

Creative Materials Corporation

Porcelain Tile: All About Porcelain

I. Porcelain Tile Knowledge

A.) History of Porcelain Tile

Porcelain tile has been with us for a long time. Ceramic mosaic tiles of 1"x 1" and 2"x 2" have been utilized in toilet rooms, locker rooms and other small scaled areas requiring a durable, resistant and easy to clean floor surface since the 1930's.

The advancement of the technology required to press larger unit sizes of 8"x 8" and 12"x 12" in the 1980's brought about what we call "The Porcelain Revolution". The now larger sized units available allowed this uniquely qualified and superior performance tile type to be used in large area spaces such as building lobbies, shopping malls, automobile showrooms and grocery stores. Since then, porcelain has become the most widely used product type for all commercial large area spaces. Porcelain tile has contributed to a significant advancement in commercial design.

B.) Production and Raw Materials

Raw materials include high-grade fire clays, kaolin, quartz and feldspar. The production process starts with computerized precise blending of these materials along with appropriate pigments and oxides. The mixed powders are injected into stainless steel molds and pressed under tremendous pressure. The pressed tiles are dried to remove all moisture and fired in specialized roller hearth kilns at extremely high temperatures of approximately 2200°F. The fired tiles are sorted by exacting shade and caliber measurements and packaged for distribution. Many factories have multiple production lines that produce up to 20 million square feet each per year.

C.) 15-year Life Cycle Costs

In the reality of today's facilities management life cycle costs, the most important consideration is the labor expenditure required to maintain flooring. Almost all flooring types available to the commercial market require a protective top dressing of sealers, waxing or both. Without a constant upkeep of this protective surface coating, vinyl, terrazzo, marble, wood and many other floor types degrade over time due to scratching, abrasion and wearing of the product surface. Carpet requires constant care and degrades very quickly.

In contrast, porcelain tile is unique in its inherent ability to withstand extremely demanding and abrasive abuse with no top dressings and no effect whatsoever. Porcelain is the hardest tile product made. It requires no sealers or waxing. This fact is very important to the life cycle costing of this product compared to all others. Independent studies have fixed porcelain's 15-year total costs including product, installation and expected maintenance costs at \$10.85 per square foot. Vinyl tile, while costing much less at installation time, costs \$24.31 per square foot over a 15-year period due to the requirement of top dressing maintenance. In any facility with relatively large corridor and lobby common space areas, the

difference between porcelain and almost all other product types becomes very meaningful.

II. **Porcelain Tile Education**

A.) Production Types

As porcelain continues to gain in popularity and availability, it continues to come down in pricing. Porcelain is now being used as the base product for glazed tiles. It should be noted that the best porcelain type for commercial construction is a true thru-body porcelain tile where the composition is porcelain throughout. Production types of thru-body porcelain tile:

1.) *Graniti and Monochrome*

Graniti is also known as small particle or speckled porcelain. This was the first production type. These two types are very common and are the most cost effective of all types. Monochrome is a consistent, non-speckled uniform color production.

2.) *Large Particle*

This was an early advancement where slightly larger speckles and particles were utilized to provide more interest and depth of color. Terrazzo like in appearance. Again, very economical.

3.) *Double Loaded*

Double loading is a manufacturing process where several different clay/pigment/coloration preparations are blended at the time of pressing. The result is a mixture of the colors into each tile resulting in a limestone-like effect. No two tiles are the same but the production still falls within defined ranges of aesthetic controls - a very important advancement in design and successful introduction.

4.) *Enhanced Thru Absorption of Mineral Oxides*

Porcelain stone replication became widely available with this technology. Dry powders consisting of soluble salts, oxides and clays are applied after pressing but before firing. The porcelain clays application is absorbed and becomes one with the porcelain body. Combined with pressing in stone texturing duplication, the final result is porcelain tile indiscernible from the natural stones it mimics.

B.) Production Sizes

From its start as the humble ceramic mosaic tile of 1"x 1", porcelain is now available in tile sizes of up to 24"x 24" and 24"x 48". The most common size is still 12"x 12" but the definite trend is toward 16"x 16" and 18"x 18". A notable new size available on the market is the 4"x 4" size, which comes with a mesh mounted backing that allows 12"x 12" sheets to be installed rapidly. The 4"x 4" size is actually less expensive than the 1"x 1" and 2"x 2" porcelain ceramic mosaic tiles that are still commonly used in toilet rooms & locker rooms. The 4"x 4" size will still easily allow pitching of the floor to accommodate floor drains and this size eliminates the excess of grout joints inherent in ceramic mosaics.

- C.) *Fabricated Sizes*
Thru-body porcelain is easily fabricated, cut and worked to accommodate many situations. From triangular patterning to octagonal or diamond shapes, porcelain is routinely cut to express a wide variety of design ideas. Porcelain can be worked to impart bullnose edges, beveled edges, grooved stair treads and many other special shapes. Many factories produce a range of special trim pieces and augment this with fabricating as well.
- D.) *Colors*
There are now literally thousands of porcelain tile colors throughout all the production types. The porcelain tile producing factories are focused on the commercial design market and are constantly directing new colors and series toward the latest design trends.
- E.) *Textures*
A multitude of textures address every requirement for aesthetics and performance. Matte surfaces, satin honed, polished, textured stone, slate surface, clear glazed wall tile porcelain and industrial surfaced are the current main texturing types.

III. **Specification Skills**

“products don’t fail – installations do”

- A.) *Installation*
95% of porcelain is installed utilizing the thinset method. 5% is performed with a mudset installation. Thinset installation consists of applying a latex modified cement and sand adhesive with a notched trowel to a suitable substrate such as a concrete floor. The tiles are set into the adhesive, leveled and allowed to set. The grout joints are then filled using a sand/cement preparation gauged with a liquid latex. The finished floor is cleaned. Mudset installation is similar except the concrete substrate is recessed to allow a 1 ½” to 2” sand/cement mixture to be installed as a leveling bed before the tiles are placed. Mudset floors are not bonded to the substrate typically so that any movement or cracking of the concrete underneath is not telegraphed through to the mudset application on top. Mudset is used for exacting and longest lasting institutional use and can be easily worked to include necessary pitching to floor drains in water prevalent areas.
- B.) *Maintenance*
During construction the finished floor should be protected against damage by other trades. The finished floor should be covered by Ivan plywood or Kraft paper depending on the expected amount of construction activity to be allowed on newly installed areas.
Upon turnover of the completely cleaned floor to the building’s owner, the maintenance procedure is extremely simple. Sweep as necessary; clean utilizing a neutral based cleaning solution, which is agitated with a brush or pad floor machine. Vacuum the soiled solution. Rinse with clean water. Vacuum and allow to dry. Porcelain is a true “wash and wear” product and is very easy to maintain. The most important element of porcelain maintenance is the

lack of any requirement for top dressing with sealers or waxes. This fact saves substantial amounts of labor and materials over the life of the floor and makes porcelain tile one of the lowest priced flooring products available. A properly installed porcelain floor will last 50 plus years with only normal wash and rinse maintenance procedures.

C.) *Budgeting for Porcelain Tile Flooring*

Thinset: Material at + - \$2.50/SF, labor at + - \$3.50/SF

Installed thinset porcelain floor budget = \$6.00/SF

Mudset: Material at + - \$2.50/SF, labor at + - \$5.50/SF

Installed mudset porcelain floor budget = \$8.00/SF

D.) *Specifying to Avoid Jobsite Problems*

The best method to prevent jobsite problems is to enlist the assistance of a qualified architectural tile sales representative for a review of plans and specifications before they are put out to bid. Every project's circumstances are different and many problems can be avoided by the review and suggestion of a porcelain tile sales expert.

These are four items that we feel are very important for all projects:

1.) *Inspection. Use = Acceptance*

The floor installation tile contractor should be responsible for a pre-installation review of the substrate. Structural movement or shrinkage, proper detailing of expansion/contraction jointing in the substrate, need for leveling of the substrate, proper amount of absorption to achieve adhesive bonding – all of these should be reviewed and addressed before the tile contractor begins an installation. This inspection and notification of any possible problems should be included in the project specifications as the responsibility of the tile subcontractor.

2.) *Latex Modified Thinset and Grout*

Due to porcelain's low absorption, latex is used to improve the bond. Use liquid latex and specify it for both thinset and grout.

3.) *Expansion Joints*

It is the responsibility of the specifier to detail and specify the appropriate amount of expansion jointing and their locations. Expansion joints should be provided in accordance with Tile Council of America guidelines, taking into account any areas exposed to direct sunlight.

4.) *Pre-Installation Walk Through*

On any larger projects it is advisable to conduct a pre-installation walk through to insure products, existing conditions and environmental considerations are all conducive to a successful installation. Material suppliers, installer, general contractor, architect and owners representatives should all attend.

E.) Porcelain Stone Types

Porcelain stone is now one of the most important advancements in commercial (and residential) building materials. The porcelain producing factories have achieved results in the last 5 years that are changing the flooring industry. Many types of porcelain stone are virtually indistinguishable from the natural stone tiles they emulate. The advantages of porcelain over natural stone are substantial and meaningful. Some of the advantages include:

- 1.) Cost 1/3 that of natural stone.
- 2.) Natural stone requires sealers or waxing – porcelain does not.
- 3.) Consistency of sample to product shipped allows exact programming of colors within the tiles to coordinate with adjoining colors. Natural stone will vary from samples to shipments due to quarry inconsistencies over time.
- 4.) Availability of product. Reliable supply.
- 5.) Abrasive resistance. Porcelain is harder than any stone, including granite.
- 6.) Uniform strength throughout the tile. Natural stone veining and variations are (while adding to the beauty) the weakest points. Natural tiles always break along the veining, as that is the weakened area. Color variegation forms by inconsistent minerals and components within the tiles. Porcelain is produced as a homogenous body with no inherent weak areas.

Some of the many types of natural stone now successfully produced in porcelain tile include:

- Bluestone, Slate, Marble, Travertine, Limestone, Granite, Quartzite as well as many other regional and worldwide stone types.

F.) Closing

For further information, samples, pricing, literature or project photos please contact **Creative Materials Corp.** We would be happy to discuss any topic contained within our presentation. Our goal is to educate and inform and to make quality design attainable to architects, designers, developers and the building construction industry.