fabric. However, polyester does have one weakness...it does not adhere well on damp surfaces or cure under humid or damp conditions. Therefore, if the marble was not thoroughly dried before the resin backing was applied, it is quite possible that the backing can delaminate under stress.

Now it becomes necessary for the tile installer to ask the supplier what the backing is on their marble tile, if it has resin or resin and fabric and what type of thin-set mortar or adhesive has been tested and approved for such installations ?

In the present American climate, where everyone sues, a contractor cannot risk guessing what is the proper adhesive for installing marble tile that is reinforced with resin on the backside.

Generally speaking, late modified thin-sets, not the "so-called" one part mixes, but a good quality thin-set mortar that is mixed with a liquid latex additive, instead of usual water, will have good adhesion to clean marble and granite. In addition, these mortars have the ability to absorb shock and prevent cracking of thin and fragile marble tiles.

The normal thin-set mortars were designed for either vitrified tile or porous wall tile, since many of them were developed from Tile Council of America Formulations. Where has anyone ever seen on a bag of Tile Council Mortar a statement that is "designed for installing marble or granite tiles?" Yet...there are contractors that take chances and use these materials without getting confirmation from the mortar supplier as to its suitability.

So you face the additional problem of getting the correct adhesive or thin-set mortar for a specific type of marble or granite.

The safest course is to buy quality materials from a reputable manufacturer who has long experience and who can answer technical questions and give specific recommendations as to the correct material for installing the specific tile, marble or stone that is to be installed.

And when an adhesive is decided on...what about OSHA? Can you obtain quickly a MSDS (Material Safety Data Sheet)?

LATICRETE has installed a Fax on Demand program to make them available 24 hours a day - 7 days a week.

A reputable contractor can no longer afford to guess which material to use. He must depend on expert recommendation, because this business is getting more complex every day.

Now there is another problem to face...and that is curling of thin marble tiles. In the past, when we installed 7/8" (21mm) thick or heavier marble tiles and slabs there was never any question or problem with marble curling. Oh yes...It was known that green marble had a tendency to curl and we had to install it carefully. However, the bulk of the marble and granites were installed without problems. Today...with the wide availability of extremely thin marbles, some of which have low absorption and others with high water absorption. The installer must keep in mind that there are some thin marble tiles that have a tendency to curl when they are installed in a Portland cement thin or thick bed mortar. These tiles absorb moisture, are not dimensionally stable and, therefore, expand and curl.

There are rapid setting thin-set mortars developed that can overcome this problem with some of the marbles. However, colors such as green, which is notorious, and some of the blacks and dark chocolate browns do absorb moisture, curl quickly and cannot be successfully installed in thin-set mortars or latex modified thin-set mortars.

For these marbles, which curl rapidly and drastically when exposed to moisture, the safest installation material to use is 100% epoxy which is totally free of water, provides high bond strength and prevents any curling developing during the initial installation period and after.

In response to some of these curling thin marble problems, LATICRETE developed an epoxy marble setting material that is fairly economical, easy to install and user friendly. There are a few brands of 100% epoxy adhesives on the market that are suitable for installing these questionable marbles.

How can the contractor recognize these problem thin marble tiles? I cannot answer specifically by name which marbles give a problem because every marble producer, even though they cut marble from common blocks of green and black or other colors, tends to identify his brand by individual names. So if we have a Verdi Alpeni, that would be a green by one quarry and another tile producer will call that same verdi with a similar or different name. The same is true of black and dark brown marbles.

Usually, marbles that have fairly high absorption rates, will be more sensitive to moisture and curling. The sound marbles with very low water absorption rates are fairly stable, and do not pose problems when installed.

In summarizing the problems of the installer, consideration must be given to the type of slab or floor surface to be covered, the deflection of the floor, the location or placement of expansion joints, the type of marble or granite and the backing or reinforcement on the marble and granite.

And after considering all these problems, it may very well be necessary to consult an experienced manufacturer to get a specific recommendation for the installation adhesive or thin-set mortar. Of course it would be helpful if the marble supplier would provide information regarding the sensitivity of the marble to moisture and whether it had to be installed in an epoxy adhesive or, what would be a suitable adhesive. For marble tiles that have a resin backing, this is very important.

Our experience in laboratory testing and job performance of resin-backed marble has confirmed that a quality latex thin-set mortar has good adhesion to sound resin backing. However, there are instances where the resin reinforcing delaminates from the back of the marble before there is any bond failure in the latex modified thin-set mortar. In some instances, shrinkage of a concrete slab or creep result in sufficient strain or movement to tear the resin back off marble tiles and leave the resin reinforcement bonded to the latex thin bed mortar. The marble tile may come off the floor leaving the back of the marble clean. This is unusual...but it has happened.

NOTE: When I refer to thin marble tiles or granite tiles this also includes agglomerate marble made with either Portland cement binder or resin binders and resin terrazzo tiles made with marble or granite chips.

Again, I remind every installer to collect as much information as possible about the particular marble tile that he is planning to install and to have a recommendation from the marble supplier and a manufacturer of installation materials so that he'll have a trouble-free, long lasting, serviceable thin marble or thin granite installation.

The use of marble and granite floor tiles has been growing dramatically. These floors are not cheap. They require costly labor and costly materials if a good quality installation is to be made. Consequently, it is worth taking the time to check each installation carefully and be sure that all of the materials, the marble tile, the adhesive and floor to be covered have been selected to work together and provide a beautiful, long-lasting and maintenance free installation.

Every well-installed, serviceable floor is a salesman for many, many more installations. Any one poor installation is viewed by and trafficked over by hundreds of people who could turned away from the future use of marble or granite flooring by one loose tile or cracked tile. Since a good installation is an excellent salesperson for our industry, it is to all our benefit to take the time to make quality installations and ensure the future of our business.

Technical Data Sheets are subject to change without notice. For latest revision, check our website @ www.laticrete.com

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