DEMYSTIFYING CERAMIC TILE

I. Understanding Tile

A. Science & Art

Even with today's most sophisticated technology, ceramic tile production is still as much an art as a science. The variables are numerous and some are even out of the control of the producers; therefore, variation in size, shade, texture and trim are inherent to ceramic tile. By being exposed to what goes into the production of tile, a designer develops an understanding of these variations.

B. Framework

A basic knowledge also gives a framework into which tile information can be placed. Since it is impossible for a designer to know everything about tile, he or she must rely on reputable suppliers and contractors to provide information. When comparing different tiles for a particular use, both in terms of suitability and aesthetics, this information can be meaningless unless there is a framework for understanding. This knowledge is also helpful in evaluating differences in the cost of tile and the price of its installation.

II. How Tile Is Made

A. Forming the Clay

1. Wet Clay Method

This method starts with a malleable (wet) clay and forces it, under terrific pressure, through a die hole. The resulting ribbon of formed clay can be in a great variety of shapes (the dies are changeable), or it can be in a flat sheet. The ribbons are wire cut to the specified length or the sheet is cut into tiles with dies that are similar to cookie cutters.

Tiles that are made this way have to be dried before firing. In the drying process they will shrink about 10% (they will shrink again during firing). This means that tiles that start as wet clay will have more variation both in size and texture, as a general rule, than those that are made using other methods.

2. Dry or Dust Pressed Method

In this method, the clay is a dry powder with no perceptible moisture, like a very fine dry sand. This clay powder is put into a mold with a top and bottom, and the top is forced into the bottom under extreme pressure. This pressure is so intense that it makes the dry powder into a compressed cake, and when the top mold is removed, the formed tile remains. Although this raw tile is fragile, it can be carefully moved along conveyer belts, glazed,

and put into the kiln for firing. Unlike with the wet clay method, dust pressed tiles do not need to be dried before firing, thus there is generally less size variation. There are variables in the dust pressed method, however, and factors like tile size, pressure of the pressing machine, firing temperature and general firing conditions all contribute in some degree to variation in the final product.

3. The Cast Method

   In the cast method liquid clay is poured into plaster molds, much like you would make a jello mold. The clay dries and takes on the shape of the mold. This method is rarely used for field tiles, and is primarily used for trims and decorative tile. It is possible with this method to make shapes that are difficult and sometimes inefficient to produce in the pressed system. Many times the field tiles and the most common trims will be made by the pressed system, but the less common or more difficult trims will be made by the cast system. Size variation is again a concern since the liquid clay must dry before firing. It also will have a different consistency and make-up than the dust pressed. Making tiles that match using these two different systems is one of the many difficulties of tile manufacturing. It is also one of the several reasons why field and trim tiles often are not an exact match in size and color.

4. Handforming Method

   Many Mexican tiles are made by this method in which wet clay is pushed by hand into molds that are either metal or wood. The resulting tile is much less "refined" than the product of the other methods, and can be soft, easily chipped and show imperfections.

B. Glazing

Not all tiles are glazed, but for those that are, the glazing happens at one of two times. In the "Single Fire" method the clay is glazed immediately after formation, then allowed to dry before being fired in the kiln. The second approach is the "Double Fire" method in which the tiles are bisque-fired, then glazed and fired again.

In either method, the glazes are most commonly applied by spray machines as the tiles pass on a conveyer belt. Often a tile may go through 2 or 3 sprayings in order to get the desired effect, with the application method being altered in order to change the final result. A grit can even be added to the glaze to increase slip resistance.

Once again there are many factors which may cause variation in the final product. Since glazes are products of mixed elements, they vary considerably in their stability. Glaze color, method of application, firing temperature, cooling time and placement of tiles in the kiln all influence the final outcome of the glazes. A slight variation in firing temperature, for example, can cause a great difference in the color or finish of a glaze. Even the ambient temperature or weather conditions can cause a change in the glaze.

C. Firing

There are many types of kilns and methods of firing. With constant improvements and advancements in firing technology, many things that were thought impossible 10 years ago are commonplace now. These changes have kept ceramic tile an affordable product and added to the wide variety of tile available.

How long and how hot a tile is fired will have much to do with its physical characteristics. The higher the temperature at which a tile is fired, the closer it comes to totally fusing, thus, the denser and harder it will be. This is an oversimplification, however, since some clays will become fused or vitrified at lower temperatures than others. The more fused a tile, the lower its absorption of water. The water absorption of a tile is a good guide to its other physical characteristics. If it is low in water absorption it is usually hard, and has good breaking strength. It is, however, harder to control the sizing of a tile the closer it comes to fusing or vitrifying. For example, if two tiles are made by the dust pressed method and one is fired higher than the other, the higher fired tile will be harder and less likely to chip, but it will have more size variation.

The variation of temperature inside the kiln also causes variation in the tile. Higher spots in a kiln tend to be hotter than lower spots since heat rises. This means that tiles can vary according to their location in the kiln. Although there is great effort to control kiln temperature and atmosphere, it can vary slightly from day to day and season to season. These temperature changes cause variation from one production run to the next.

When a tile is not able to be fired in the flat position (as with trim pieces), the possibility of variation is increased. The glaze may run on the vertical surfaces, resulting in uneven glaze coverage. In addition, the trims require special stands (called "kiln furniture") to hold them in place during firing. These supporting pieces change the

interior conditions of the kiln, changing the firing conditions as well as preventing the trim from being fired with the corresponding field tile. As a result, a perfect match is highly unlikely.

III. Types of Tile and Their Uses

A. Types of Tile

1. White Body Tile

White body tile is a fairly soft, very absorbent tile that is used primarily for walls. The standard 4-1/4" X 4-1/4" tile is a white body tile.

2. Porcelain Tile

Porcelains are made from a fine-grained clay that is strong, durable, and generally low in water absorption. Usually it is fired at extremely high temperatures, and can be glazed or unglazed. It can be excellent for both walls and floors.

3. Quarry and Pavers

Quarry and Pavers are usually a composition of a variety of clays that can range from soft to hard, absorbent to not, high fired to low fired. Because there is great variety in this category, specifications of each tile should be requested. Usually pavers are floor tiles used either outside or inside.

4. Glazed Floor Tile

Glazed floor tiles can vary greatly in their appropriateness for an installation. The clay composition can vary from Mexican red clay (very soft) to a very strong, dust pressed or extruded clay. The surface can be a high finish gloss or a dull matte. It is important to carefully evaluate both the glaze and the clay body when deciding if a glazed floor tile is appropriate for a particular installation.

5. Slip Resistant Glazed Floor Tile

A fairly recent innovation in the tile industry, these tiles combine the easier maintenance qualities of a glazed tile and the safety of a slip resistant tile. A grit is added to the glaze to create a hard, rough-surface tile that is excellent for both interior and exterior floors. Often these tiles are easier to maintain, and have a greater co-efficient of friction than the previously preferred unglazed porcelains or pavers.

B. Deciding What to Specify

1. Suitability

Whether a tile will hold up in any particular installation is a function of many factors. Several of these we have already discussed; among them the type of clay used, firing temperature,

glaze (if any), and finish. Aesthetics come into it also, of course.

Of primary importance is a clear evaluation of the requirements and demands of the installation itself. Location, use, traffic, weather exposure, anticipated maintenance, and desired longevity are among the factors to be evaluated. The frequently used categories of "commercial" and "residential" are, at best, guidelines to help in the selection of a tile. A tile labelled "residential" may hold up better in an office bathroom core than in a residential playroom by the beach. It is essential to evaluate the client, their use patterns, the installation method, and the aesthetics. This information can then be discussed with the qualified tile representative in order to make a knowledgeable assessment of the suitability of a particular tile.

2. Availability

It does little good to specify tile only to find out that it is not available when it is needed. Even if you specify only "stock" items, there is the possibility that the item, or one of the trims that goes with it, will be temporarily out of stock when needed. This is especially true during busy times like the present. Tile factories all over the world are quite busy, increasing lead times and causing shortages. Part of the selection process should be checking availability. It is the supplier's responsibility to give you the best information possible about availability; however, the more details you give the supplier the more accurate they can be. Critical among these details is <u>when the tile will be needed.</u> Many times when we get an inquiry we are only asked if a certain quantity of field tile is in stock. The vital information does not stop there. Stock on trims, decoratives and accents should also be checked.

With some jobs, (depending on size, time and tile used), a special order may be not only helpful, but necessary. In this case, the lead time may vary going into months, and the order must be as accurate as possible. Once the order is placed, a reasonable estimate of the delivery date can be given.

3. Budget

When pricing out a tile job it is important to take into consideration not just the price of the field tile, but also the price of all the trim to be used. A designer needs to make a very realistic evaluation of the client's budget, and be able to accurately estimate the needs and cost of the job.