Product Testing and Attributes

In order for a tile to be considered for a particular application, various test results must be considered in addition to defining its final use. Usage charts are provided as a general guide only. Actual job site conditions may change a product's suitability for a specific application. If special conditions apply; an Emser Tile® representative should be consulted prior to material selections. All testing is conducted in a lab environment and represents the specific specimens being tested. New production runs, actual jobsite conditions, as well as the handling and installation of products may alter the performance results. For the most current testing results and application usage guide please visit our website at emser.com. The testing and information that should be looked at prior to making selections are as follows:

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 the tile that may be required to determine use in a given application. Tiles are classified according to water absorption percentages as follows:

Impervious tile:	≤0.5%
Vitreous tile:	>0.5% - ≤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 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 tiles, wall tiles, mosaics, quarry tiles, and paver tiles. Ceramic/Porcelain 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. This is a very different measurement of force than PSI and there is no direct conversion of pounds of force to pounds per square inch.

Chemical Resistance - ASTM C650

The chemical resistance 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.

Freeze Thaw Cycling - ASTM C1026

The freeze thaw cycle test measures a 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 reported as a pass or fail.

Scratch Hardness - MOHS Scale

Scratch hardness is the tile 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 according to hardness.

Abrasion Resistance - ASTM C1027

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

0: 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:

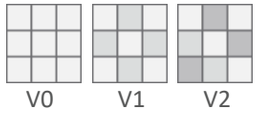
Class 1: Pressed, extruded, other with <0.50% water absorption - maximum loss 175mm3 175mm3
Class 2: Pressed with >0.50%-3.0% water absorption - maximum loss 225mm3
Class 2: Extruded, other with >0.50%-3.0% water absorption - maximum loss 275mm3 Class 3: Pressed with >3.00%- 7.00% water absorption - maximum loss 345mm3
Class 3: Extruded, other with >3.00%- 7.00% water absorption - maximum loss 393mm3 Class 4: Extruded, other with >7.00%-20.00% water absorption - maximum loss 2,365mm3 Class 4: Pressed with >7.00%-20.00% water absorption - maximum loss no requirement

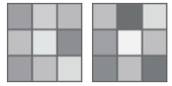
Dynamic Coefficient of Friction - ANSI A137.1 and A326.3

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 BOT3000E (Binary Output Tribometer) is a machine that runs approximately 8" across a surface, measures the DCOF of the tile and provides a digital reading with the results. Because this machine is automated, it objectively measures the slip resistance and most importantly provides 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. If the surface is not intended to be walked on wet then a different value may be specified. Some surfaces intended to be walked on wet should be >0.60 depending on final traffic type and use, so specification of ">0.42" may not be sufficient. Although there are no ADA or OSHA benchmarks for DCOF values in the current guidelines and codes for interior applications, Emser recommends a DCOF of 0.50 or greater for covered exterior floor applications as well as interior commercial dining areas due to the presence of grease, water and other contaminants. Emser also recommends that all exposed exterior floors that will be walked on wet meet 0.60 DCOF. If the floors will not be walked on when wet then a lower DCOF may be suitable. There is no direct conversion of ANSI DCOF values to European ISO R-values, however a comparison range can be provided by request.

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

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. A colored body is more desirable in case the tile chips or scratches and the color of the body becomes exposed. If the body matches the glaze, chips and scratches will not be as evident.

Through-Body/Unglazed

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.

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 bull nosed 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.

Pacific Rim™ •