



What's Different About Testing Glass Tiles?

From the more practical viewpoint of a tile manufacturer or tile installer, there are significant differences between glass and ceramic tiles. Glass is a ceramic; therefore, by strict definition glass tiles are indeed ceramic tiles. Let's take a brief excursion into material science-based definitions.

1) How do glass tile differ from ceramic tile?

Conventional ceramic tile made from traditional materials including silica, clay and feldspar, upon firing, develop a microstructure consisting of crystalline phases (having orderly, repeating arrays of atoms) bound together by a glassy phase made of a melted and solidified combination of raw materials. Glass tiles are made basically of completely melted and solidified raw materials (usually not the same as those in ceramic tile).

For example, window glass is made of a fused mixture of sodium, calcium and silicon oxides. Another common glass composition family contains boron oxide.

Glass has no orderly long-range repeating atomic structure. It is this difference that allows glass to soften over a wide temperature range and not have a sharp melting point as does a pure crystalline solid. Glass is known for its brittleness, relatively low scratch resistance and higher thermal expansion than ceramic (tiles). Glass tile can be colored through-body or can be colored by a back surface treatment that is usually protected by a thin organic layer. Ceramic tiles usually present a back surface

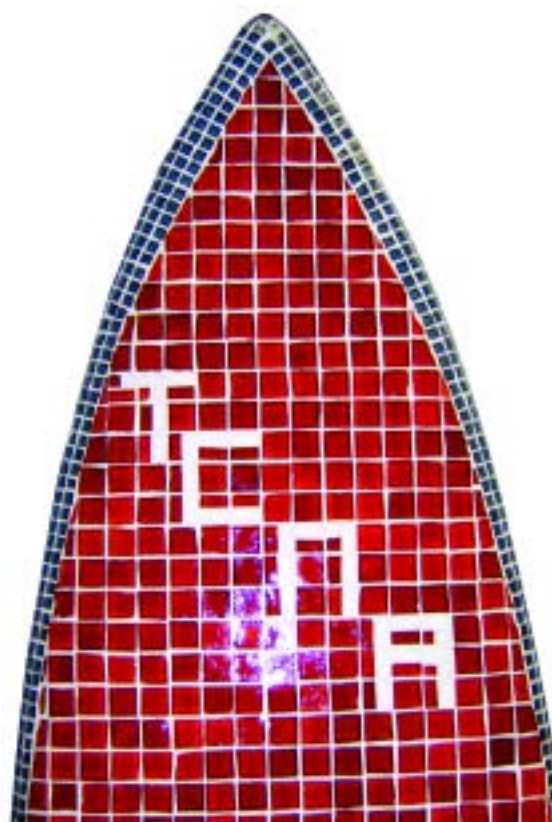
that is somewhat "rough" and conducive to bonding to Portland cement-based thin-set mortars. Conversely, glass tiles usually contain no open porosity and can be more of a challenge to bond to thin-set mortar.

2) The standard A137.1-1988 defines ceramic tile and associated minimum property requirements. Does it apply to glass tile?

The direct answer is, no. Neither A137.1-1988, nor the soon-to-be-issued revision, includes glass tile. However, the encouraging news is that an effort is underway to prepare a parallel document to A137.1 for glass tile. It will be A137.2. People interested in working on this project should contact TCNA for more information.

The specification for glass tile is likely to be divided into sections respectively reflecting three forming methods used to manufacture glass tiles. The methods

Glass tile is available in a huge range of colors and textures. In this picture, a surfboard was tiled in glass mosaics and donated to the Tile Council by a member.



are: 1) Cast (hot) at 1600°F or above; 2) Fused (warm) in the range of 1200°F to 1599°F; and 3) Cold at temperatures less than 1200°F.

Each forming method provides unique opportunities to vary color/luster, surface finish, coefficient of friction, etc. Additionally, glass specifications are likely to be segmented based upon the facial dimensions of the tile. For example, mosaic tiles are often quite thin and can be smaller than 1/2-inch square. Conversely tiles intended for floor or wall applications could have facial dimensions as large as 8 or 12 inches (or even larger). The apparatus needed to test such disparate sizes is often not useful for both, so property values must be set according to the testing device.

3) What differences in setting practices are necessary for glass tile?

Glass tile's translucency or transparency presents challenges to the tile setter in

that materials and techniques used to set glass tile should not detract from the colorful beauty of the glass tile. Manufacturers of setting adhesives and grouts provide materials formulated for installing glass tile and careful attention must be paid to their installation recommendations. Besides guidelines from glass manufacturers and installation material manufacturers, one should also refer to the TCNA Handbook and three recent American National Standards for installing glass mosaics.

4) What particular challenges exist in adopting specifications for glass tile?

Challenges that must be addressed include:

Small-sized mosaics (<1 inch square) require special care. TCNA's laboratory designed and built a mini-dimension table that allows gauging dimensions of glass mosaics down to <1/2 inch square.

Light transmission and light reflectivi-

ty are often legislated in building codes for certain installations. While this can also apply to ceramic tile, it more often comes up in specifications for glass tile projects. TCNA's laboratory recently purchased a sophisticated spectrophotometer capable of a wide range of reflectivity and color measurements to help address this issue.

In pool applications, water and pool chemicals might cause visual variations that are unpleasing to the eye. Thus, chemical attack is an important parameter to assess.

Because smooth glass can be slippery when wet, COF specifications will be an important point for discussion in the standards setting process. Manufacturers can adjust the surface properties of their tiles for improved traction in floor applications, so a means for comparing and evaluating such changes is quite important. This method must also measure the beneficial traction effect from the grout joints in mosaics.



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5) What are the tests most commonly performed on glass tiles by TCNA's Product Performance Testing Laboratory?

It was stated above that there are at this time no specially designed ANSI test standards and associated minimum values for glass tile properties. Consequently, it is necessary to use established ASTM and ANSI tests developed for conventional ceramic tiles and installation materials when testing glass tiles. TCNA's laboratory has routinely performed the following tests on glass tiles.

- ASTM C648: Breaking Strength
- ASTM C1026: Freeze/Thaw
- Mohs' Scratch Hardness
- ASTM C373: Water Absorption
- ASTM C484: Thermal Shock Resistance
- ASTM C650: Chemical Resistance
- ASTM C1027: Abrasion Resistance
- ASTM C1028: Static Coefficient of Friction



About the Author

Virgil (Sonny) Irick is Director of Laboratory Services for Tile Council of North

America's Product Performance Testing Laboratory. He is responsible for testing of tile, stone, adhesives, grouts and membranes to ASTM, ANSI and ISO standards. Additionally he directs development of non-standard tests for solution of raw materials and processing problems, analyses of special chemical and microstructural problems, etc. Dr. Irick earned B.S. and M.S. degrees in ceramic engineering from Clemson University and a Ph.D. in ceramic engineering from The Ohio State University.

6) What can one expect for glass tile standards in the near future?

Beautiful glass tile installations have existed for well over 1,500 years. Clearly, on one hand, glass technology and installation methods are well established. However, with the proliferation of new methods of manufacture, new installation materials, and new installation tech-

niques, there are also many improvements still occurring in our industry. However, there are also failures pointing to the need for standards regarding both the manufacture and installation of glass tile. We fully expect that these standards will be developed and we look forward to their adoption by the international glass tile community. **TILE**

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