

# Technical Specifications

## *Water Absorption - ASTM C373*

Water absorption is the measurement of density, porosity and specific gravity of a product. It is used as a tool for identifying structural properties of the body of tile, which may be required to determine use in an application. Tiles are classified according to water absorption percentages as follows:

Impervious tile:	≤5%
Vitreous tile:	>.5% - ≤3%
Semi-vitreous tile:	>3% - ≤7%
Non-vitreous:	>7% - ≤20%

## *Breaking Strength - ASTM C648*

Breaking strength is measured by applying force to an unsupported portion of a tile until breakage occurs. The results are expressed in lbf (pounds of force). This test covers the determination of the breaking strength of glazed and unglazed porcelain and ceramic floor tile, wall tile, mosaic, quarry tile and paver tile. Ceramic tiles used on floors and walls must be able to withstand the expected load bearing capacity of various installations and must meet >250lbf to be considered suitable for floor use.

## *Chemical Resistance - ASTM C650*

The test is intended for tile that will be used for lavatories, food counters or similar residential, commercial or medical installations. A tile sample is placed in continuous contact with a variety of chemicals for 24 hours, rinsing the surface and then examining the surface for visible variation. These results are typically measured as a pass or fail test.

## *Freeze Thaw Cycling - ASTM C1026*

The freeze thaw cycle test measures the tile's resistance to various stages of freeze cycles. The first step involves soaking the tile in water using a vacuum method to ensure its pores are properly saturated before it is subjected to freezing temperatures. The tile is then monitored for failures. As water expands when it freezes, tiles that are not suitable will show stress cracks or simply break apart. These results are typically measured as a pass or fail test.

## *Abrasion Resistance - ASTM C1027*

Abrasion resistance measures the visible surface abrasion of glazed porcelain and ceramic, glazed quarry and glazed mosaic by subjecting the test specimen to a rotating abrasion wheel. This test is monitored for failures after a certain number of cycles. Below is the classification for this test:

- O: Wall use only- 100 rotations
- I: Residential, light traffic- 150 rotations
- II: Residential, medium to light traffic- 600 rotations
- III: Residential, heavy traffic; Commercial, light traffic- 750-1,500 rotations
- IV: Commercial, considerable traffic- 2,100-12,000 rotations
- V: Commercial, heavy traffic- >12,000 rotations plus dye test

\*Deep Abrasion ASTM C1243 must be used for unglazed products

## *Deep Abrasion Resistance - ASTM C1243*

Deep Abrasion resistance measures the volume removed from an unglazed tile that is subjected to a rotating abrasion wheel. Below is the classification for this test:

- Class 1: Pressed, extruded, other with <0.50% water absorption - maximum loss 175mm<sup>3</sup>
- Class 2: Pressed with >0.50%-3.0% water absorption - maximum loss 225mm<sup>3</sup>
- Class 2: Extruded, other with >0.50%-3.0% water absorption - maximum loss 275mm<sup>3</sup>
- Class 3: Pressed with >3.00%- 7.00% water absorption - maximum loss 345mm<sup>3</sup>
- Class 3: Extruded, other with >3.00%- 7.00% water absorption - maximum loss 393mm<sup>3</sup>
- Class 4: Extruded, other with >7.00%-20.00% water absorption - maximum loss 2,365mm<sup>3</sup>
- Class 4: Pressed with >7.00%-20.00% water absorption - maximum loss no requirement

## *Scratch Hardness - MOHS Scale*

Scratch hardness is the tile's surface resistance to scratching by different minerals, the softest being talc (1) and the hardest being diamond (10). The MOHS scale of hardness is the most common method used to rank gemstones and minerals.

### *Dynamic Coefficient of Friction (DCOF) - ANSI A137.1*

The coefficient of friction measurement is an evaluation of a tile surface under known conditions using a standardized sensor material. It provides a useful comparison of tile surfaces, but it does not predict the likelihood a person will or will not slip on a tile surface. DCOF (Dynamic Coefficient of Friction) specifically tests the friction of an object that is already in motion (kinetic).

The BOT3000 (Binary Output Tribometer) and BOT3000E are machines that run approximately 8" across a surface, measure the DCOF of the tile and provide a digital reading with the results. Because these machines are automated, they are able to objectively measure the slip resistance and most importantly, provide repeatable results. ANSI A137.1 recommends, but does not require, a wet result of 0.42 or greater for interior surfaces that are intended to be walked on wet.

### *Glazed Porcelain*

Glazed porcelains are manufactured to have superior breaking strength, scratch, wear, dirt and water resistance. Porcelains are a type of ceramic with a much more refined body and are dry pressed. The body of a porcelain has a <0.50% water absorption rate while the glaze applied to the surface of the tile is impermeable. All porcelain tiles are fired in a kiln just like ceramics but they are fired under higher heat for longer periods of time and under pressure, which adds to the density and durability of the tile.

### *Glazed Ceramic*

Glazed ceramics offer stain and moisture resistance compared to most unglazed clay products. Ceramic tiles are made from a combination of clays, polymers and fine powders such as, sand and feldspar. The body of a ceramic is often referred to as a "bisque" or "clay." Ceramics have either a red or white body, which is typically determined by the region the clay was mined from. The body of a ceramic has a >0.50% water absorption rate, while the glaze applied to the surface of the tile is impermeable after firing, making it a low maintenance and durable wall or flooring surface.

### *Glazed Body Match*

Glazed products typically have a white or red body, however, a glazed body match tile has a tinted body to match the top glaze color. With glazed porcelain and ceramic tiles, the hardness and abrasion resistance of the glaze will determine product suitability for a particular application. If the body matches the glaze, chips and scratches will not be as evident making a colored body more desirable.

### *Through-Body*

Through-body porcelains are unglazed and exhibit the same color and pattern all the way through the tile. The pressed dry powder method is also known as Single Charging. During this process, fine powders are colored during the pressing stage of production and the pigments are consistent throughout the body of the tile. Through-body porcelain tiles are typically very dense, extremely durable and desirable in applications subject to heavy abrasion. The advantage to using through-body products is the ability to bullnose custom trims on site and ability to buff out any light scratching.

### *Soluble Salt Porcelain*

Soluble Salt porcelain is a through-body porcelain product in which chemicals are applied using various silk screens or sprayers prior to firing. Metal oxide salts react with the porcelain body, resulting in various colors. This topical treatment is not considered a glaze; the surface coloring is achieved through a reaction of chemicals on the surface, triggered during the firing stage.

### *Double Loaded*

Double Loaded, also known as Double Charging, is formed by fusing two layers of porcelain together. The base layer of porcelain is bonded to an aesthetic top layer where the coloring is already infused into the micro-powders. Once these two layers are pressed together, they are fired to form one solid tile. No glaze is applied to the top surface. These tiles can often be bullnosed just like a through-body as the top and bottom layers are similar in color. The thickness of the top layer is significant enough where the performance characteristics would be the same as a through-body tile.

### *Shade Variation*

Shade variation is the tile's range from complete inconsistency to a more random appearance. Below is an overview of color and shading of individual tile selections.

- V0 - Monochromatic - Very uniform, monochromatic color
- V1 - Low - Consistent color within each tile and from tile to tile
- V2 - Medium - Color variation within each tile
- V3 - High - Some variation from tile to tile, and within each tile
- V4 - Random - Considerable variation from tile to tile

