



## Is It Really Porcelain?

Over the last 20 years, we have seen many improvements in the production of porcelain tile. As a result there has been a large increase in the amount of porcelain tile that is available to consumers. Though once it represented only a small percentage of the total ceramic tile sales in the United States, some estimate that it now represents more than 50 percent of all U.S ceramic tile sales. In fact, the word “porcelain” has developed a cachet unto itself.

Not all consumers have a complete understanding of what porcelain tile actually is. Although the term “porcelain” has been clearly defined domestically for more than 20 years, the word “porcelain” has not been defined very clearly overseas. For example, ISO 13006, the specification for ceramic tile as designated by the International Standards Organization (ISO), identifies a specific class of ceramic tile with qualities similar to the American specification for porcelain tile, but the

word “porcelain” does not appear. Perhaps because of the product’s increasing popularity, along with the fact that the word “porcelain” is not defined in ISO specifications, we know some marketing and sales campaigns have taken inappropriate liberties when describing their tile, calling it “porcelain” when it did not meet the American requirements.

### What is the definition of porcelain tile?

When asked to define porcelain tile, most ceramists would consider the following material-based definition: a tough white body containing any triaxial combination of quartz, clay, and feldspar that is fired at temperatures ranging from 1200-1400°C. Many porcelain tile products fit this description; however, the ceramic tile industry has a broader definition, one that generally describes porcelain as being any ceramic tile that is impervious, regardless of composition. Often, porcelain tiles are formed by pressing light-colored clay that contains minimal impurities and are rich in kaolinite. However, porcelain tile can also be extruded, and can even consist of red clay, so long as the water absorption of the fired product is less than 0.5%.



**More rigorous than the prescribed ISO test method, ASTM C373 requires a rapid five-hour boil followed by a 24-hour soak.**

## What test procedures are used to evaluate water absorption?

There are two very common test protocols for measuring the water absorption of ceramic tile. In the United States, we refer to the test procedure ASTM C373 “Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products,” as designated by the American Society for Testing and Materials (ASTM). The other common test procedure is ISO 10545-3 “Determination of water absorption, apparent porosity, apparent relative density and bulk density,” as designated by the International Standards Organization (ISO).

ASTM C373 involves the testing of five specimens that weigh at least 50g and have as many freshly fractured surfaces as practical. These are usually 3” x 3” specimens that are each removed from the centers of individual pieces of tile and dried in a laboratory oven to constant mass. The test specimens are then subjected to a five-hour boil, followed by an additional 24-hour water soak. The percent water absorption is calculated as a function of the specimen’s weight difference prior to and after water submersion.

ISO 10545-3 is a test method for measuring water absorption via the option of two different water impregnation techniques: boiling and vacuum immersion. The boiling method involves the testing of 10 whole tiles (as opposed to five portions of tiles in the ASTM procedure) that are dried to constant mass and subjected to a two-hour boil followed by an additional four-hour water soak (as opposed to a five-hour boil followed by a 24-hour water soak in the ASTM procedure). Just as in ASTM C373, water absorption is calculated as a function of the specimen’s weight difference prior to and after water submersion. The other impregnation technique, vacuum immersion, was established for purposes of measuring apparent porosity and apparent relative density, and can also be used as a “quick-check” alternative for measuring water absorption. However, the boiling

method is the primary technique that is referenced by all ISO product classifications and specifications.

## Which test procedure is appropriate?

In the United States, we use ASTM C373 for the determination of water absorption per ANSI A137.1 American National Standard Specifications for Ceramic tile. The procedure is more rigorous than the

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ISO test in that it requires a longer boil, prolonged water exposure, and fractured specimen edges.

Although the ISO test procedure is used very frequently in Europe and in many parts of the world, we understand that the test method, with a six hour combined boil and soak time, was developed because of concerns that the ASTM procedure took too long and did not allow laboratories to complete the test in an eight hour work day. However, it is well known that the ISO test procedure does not allow test specimens to saturate to full capacity at times, and can under-report the open porosity of a tile. In many cases, tiles that reside on the very threshold of meeting the 0.5% water absorption requirement for porcelain tile have

failed using the ASTM procedure and inaccurately passed using the ISO procedure. While we are all interested in a method that can save time and energy, the consensus of the American tile industry is to use the test method that more accurately describes a tile’s true water absorption (i.e. ASTM C373).

## What steps are being taken to certify true porcelain?

The Porcelain Tile Certification Agency (PTCA) has been established to test tiles for water absorption, and certify ones that meet the water absorption criteria of true porcelain tiles. This agency was developed via the efforts of the Ceramic Tile Distributors Association (CTDA) in conjunction with the Tile Council of North America (TCNA). The program will launch in the near future, and products that are certified will be allowed to display a unique PTCA “Certified Porcelain” logo on boxes and in corresponding literature. As manufacturers and importers embrace and participate in this program, we expect consumers will become more aware of the requirements for porcelain tile. In turn, we hope this reduces the number of tiles that are falsely identified. **TILE**



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### About the Author

Bill Griese, Laboratory Engineer for the Tile Council of North America’s

Product Performance Testing Laboratory, is responsible for testing tile and installation materials to ASTM, ANSI and ISO standards. He is involved in the development and revision of ASTM, ISO, and ANSI product standards. Griese earned a Bachelor of Science degree in ceramic and materials engineering from Clemson University in Clemson, SC.