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2022
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The advertisements in this issue come from the Elite, Signature, and Platinum level sponsors of the Ceramic Tile Education Foundation (CTEF). Their generous donations enable the administration and growth of CTEF’s educational and certification programs for tile installers and other tile industry professionals. These programs benefit the construction industry and tile-consuming public by facilitating a higher level of craftsmanship in tile installation and a means of identifying qualified installers in the trade. For more information, visit www.tilecareer.org. All of the funds received go directly to CTEF with the cost of printing donated by the Tile Council of North America (TCNA), publisher of the TCNA Handbook.
ANSI A326.3, the American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials, was first published in 2017 to describe the test method for measuring dry or wet dynamic coefficient of friction of hard surface flooring materials in the laboratory or in the field. In 2021, ANSI Accredited Standards Committee A108 voted to incorporate five product use classifications into the standard to provide manufacturers with a standardized framework to communicate product use based on slip resistance.

Dynamic coefficient of friction (or “DCOF”) measurements have been used to provide insight into the slip resistance of materials for decades. While DCOF measurements continue to be utilized today, and are useful to provide a comparative assessment of flooring, understanding slip resistance and anticipating appropriate product use requires additional considerations. Taking this into account, the ANSI Accredited Standards Committee (ASC) A108 developed a five-category product use classification system in ANSI A326.3. Product use classification is intended to provide specifiers, designers, and architects with information on where products may be used based on slip resistance parameters. Crucially, the system allows for manufacturer-declared classifications to be made based on criteria including and in addition to DCOF measurements.

Criteria for the New Product Use Classification System

The criteria for all five categories are summarized in ANSI A326.3 Table 1; two categories incorporate DCOF criteria as measured per the A326.3 test method, while the majority require manufacturer declarations based on internal selection criteria. Manufacturers can consider a wide range of traction-related parameters for their internal criteria, such as experience with similar surfaces, presence of surface structure or abrasive elements, and results from different test methods used to help evaluate surface traction (e.g., ANSI A326.3, DIN 51130, and BS 7976).

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1 ANSI A326.3 defines DCOF as the ratio of the force necessary to keep a surface already in motion sliding over another surface divided by the weight (or normal force) of the sliding object. Different contaminants such as dirt, water, soap, oil, or grease can change this value.

2 ANSI ASC A108 develops standards which define the installation of ceramic, glass, and stone tiles and panels as well as the test methods, physical properties, and sustainability of ceramic, glass, stone, and other hard surfaces, and related installation materials.

3 DIN 51130 is a German standard with the title translated as Testing of floor coverings; determination of the anti-slip properties; workrooms and fields of activities with slip danger; walking method; ramp test. The method requires that human subjects, wearing standardized footwear and a safety harness, walk on an increasingly inclined flooring material until a slip occurs.

4 BS 7976-2 is a British standard titled Pendulum testers – Method of operation. It is part of a series of standards and specifies a method of operation for the pendulum-type floor tester.
The new language in ANSI A326.3 on manufacturer-declared product use classifications, found in Section 3.4, is as follows:

Manufacturer shall declare product use classification based on manufacturing parameters, internal quality control criteria, their experience with similar surfaces, and the criteria in this standard for all surfaces classified under Sections 4.1.3, 4.1.4, and 4.1.5, mosaic surfaces, and flooring where surface structure (e.g., three-dimensionally patterned or profiled surfaces) results in misleading DCOF measurements due to test device constraints. Optionally, surfaces classified under Section 4.1.2 shall also be permitted to be manufacturer-declared. Hard surface flooring manufacturer shall define internal product selection criteria (for example, but not in limitation, DCOF limit values established using this test method or other test methods, internal reference standards and practices, and/or the presence of abrasive grain and/or surface structure) for each product where the manufacturer-declared product use classification is not based on DCOF criteria developed per this standard. Regardless of declared product use classification, specifier shall determine materials appropriate for specific project conditions, considering by way of example, but not in limitation, type of use, traffic, expected contaminants, expected maintenance, expected wear, and manufacturers’ guidelines and recommendations.

The 0.42 DCOF threshold limit in Table 1 applies to the BOT 3000E device; devices being used as equivalent may have different threshold limit values, which shall be independently correlated to those values determined with the BOT 3000E, and independently derived precision statements which shall be provided by the device manufacturer.

This five-category system is similar in concept to the German work premises rule BGR/GUV-R 181, which provides product use examples based on “R” values (ranging from R9 to R13) derived from the German DIN 51130 standard. Examples of work premises with corresponding DIN 51130 “R” values are provided in Table 2. However, unlike the German work premises rule, the new A326.3 product use classification system allows for criteria that do not rely on a single test method; this is beneficial for materials that have complex surface texture, profiling, and/or patterning.

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Table 1: Product Use Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Reference Category</th>
<th>Criteria</th>
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<tr>
<td>Interior, Dry</td>
<td>ID</td>
<td>≥ 0.42 dry DCOF* (per Section 10.1)</td>
</tr>
<tr>
<td>Interior, Wet</td>
<td>IW</td>
<td>≥ 0.42 wet DCOF* (per Section 9.1) or Manufacturer-Declared</td>
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<tr>
<td>Oils/Greases</td>
<td>O/G</td>
<td>Manufacturer-Declared</td>
</tr>
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5 BGR/GUV-R 181 (Rules on Occupational Safety and Health), Floors in working rooms and working areas subject to a risk of slipping, October 1993.
Just as Table 2 from the German criteria in BGR/GUV-R 181 provides examples of work areas for each “R” value, each A326.3 product use classification lists possible areas of use. For example, possible areas of use for products classified as “Interior, Dry” include, but are not limited to, indoor shopping malls (excepting food courts), hotel lobbies, office buildings, and showrooms.

At the other end of the scale, possible areas of use for products classified as “Oils/Greases” include, but are not limited to, level areas regularly exposed to automotive fluids, “back of the house” fast food or family style restaurants, and food preparation areas with grills or deep-fry equipment.6 While the provided possible areas of use are intended to guide the specifier (i.e. the person choosing the flooring), it is ultimately the responsibility of the specifier to make the project-specific selection.

Per A326.3, “regardless of declared product use classification, specifiers shall determine materials appropriate for specific project conditions, considering by way of example, but not in limitation, type of use, traffic, expected contaminants, expected maintenance, expected wear, and manufacturer’s guidelines and recommendations.”

Putting the Standard into Practice

Since its publication in 2017, ANSI A326.3 has been widely used and specified throughout the ceramic tile industry and for many other hard surfaces. Both domestic and overseas tile manufacturers already report DCOF for their products according to ANSI A137.17, which references A326.3, with some including the information directly on packaging and others providing the information in product literature. It is expected that product use classifications will soon become widely available, which will provide designers, architects, and other specifiers, and consumers in general, with information from the manufacturer to help choose appropriate hard surface flooring products, ultimately benefiting all end-users of flooring through better choices and fewer slip and fall injuries.

For more information on the ANSI A326.3 standard, its publisher, TCNA, offers the standard free of charge on the TCNA website.

For information regarding the adoption of ANSI A326.3 into building code regulations, please see the TCNA Bulletin, “Measurable Code Criteria for Slip-Resistant Surfaces Around Pools, Spas, and Hot Tubs” later in this publication.

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6 Refer to ANSI A326.3 Product Use Classification section for more information on each classification and their corresponding possible areas of use.

7 ANSI A137.1 is titled American National Standard Specification for Ceramic Tile. It describes the normally available sizes and shapes of ceramic tile: the physical properties of Standard Grade and Second Grade Ceramic Tile, Decorative Tile and Specialty Tile; the basis for acceptance and methods of testing prior to installation; the marking and certification of ceramic tile; and the definitions of terms employed in these [A137.1] specifications.
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In 2021, the Uniform Swimming Pool, Spa & Hot Tub Code (USPSHTC), published by the International Association of Plumbing and Mechanical Officials (IAPMO), established for the first time, measurable criteria for slip-resistant surfaces around pools, spas, and hot tubs. Similarly, the International Code Council’s (ICC) International Swimming Pool & Spa Code (ISPSC) Committee voted unanimously to accept language requiring friction testing for products deemed to be “slip-resistant.”

Introduction to the USPSHTC

According to IAPMO, the USPSHTC establishes “minimum requirements and standards for the protection of the public health, safety, and welfare.” It is relevant to “the design, construction or installation, repair or alterations of swimming pools, spas, and hot tubs,” and “is available for adoption and use by jurisdictions in the United States and internationally. Its use within a governmental jurisdiction is accomplished through adoption by reference in accordance with applicable jurisdictional laws.”¹ Prior to the publication of the 2021 edition, the USPSHTC did not include any quantitative threshold related to slip resistance, nor did it provide code officials, inspectors, specifiers, or other users with any criteria to assess walkway surfaces that are intended to be slip-resistant.

Changes to the USPSHTC

In the summer of 2019, a Slip-Resistance Task Group comprised of technical experts representing a variety of industries and fields was formed to draft recommended code revisions to standardize the specification of slip-

¹ Refer to the 2021 USPSHTC, viewable for free on IAPMO’s website, for more information.
resistant walkway surfaces and address the applicability of such surfaces in swimming pool, spa, and hot tub applications. The group, chaired by Tile Council of North America’s (TCNA) Director of Standards Development and Sustainability Initiatives, developed updates to the code language that were accepted by the IAPMO Technical Committee in 2020 and subsequently approved for inclusion in the 2021 USPSHTC.

The new USPSHTC criteria for slip-resistant walkway surfaces contain the following provisions:

1. A required wet dynamic coefficient of friction (DCOF) value of no less than 0.42, for level walkway surfaces intended to be walked upon when wet, as determined in accordance with the ANSI A326.3 standardized test method.

2. An angle-corrected minimum DCOF requirement for inclined/sloped walkways, which require greater available friction to prevent slipping.

3. For three-dimensionally patterned or profiled surfaces, testing shall be conducted on a nominally flat section (i.e., a non-profiled, non-patterned section) of such walkways. Where that is not possible, the specifier must provide documentation substantiating the product choice.

An appendix is also provided in the code with additional information regarding the determination of DCOF values for hard surface walkways intended to be slip-resistant.

**Introduction to the ISPSC**

According to the ICC, the ISPSC establishes “minimum regulations for public and residential pools, spas, and hot tubs using prescriptive and performance-related provisions.” Similar to the USPSHTC before 2021 (i.e., prior to the new language discussed above), the ISPSC did not include any quantitative threshold related to slip resistance, nor did it provide code officials, inspectors, specifiers, or other users with any criteria to appropriately assess walkway surfaces that are intended to be slip-resistant.

**Changes to the ISPSC**

In 2021, the ISPSC Committee voted unanimously to accept language proposed by TCNA and the Pool and Hot Tub Alliance (PHTA) requiring testing per A326.3 or AS 4586 for products deemed to be slip-resistant.

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2 AS 4586 is an Australian standard titled Slip resistance classification of new pedestrian surface materials. It provides a classification rating system ranging from P0 to P5 (see Table 2 of AS 4586), each of which correspond to a defined measurement range using a pendulum tester.
MEASURABLE CODE CRITERIA FOR SLIP-RESISTANT SURFACES AROUND POOLS, SPAS, AND HOT TUBS

The language shown below will appear in the next revision of the ISPSC occurring in 2024.

Slip resistant. Decks, ramps, coping, and similar step surfaces shall be slip resistant and cleanable. Where surfaces are evaluated for slip resistance, such surfaces shall have, when tested wet, a minimum pendulum slip rating classification of P4 if tested in accordance with AS 4586 or a minimum Dynamic Coefficient of Friction (DCOF) of 0.42 if tested in accordance with ANSI A326.[3.] The design professional shall determine the appropriate classification and level of slip resistance necessary based on surface type, placement environment, and pedestrian traffic. Special features in or on decks such as markers, brand insignias, and similar materials shall be slip resistant. [Ed. correction shown in brackets]

Background on ANSI A326.3

For information on ANSI A326.3, please see bulletin “New Product Use Classifications for Hard Surface Flooring” earlier in this publication. Although such product use classifications have not yet been adopted into the codes discussed above, they can be used for product choice substantiation when needed.

Additional Information and Websites

For more information on the code language on slip-resistant walkway surfaces in the USPSHTC, consult Section 314.0 of the 2021 edition on the IAPMO website.

For more information on the ISPSC, refer to the ICC website.

For more information on the ANSI A326.3 standard, its publisher (TCNA) offers the standard free of charge on the TCNA website.

Going beyond the codes . . . other important slip-resistance factors

To further address the complicated issue of slip-resistance, it is important that specifiers are aware of many different factors not addressed by standardized product testing that will affect the slip resistance an individual experiences. Referencing ANSI A326.3:

“There are many factors that affect the possibility of a slip occurring on a surface, including, by way of example, but not in limitation, the following: the material of the shoe sole and the degree of its wear; the presence and nature of surface contaminants; the speed and length of stride at the time of a slip; the physical and mental condition of the individual at the time of a slip; whether the floor is flat or inclined; how the hard surface flooring material is used and maintained; … how the flooring surface is structured, and how drainage takes place if liquids are involved. Because many variables affect the risk of a slip occurring, the measured DCOF value shall not be the only factor in determining the appropriateness of a hard surface flooring material for a particular application.”

Simply stated, understanding how a space will be used and maintained, in conjunction with code criteria and specifications contained in ANSI A326.3, along with A326.3 DCOF and product use reporting by the manufacturer, allows the specifier to choose flooring for the intended use.
In addition to having a unique product standard (A137.3), gauged porcelain tiles and gauged porcelain tile panels/slabs require unique installation procedures and workmanship standards (A108.19 and A108.20).

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Submitted by Scott Conwell, 
International Masonry Institute

For the first time since the introduction of porcelain tile to the International Building Code (IBC) in 2009, the newest edition of IBC published in 2021 includes major changes to the requirements for exterior adhered porcelain tile. The new criteria for exterior tile were examined and developed by the International Masonry Institute (IMI), Tile Council of North America (TCNA), and manufacturers of tile and setting materials. Once consensus was reached, IMI and TCNA made a formal proposal to the International Code Council (ICC), publisher of the IBC, and testified at ICC’s public hearing on the new code criteria. ICC unanimously approved the proposal and has implemented its language into the 2021 IBC. The updated requirements are in response to the increased availability of larger, thinner porcelain tiles, improved technologies in bonding mortar, and the tile industry’s focus on qualified labor. These new code requirements will allow safe and more liberal use of large format adhered porcelain tile on exterior walls and will create unprecedented opportunities to use ultra-large format tile on building exteriors. The updated section from the 2021 IBC reads as follows in its entirety:

1404.10.2 Exterior adhered masonry veneers—porcelain tile. Adhered units weighing more than 3.5 pounds per square foot (0.7 kN/m²) shall not exceed 48 inches (1219 mm) in any face dimension nor more than 9 square feet (0.8 m²) in total face area and shall not weigh more than 6 pounds per square foot (0.29 kN/m²). Adhered units weighing less than or equal to 3.5 pounds per square foot (0.17 kN/m²) shall not exceed 72 inches (1829 mm) in any face dimension nor more than 17.5 square feet (1.6 m²) in total face area. Porcelain tile shall be adhered to an approved backing system.
Code requirements from 2009 through 2018

In 2009, porcelain tiles meeting ANSI A137.1 *American National Standard Specifications for Ceramic Tile* were typically manufactured to a thickness of 9/32–7/16 in. (7-11 mm), and were adhered with mortar manufactured in compliance with ANSI A118.4 *American National Standard Specifications for Modified Dry-Set Cement Mortar*. Due to safety concerns and recommendations of the tile industry at that time, the IBC limited the size of these relatively thick and heavy tiles to a maximum of 24 in. (610 mm) in any dimension, and a maximum area of 3 ft² (0.28 m²) for any one tile. Moreover, the IBC imposed the restriction that any one tile shall not weigh more than 9 pounds per square foot (0.43 kN/m²). By today’s standards these requirements seem overly restrictive, but they served the tile industry well in the last decade.

What factors have sparked the code changes?

The past ten years have seen major developments in the tile industry leading to the safe use of larger adhered porcelain tiles: the advent of larger and thinner tiles, the development of stronger mortars, and the increased focus on installer training and certification programs.

Larger, thinner tiles

Manufacturers of porcelain tile in North America and worldwide now have the technology to produce tiles that are significantly thinner and larger than tile manufactured in previous decades. Porcelain tiles manufactured to ANSI A137.3 *American National Standard Specifications for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs* are commonly 1/8–7/32 in. (3.5–5 mm) in thickness. Gauged porcelain tile (GPT) panels also frequently have facial dimensions nearly as large as 6 ft. x 12 ft. (1800 mm x 3600 mm in actual size). The thinner profile of these tiles results in units that remain relatively lightweight despite their ultra-large format.

Stronger mortar

Just as tile manufacturers were developing technology that would test the limits of tile size and thickness, setting material manufacturers were improving their products to provide more tenacious bond strength. ANSI A118.15 *American National Specifications for Improved Modified Dry-Set Cement Mortars* was approved as a new standard in 2014, establishing more rigid criteria for resistance to shear forces. For example, the required 28-day shear strength of mortar meeting ANSI A118.15, the standard recommended by most GPT panel manufacturers, is double the requirement for mortars meeting ANSI A118.4, at 400 psi (2.76 MPa) and 200 psi (1.38 MPa) respectively.
Industry’s focus on qualified labor

Finally, even with these tremendous improvements in materials, the tile setters, finishers, and contractors installing them must be qualified. Trained, skilled craftworkers and contractors are paramount to the success of any tile project, and when the public’s health, safety, and welfare are at stake, qualified labor is critical. The tile industry has made great strides in the last decade in expanding the delivery of longstanding programs like the apprenticeship and training program of the International Masonry Training and Education Foundation (IMTEF), which is the training arm of the IMI for union installers, and the Certified Tile Installer (CTI) program of the Ceramic Tile Education Foundation (CTEF) for union and non-union installers. Further, the Tile Contractors’ Association of America’s (TCAA) Trowel of Excellence certification and the National Tile Contractor Association’s (NTCA) Five Star certification establish credentials for best practice tile contractors. And for installers who aspire to be the most technically proficient in their field, the Advanced Certifications for Tile Installers (ACT) allow for installers to be assessed and certified in seven critical skill areas including the installation of large format tile (LFT) and GPT. Each of these qualified labor training and certification programs works closely with manufacturers of tile and setting materials to ensure that the skilled labor force is constantly kept up to date with the latest material and installation technologies.
The new code requirements in 2021

So how large a porcelain tile can now be adhered to a facade? To simplify the new code requirements, the criteria in the 2021 IBC may be summarized as follows:

For tiles greater than 1/4 in. (6 mm) thick, the maximum tile size is 9 ft² (0.84 m²), which in common tile sizes is 36 x 36 in. (915 x 915 mm) or 24 x 48 in. (610 x 1220 mm). Tiles of this thickness may not have any face longer than 48 in. (1220 mm).

For tiles less than or equal to 1/4 in. (6 mm) thick, the maximum tile size is 17.5 ft² (1.6 m²), which translates to 48 x 48 in. (1220 x 1220 mm) or 36 x 72 in. nominally (900 x 1800 mm in actual size). Tiles of this thickness may not have any face longer than 72 in.

Finally, while this update applies to large and ultra-large format tiles, it is important to remember that ceramic and porcelain tiles in traditional sizes have always been and continue to be allowed under the IBC for exteriors. With this code change, a design professional or owner can now specify these larger size tiles without submitting any special requests to the local building code official. If a design professional or owner wishes to install tiles that exceed these requirements, it may still be possible to do so by applying for a code variance with the authority having jurisdiction.

What’s next?

As states, provinces, and municipalities adopt the 2021 IBC, we encourage design professionals across North America to consider ceramic and porcelain tiles in all sizes for their benefits on exteriors as well as interiors. Their health benefits, durability, low maintenance, sustainability, and unlimited design aesthetics make ceramic and porcelain tiles the perfect choice for building facades, and it is now easier than ever to meet building code requirements and deliver a beautiful, healthy building.

Project: Perry’s Steakhouse
Architect: Aria Group
General Contractor: International Construction Inc.
Tile Contractor: Ready Tile
Craftworkers: BAC Local 21 Illinois
Photo credits: International Masonry Institute
Ceramic tile is defined as a ceramic surfacing unit, usually relatively thin in relation to facial area, having either a glazed or unglazed face and fired above red heat in the course of manufacture to a temperature sufficiently high to produce specific physical properties and characteristics according to the ANSI A137.1 standard. This relatively broad definition encompasses different types of ceramic tile, all of which collectively make up what is commonly known as the “ceramic tile family.”

The ceramic tile family includes:

- Porcelain tile
- Pressed floor tile
- Quarry tile
- Wall tile
- Mosaic tile
- Gauged porcelain tile (GPT)
- Specialty tile

While each of these tile subsets is ceramic tile and thus shares ceramic tile’s general benefits, they are each produced differently and may consequently have additional advantages that lend themselves to specific applications.

Porcelain tile, which according to census bureau data and estimates from the Tile Council of North America (TCNA), accounts for more than 50% of U.S. ceramic tile sales, has emerged as a popular type of ceramic tile.

What defines and differentiates porcelain tile from non-porcelain tile is its extremely low water absorption. Porcelain tile is a ceramic tile with a water absorption less than or equal to 0.5%.

What is TRUE Porcelain?

What defines and differentiates porcelain tile from non-porcelain tile is its extremely low water absorption. Porcelain tile is a ceramic tile with a water absorption less than or equal to 0.5%.

This definition of porcelain is supported by both the International Standards Organization (ISO) and the American National Standards Institute (ANSI):

**ISO** definition of porcelain (ISO 13006): Fully vitrified tile with a water absorption coefficient less than or equal to a mass fraction of 0.5%, belonging to groups A1a and B1a

**ANSI** definition of porcelain (ANSI A137.1): A ceramic tile that has a water absorption of 0.5% or less that is generally made by the pressed or extruded method; Does not include materials with very little or no crystallinity, such as glass tile (Class P1, E1, or O1)

Manufacturing tiles that meet this standard—true porcelain—requires porcelain-grade clays and other unique raw materials, plus precision milling processes and kilns set to extremely high firing temperatures (2100°F to 2500°F). The required raw materials, energy, and manufacturing equipment needed to produce such low porosity, high density tiles are why real porcelain is typically more expensive than non-porcelain tiles (for tiles with the same decorative elements).
Porcelain Tile Certification Agency

As classified by the ANSI A137.1 ceramic tile standard, porcelain tile is a ceramic tile with a very low water absorption (0.5% or less), as tested per ASTM C373.

While the criteria for porcelain tiles have been well-defined for several decades in North America, the term “porcelain” was undefined in international standards until relatively recently, and the testing method used internationally for measuring water absorption was less rigorous than the ASTM C373 method used in North America.

This led to some tiles being mislabeled as porcelain, whether intentionally or through testing differences. Although the testing standards used worldwide have now been harmonized to the strict requirements in North America, the practice of mislabeling tiles as porcelain continues. In freeze/thaw and wet environments, that can result in costly failures.

In response, TCNA and the Ceramic Tile Distributors Association (CTDA) jointly established the Porcelain Tile Certification Agency (PTCA) to provide a means for manufacturers and distributors to establish that their products comply with the water absorption criteria for porcelain tile.

PTCA certification was developed to independently evaluate if the program participant understands North American water absorption criteria and can meet such.

For each series being evaluated for porcelain tile certification, five commercially available samples (selected by the participant) are sent for testing once every three years by manufacturing participants and annually by non-manufacturing participants.

The Certification Mark

The Porcelain Tile Certification Agency permits manufacturers whose products meet porcelain certification requirements to label those products with the Porcelain Tile Certification Agency certification mark.

By looking for the Porcelain Tile Certification Agency certification mark, distributors, retailers, and consumers can have greater confidence that the products meet the stringent 0.5% or less water absorption requirement defining porcelain tile.
By participating in the PTCA certification program, the program participant (i.e., the manufacturer and/or seller) is stating that the tiles it produces or sells, labeled with the PTCA mark, meet the ANSI A137.1 porcelain tile water absorption requirements.

Non-manufacturing participants are further required to obtain a written assurance from the actual manufacturer that it will immediately notify the participant of any changes in the conforming porcelain tiles or any manufacturing variances that may affect the certification.

PTCA certification does not mean the tiles tested met all ANSI A137.1 or ISO 13006 criteria, which would require testing for other physical properties such as dimensions, warpage, breaking strength, etc. Variance from those properties has not been an issue in general, and the criteria are well understood.

**Importance of Porcelain Tile Certification**

The difference between real and false porcelain cannot be detected by eye—the only way to know with certainty is to have a laboratory verify the tile’s water absorption is 0.5% or less. To illustrate the extent of the problem, through its lab, Tile Council has identified hundreds of series from international manufacturers that did not meet the PTCA water absorption criteria necessary to be certified as porcelain.

The Porcelain Tile Certification mark provides an easy way for both distributors and consumers to identify real porcelain tiles. This is crucial for several reasons:

- **Trust**
  Porcelain Certification allows consumers to confidently identify porcelain products. Purchasing products falsely identified as porcelain may lead to failed applications, the need for repairs, and additional costs.

- **Cost**
  When lower-cost products are mislabeled and sold at a higher price as porcelain, the consumers who purchased such did not receive what they were paying for.

**How to Certify Porcelain**

Manufacturers that want to have their products PTCA-certified must take the following steps:

1. **Apply for Porcelain Tile Certification** by filling out the Program Participation Agreement and the Order Form on the PTCA website. The application involves submitting samples of each tile series to be tested.

2. **Pay the cost of testing the tile samples** at an authorized testing lab, as well as the initial and annual licensing fees.

3. **Once a participant receives confirmation** of their product’s compliance, they can use the PTCA certification mark on product packaging and marketing materials and to help guide the consumer toward a confident purchase of porcelain tile.

**Benefits of the PTCA program**

The PTCA program is designed to directly benefit consumers purchasing porcelain tiles and, indirectly, everyone involved in the supply chain.

**How the PTCA tests porcelain**

When tile is tested to determine its water absorption (the test for porcelain), laboratories follow the American
Because porcelain tile is difficult — if not impossible — to identify by sight, a test for a tile’s porosity (water absorption) will determine if a tile can be called “porcelain.”


ASTM C373 involves testing samples by subjecting them to a strong vacuum while water is drawn into the pores of the tile. The water absorption rate is calculated as a percentage of water weight gained over the dry weight.

Passing the certification testing establishes that the participant understands and can meet North American water absorption criteria. It is not a test of the tile being sold but rather an assessment of the manufacturer. The PTCA certification mark also does not assure fitness of the tile for any particular purpose. The suitability of any tile for specific applications requires an analysis of the project conditions by a qualified individual, as well as proper installation.

For more details on the PTCA program, the PTCA Program Participation Agreement is publicly available and can be found at www.ptcaonline.org/PTCA_Participation_Agreement.pdf.

If a question arises about whether a tile sold as PTCA-certified truly meets the water absorption criteria for porcelain tiles, PTCA is authorized to acquire further samples and test such for compliance. The board of PTCA then reviews the available data and relevant actions taken by the program participant to decide whether to withdraw PTCA certification and use of the mark.

Anyone who suspects a non-porcelain tile is being sold as PTCA-certified tile is encouraged to notify PTCA at 630-942-6588 or info@ptcaonline.org.

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Porcelain certified products can use the PTCA certification mark on product packaging, marketing materials, and more to help guide the consumer toward a confident purchase of porcelain tile.

The Certified Porcelain Tile logo means the tile tested met the American National Standard ANSI A137.1 requirement of 0.5% or less water absorption for porcelain tile.

TCNA is the only authorized U.S. lab that performs porcelain certification for PTCA.

Product Performance Testing Laboratory

For more information or to order tests, including custom services, please visit TCNAtile.com/lab or email testing@TCNAtile.com
More and more, tile setting has become a specialized trade, yet it remains largely unregulated when it comes to requirements for installers, whether for training or for proven adherence to industry standards and best practices. Being mostly unregulated means a contractor may have seasoned, skilled craftworkers or untrained installers with little experience under their belts. Without an established skills baseline, consumers are limited in their ability to differentiate between contractors and often choose based on the lowest bid—too often selecting unqualified companies.

ACT (Advanced Certifications for Tile Installers) seeks to improve this situation and has established a skills baseline that allows consumers to compare installer qualifications.

Launched in 2013, ACT is a comprehensive program of written and hands-on testing for nine defined skill sets. While other training and certification programs may be available to tile installers, ACT has garnered wide support from the tile industry because it is standards-based and highly demanding.

ACT tests are not show-up-for-a-seminar and get-your-certificate events. ACT certification tests have strictly enforced time limits and installers’ hands-on work is evaluated and scored in-person by trained and impartial evaluators following a specific evaluation protocol. Upon completion of the hands-on component by the installer, the evaluator literally tears it apart. By removing tiles and examining fresh mortar beds, ACT evaluators judge what’s seen on the surface as well as what is under the surface—a crucial component of the program, as so much of what is required for a successful tile installation lies beneath the finished tile work. That level of rigor ensures only those with the required knowledge and skill are certified. Invariably, some installers do not pass, because of the time limit, errors made in the tile installation, or mistakes on the written exam.

The ACT program operates through the combined efforts of the six leading organizations in the tile industry: The Ceramic Tile Education Foundation (CTEF), the International Masonry Institute/International Masonry Training and Education Foundation (IMI/IMTEF), the International Union of Bricklayers and Allied Craftworkers (IUBAC), the National Tile Contractors Association (NTCA), the Tile Contractors Association of America (TCAA), and the Tile Council of North America (TCNA). ACT tests are administered by CTEF and IMI/IMTEF.

**LARGE FORMAT TILE / SUBSTRATE PREP**
Specify ACT LARGE FORMAT TILE certification when tile 15” and longer will be installed by a thin-set method.

**CRITICAL INSTALLATION SKILLS TESTED:** Flattening the substrate and installing tile within industry standards for flatness, mortar coverage, proper offset in running bond applications, grout joint consistency, and lippage.

**MEMBRANES A118.10 and A118.12**
Specify ACT MEMBRANES certification when a sheet or liquid membrane will be used for waterproofing.

**CRITICAL INSTALLATION SKILLS TESTED:** Application of sheet, single component, and fabric-reinforced liquid applied membranes with emphasis on avoiding installation errors that affect the integrity of the waterproofing.

**MUD WALLS – W222**
Specify ACT MUD WALLS certification when a mud bed has been selected as the substrate for tiling walls.

**CRITICAL INSTALLATION SKILLS TESTED:** Installing wall mud to ANSI standards, with emphasis on proper materials and precision, with the finished work being flat and level mud bed.

**SHOWERS - B415**
Specify ACT SHOWERS - B415 certification when designing “water in/water out” showers with a mortar bed and tile floor over a shower-pan membrane.

**CRITICAL INSTALLATION SKILLS TESTED:** Creating a watertight (leak-proof) continuously sloped mortar bed over a shower-pan membrane.

**SHOWERS - B421**
Specify ACT SHOWERS - B421 certification when designing bonded waterproof membrane showers over sloped mortar bed floors and solid backing walls.

**CRITICAL SKILLS TESTED:** Creating watertight (leak-proof) shower walls over solid backing and a continuously sloped mortar bed.

**ACT Certification: SHOWERS – B421C**
Specify ACT SHOWERS – B421C certification when designing barrier-free showers on a concrete substrate with a mortar bed floor and solid backing walls using a bonded waterproof membrane.

**CRITICAL SKILLS TESTED:** Creating a watertight (leak-proof) shower assembly without a curb and a continuously sloped mortar bed.
TILE. It’s the go-to finish when you’re looking for high fashion and high function. But you might not get either if you leave it to just anyone to install. Unlike plumbing, electrical, and structural masonry trades, tile installers and the tile contractors that employ them are not generally required to meet minimum trade craft criteria to be in business.

The difference between trained, experienced installers and inexperienced installers is noticeably reflected in their work, and the difference between a quality contractor and a deficient one is reflected in their service and business operations.

Together, contractor and installer transform your concept into reality. Whether you’re a design/build professional selecting tile contractors on a regular basis or a homeowner with a single tile project, it’s just not possible to overestimate the importance of finding qualified contractors and installers.

The Reputable Tile Contractor

- **Operates a legitimate business**, with responsible business practices and a policy of standing behind their work.

- **Invests in continuing education** necessary to stay up-to-date on current building codes, regulations, standards, and best practices. On-the-job training is the most popular way to learn a construction trade, but formalized training is a must for ensuring correct installation methods are being taught to and used by installers on your project.

- **Carries all required business licenses and insurances**, and doesn’t push liabilities for property damages or worker injuries onto others.

- **Does not misclassify workers** to avoid paying into social security, unemployment, workers’ compensation, and other employee programs.

- **Has a traceable business location** so customers can be sure post-installation questions and issues are addressed and resolved.

- **Has a track record for quality and service**: Good contractors can easily produce references and verifiable documentation of their commitment to quality and service.
Architects and Specifiers

Include language in job specifications requiring qualified labor and enforce it with the GC. See the TCNA Handbook for a list of industry recognized prequalification programs for installers and contractors such as the CTEF Certified Tile Installer Program, the ACT (Advanced Certifications for Tile Installers) Program, the NTCA Five-Star Contractor Program, and the TCAA Trowel of Excellence Program.

General Contractors

Deliver a quality tile installation by fulfilling contractor qualification requirements in job specifications. When not included, utilize internally developed qualifications. Require proof of qualifications to be included with all project bids and thoroughly compare estimates from bidding contractors before awarding contracts. Often, higher estimates reflect better materials and additional necessary components and tasks, like substrate preparation and movement joints.

Homeowners

Don’t hesitate to ask contractors for proof of insurance, their license (where required), and their installation qualifications. Thoroughly interview bidding contractors and check several references. Utilize consumer resources available from your state on the internet and from the Ceramic Tile Education Foundation.

“Because tile is a permanent finish, the lowest bid should not be the driving factor, but rather who is the most qualified to perform the scope of the work specified.”

— TCNA Handbook
ENDURING DESIGNS NEED SOLID FOUNDATIONS

**ANSI A137**
product performance—ceramic and glass tile

**ANSI A108, A118, A136**
installation and workmanship; product performance—mortars, grouts, and membranes

**TCNA Handbook**
installation systems—ceramic, glass, and stone tile

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Viruses available for testing*

- SARS-CoV-2 – NOW AVAILABLE
- Adenoviruses
- Hepatitis B
- Hepatitis C
- Norovirus
- Influenza H1N1 Human
- MSQ bacteriophage (viral screening tool)

* Additional viruses available upon request

The TCNA Product Performance Testing Laboratory has a long history of microbiological testing and research, including ground-breaking research on photocatalytic antimicrobial surfaces and the antimicrobial effects of various metal oxides in glazes.

Additionally, the lab offers tests to evaluate the survival of different viruses (including SARS-CoV-2) on surface materials, the efficacy of common household cleaners to disinfect these surfaces, and the antiviral efficacy of products with antimicrobial coatings against different types of viruses.

Contact testing@TCNATile.com, or call 864-646-8453, to test your products for hygienic advantages.
Stress-Free Sustainability

CREDITS
LEED v4.1
Green Globes
NAHB National Green Building Standard

COMPLIANCE
International Green Construction Code
GSA Facilities Standards for Public Buildings
ASHRAE Standard for the Design of High-Performance Green Buildings

CONFIDENCE
Life Cycle-Based, Multi-Attribute Criteria
Verification by Leading Certification Bodies
Listed in National Institute of Building Sciences’ Whole Building Design Guide
Recommended by the US EPA for Federal Purchasing

For certified product lines, visit greensquaredcertified.com
2022 TCNA Handbook and ANSI Standards

Handbook for Ceramic, Glass, and Stone Tile Installation

Update your reference library today with the standards information you need for a successful project.

www.tcnatile.com
Tile Heritage Foundation was established in 1987 as a member-supported, not-for-profit organization whose sole purpose is to protect and preserve the history of the American Tile Industry. Tile Heritage is dedicated to promoting an awareness and appreciation of ceramic surfaces in the United States. The Foundation serves as a repository, an archive, which embraces all aspects of the industry from its inception in the 1870s through to the present time, validating its significance for posterity.

“The Seven Stages of Man,” designed and crafted in the mid-1950s by Carl Zimmerman in ceramic mosaic from the Cambridge Tile Manufacturing Co. for the library at Princeton High School in Sharonville, Ohio, a suburb of Cincinnati. Photo courtesy of Robert A. Flischel Photography, Cincinnati, Ohio.

“...we have built a storehouse and filled it with books and letters, written and printed, private and public, a storehouse ever full, holding in trust all the dreams... sheltering hopes and wisdom, recording trials, failures and accomplishments.”
— Carl Zimmerman (1900-1985), Professor of Art at the University of Cincinnati

In like manner, the Tile Heritage Foundation has developed an archive for the tile industry in the United States. In addition to the “books and letters” in its library, Tile Heritage storehouses a collection of historic American tiles, all one of a kind, from scores of different companies, some dating back to the late 19th century, as well as tiles from contemporary artisans. Add to this the collections of historic documents, tile catalogs, and tile-related books and periodicals covering a period of 135 years.

Rest assured that this archive and the collections belong to ALL OF US!
The Foundation’s Archive holds hundreds of valuable records of historic and contemporary American tile companies.

The Archives
The heart of the archive is stored in individual alphabetized folders representing over 400 companies pre-1960 and over 700 post-1960. The contents of the files have been indexed and are available by emailing Tile Heritage.

Tile Heritage archivists Jim Hamilton and Jenny Meeker classify the material in each company’s file folder, arranging information chronologically. All information is then entered into the Finding Aid Index, readily accessible and available to the public upon request.

Contemporary company folders in the THF archive.
Tile manufacturing got underway in America inspired by the European displays at the Centennial Exposition in Philadelphia in 1876.

Ornamental embossed tiles became the surface of choice for domestic fireplace surrounds.

American Encaustic Tiling Co., Zanesville, Ohio with these 6x6 embossed tiles represented in the Tile Heritage Collections.
Surround gifted by Peter Cornelison and Anna Howe

6x6 embossed decorative produced by Providential Tile Works of Trenton, New Jersey (1886-1913).

4x4 embossed tile by Owen & Peirce of Newburgh, New York (1884-1891).
Gift of Norman and Shannon Karlson

4x4 encaustic floor tile produced at International Tile & Trim, a company formed by English tile makers, in Brooklyn, New York (1882-1888).
Honoring the late historian Susan Padwee.

Dubbed “Ceramic Florentine Mosaic,” a patented encaustic tile designed by Herman Mueller in 1895, positioned the Mosaic Tile Company (1894-1972) to compete in the custom floor tile market.
Gift of Kirby Brown
There are many exceptional historic tiles in the Foundation’s collection.

Claycraft Potteries: Yosemite Series, c. 1925
Gift of Bart Huffman 1987

Yosemite Falls 8” x 12”
Vernal Falls 8” x 12”
El Capitan 12” x 12”

Batchelder Tiles (1911-1939)
Gift of the Trustees of the Ceramic Tile Institute

Tile No. 86 18” x 18”

"Knights" Tile No. 3498 12” x 36”

At the present time, Historic Tile Collections of the Tile Heritage Foundation consist of 4167 different individual tiles representing 48 American tile companies.

Among the companies represented with the largest number of tiles:
- American Encaustic Tiling Co. with over 800.
- Gifted by Norman and Shannon Karlson
- Solon & Schemmel and Solon & Larkin number over 500.
- Gifted by Riley Doty

Batchelder Tiles
Gift of the Trustees of the Ceramic Tile Institute

Tile No. 218A 4” x 8”

Custom made for a tile contractor 4” x 8”
In 1991 as Tile Heritage was engaged in research for an upcoming Arts & Crafts exhibition at the Oakland Museum, we met with the late Irene Knops, the daughter of the founder of Muresque Tiles, who subsequently gifted the Tile Heritage Foundation a sizable selection of her father’s personal tile collection. The company was little known at the time, and Muresque tiles provided a significant addition to the popular exhibition.

THF does not buy or sell historic tiles.
The Foundation’s collections include sample boards and boxes of many historic manufacturers.

Short of having the actual tiles in hand, there is no better way to sell ceramic tiles than with “samples” mounted on boards that can be left with a client or in boxes from which the client may choose the appropriate glazes.

Gift of Don West
Gift of Steuart Weller
Marketing, sales and distribution have served the tile industry since tiles were first produced to sell. **PRODUCT CATALOGS** play an essential role.

Two late 19th century catalogs, among others.
Gift of Norman and Shannon Karlson

Roughly 180 historic tile companies are represented in the US Catalog Collection with over 1000 different catalogs. Contact THF for details.
See below for some mid-century catalogs with contemporary appeal.

Pre-Depression 20th century catalogs continue to provide design inspiration.

A selection of historic catalog reproductions are available for sale.
The Archives contain a plethora of vintage architectural renderings for the inclusion of tiles—many still in dire need of conservation.

Gifts of James Lee and Rick and Richard Baratta
The THF Library contains many valuable vintage books—many restored but still some in need of conservation, which requires funding.

Geschichte der Europäischen Fliesen-Keramik (History of European Ceramic Tiles from the Middle Ages to 1900) by Robert Forrer (1901) with illustrations of early tiles and tile designs from all western European countries. The book has now been professionally conserved. Note its original condition up top; the conserved book below.

The Keramic Gallery by William Chaffers (2nd Edition 1907), now fully conserved, offers hundreds of Illustrations of rare, curious and choice examples of pottery and porcelain pre-19th century.

Composition by Arthur Wesley Dow, professor of Fine Arts at Columbia University (9th Edition 1919), has also been recently conserved. A series of exercises in art sculpture for the use of students and teachers alike.

These books gifted by Kirby Brown
The THF Library holds roughly 1120 books that present tiles in twenty different countries including the United States. When the foundation got underway in 1987, there were almost no tile-related books in the card catalog in the San Francisco public libraries; the UC Berkeley libraries, only a few more. Today Tile Heritage shelves over 1100 titles, over 160 of these relate to tiles in the US. Other countries include England (73), Portugal (60), Italy (54) and Islamic countries (43).

There are 160 books on architects and architecture; 70 publications related to mosaic art; 64 to ceramics in general and 73 to art pottery; 44 to bricks and architectural terra cotta; 40 to Arts & Crafts; 30 to installation, the earliest of which is a two-volume set of Frank Graham’s Audels Masons and Builders Guide #1 and #2, first editions, 1924. These were gifted by Steven Kinney, a tile contractor from San Ysidro, California.

The book pictured below, The Story of Terra Cotta by Walter Geer, was chosen to be conserved. It’s one of only 100 printed copies, published in 1920. Geer was president of the New York Architectural Terra-Cotta Company. Gift of Kirby Brown.
Periodicals hold the stories of the industry and provide visual stimulus to enhance tile design and promotion, then and now.

Two issues of Palette & Bench from 1910 offer photographic imagery to period tile designers.

Ten issues of Keramic Studio, 1903-1924. Monthly Magazine for the Potter and Decorator. Editor: Adelaide Robineau-Alsop

Clay Record (34 issues 1892-1899), a late 19th century journal devoted to the dissemination of all matters pertaining to clay. The Clay Worker (107 issues 1904-1922), a late 19th and early 20th century publication focusing on all aspects of the clay industries. Gift of Mike Duff

An early 20th century publication with selected architectural features and advertising of numerous products for both residential housing and commercial buildings. Gift of Ruth Walker
Additional examples of 20th century and 21st century periodicals.

American Ceramic Society, mid-1930s.

Gladding, McBean & Co., 1925 to 1937.

Complete set of issues, 1931.
Associated Tile Manufacturers


The THF Periodicals Collections list 134 titles, including some rare ones!

Ceramic Tile Institute
Gift of Betty Knesel

*Tiles and Tile Work* (22 issues 1929 to 1931).
Rossman Corporation
Gift of Deborah Miller

*Tile Talk* (11 issues 1926 to 1929).
Devoted to Sanitary, Decorative and Lasting Building Construction. Empire Floor & Wall Tile Co.
Gift of Michael Sims
Since 1994, the foundation has published 21 issues of *Tile Heritage: A Review of American Tile History* offering articles by today’s tile historians, as well as by family members or friends of those individuals and companies that have influenced what we recognize as the tile industry today. “Flash Point” was discontinued in 1993 after 41 issues had been published. Along with scholarly articles, there was news of what was happening at Tile Heritage at that time. Back issues of both publications are available. Member discounts apply.
Perceiving and embracing the diversity of the Tile Heritage Foundation Archives and Collections is enlightening and energizing!

A broad funding base is essential for the long-term sustainability of Tile Heritage. Sponsorship and Membership have always provided the core of the Foundation’s stability.

TEAM UP WITH TILE HERITAGE TODAY!!
Web: www.tileheritage.org  Email: foundation@tileheritage.org
Comprehensive Testing  TCNA offers a broad array of ISO-accredited ASTM, ANSI and ISO standard tests to serve clients worldwide.

Unparalleled Experience  TCNA staff can help design custom testing to support research and innovation efforts.

Multi-Disciplinary Expertise  TCNA engineers and scientists, along with the lab’s collaboration with Clemson University, offer a broad and unparalleled expertise.

Standards Insight  TCNA staff hold leadership positions in numerous international standards committees, allowing for a unique understanding of industry standards and testing methods.

To learn more about our full testing capabilities or to place a testing order, visit: www.tcnatile.com/test

Examples of materials tested: Stone, Tile, Plastic Based Materials (PBM), Agglomerate Stone, Installation Materials, and more. Custom (or non-standardized) testing requests are always welcome.
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The Tile Council of North America Handbook strongly recommends using installers who have demonstrated their commitment to their craft.

Because tile is a permanent finish, the lowest bid should not be the driving factor, but rather who is the most qualified to perform the scope of the work specified.

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Contact the NTCA and TCAA for qualified Five Star and Trowel of Excellence contractors for your upcoming project.

www.tile-assn.com/Member/FiveStar.aspx?mid=84
www.tcaainc.org/trowel-of-excellence.php
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1. Go to partners.WhyTile.com
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