

ANSI A326.3—2021

Release date: February 2022

For updates: www.TCNAtile.com



American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials



Product Performance Testing Laboratory

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.



ACCREDITED
Testing Laboratory

ISO 17025
TL-720

**American National Standard Test Method
for Measuring Dynamic Coefficient of
Friction of Hard Surface Materials**

American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Materials

Secretariat

Tile Council of North America, Inc.

Approved

American National Standards Institute, Inc. (ANSI)

Abstract

The American National Standard A326.3 describes the test method for measuring dynamic coefficient of friction (DCOF) of hard surface flooring materials in the laboratory and in the field. The standard also includes DCOF specifications, product use classifications, and guidance on specifying hard surface flooring materials. This standard is intended to serve as a guide to the general public, manufacturers, distributors, specifiers, architects, contractors, testing laboratories, building owners, and other businesses and professionals.

American National Standard

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity.

Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he or she has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretation should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute. For information regarding the latest version of this standard, including any updates since the last printing, refer to www.TCNAtile.com.

TCNA Production Staff

Eric Astrachan, *Executive Director*

Bill Griese, *Director of Standards Development and Sustainability Initiatives*

Katelyn Simpson, *Laboratory Director and ASC A108 Committee Secretary*

Ryan Marino, *Standards Development and Research Manager*

Kathy Meyer, *Director of Marketing*

Cynthia Faber Smith, *Content and Creative Manager*

Roxanne Morris, *Production Manager*



100 Clemson Research Blvd.
Anderson, SC 29625
USA

Ave. Batallón de San Patricio #109-627.
Colonia Valle Oriente, San Pedro Garza García
Nuevo León, México. CP 66269

www.TCNAtile.com

(864) 646-8453

52 (81) 8625-3306

COPYRIGHT © 2022 Tile Council of North America.

Printed in the United States of America.

ISBN: 978-1-7369190-5-7

ALL RIGHTS RESERVED. No part of this work covered by the copyright hereon may be reproduced or used in any form or by any means (graphic, electronic, or mechanical, including photocopying, recording, taping, internet distribution or information storage and retrieval systems) without the written permission of the publisher.

Published by Tile Council of North America.

NOTICE OF DISCLAIMER AND LIMITATION OF LIABILITY

THIS PUBLICATION AND ALL OF THE INFORMATION IT CONTAINS ARE PROVIDED 'AS IS' WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS OR IMPLIED. ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT, ARE HEREBY EXPRESSLY DISCLAIMED.

PUBLISHER EXPRESSLY DISCLAIMS ANY OBLIGATION TO OBTAIN AND INCLUDE INFORMATION OTHER THAN THAT PRESENTED HEREIN RESULTING FROM THE AMERICAN NATIONAL STANDARDS INSTITUTE ACCREDITED STANDARDS COMMITTEE A108 CONSENSUS PROCESS.

THIS INFORMATION DOES NOT PURPORT TO ADDRESS SAFETY ISSUES OR APPLICABLE REGULATORY REQUIREMENTS ASSOCIATED WITH ITS USE. IT IS THE RESPONSIBILITY OF THE USER OF THIS INFORMATION TO REVIEW ANY APPLICABLE CODES AND OTHER REGULATIONS AND ANY SITE SPECIFIC CONDITIONS IN CONNECTION WITH THE USE OF THIS INFORMATION. PUBLISHER EXPRESSLY MAKES NO REPRESENTATIONS OR WARRANTIES REGARDING USE OF THIS INFORMATION AND COMPLIANCE WITH ANY APPLICABLE STATUTE, RULE OR REGULATION.

THE READER IS EXPRESSLY WARNED TO CONSIDER AND ADOPT ALL SAFETY PRECAUTIONS APPROPRIATE FOR THE ACTIVITIES HEREIN AND TO AVOID ALL POTENTIAL HAZARDS. SUCH PRECAUTIONS ARE GENERALLY NOT LISTED HEREIN AND ARE OUTSIDE THE SCOPE OF THIS DOCUMENT.

UNDER NO CIRCUMSTANCES WILL PUBLISHER BE LIABLE TO ANY PERSON OR BUSINESS ENTITY FOR ANY DAMAGES, INCLUDING WITHOUT LIMITATION ANY AND ALL DIRECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES, RESULTING, IN WHOLE OR IN PART, FROM ANY USE OF, REFERENCE TO, OR RELIANCE UPON THIS PUBLICATION, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE FOREGOING LIMITATION OF LIABILITY IS A FUNDAMENTAL ELEMENT OF THE USE OF THIS INFORMATION AND THE INFORMATION WOULD NOT BE OFFERED BY THE PUBLISHER WITHOUT SUCH LIMITATION.

Foreword

This foreword is not part of American National Standard A326.3.

American National Standard A326.3 describes the test method for measuring dynamic coefficient of friction (DCOF) of hard surface flooring materials in the laboratory and in the field. This standard also includes DCOF specifications, product use classifications, and guidance on specifying hard surface flooring material. This standard is intended to serve as a guide to the general public, manufacturers, distributors, specifiers, architects, contractors, testing laboratories, building owners, and other businesses and professionals.

While the existence of this standard does not in any respect preclude anyone, including those who have accepted it, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to this standard, producers of hard surface flooring materials measured per A326.3 and users of the standard in general are encouraged individually to indicate such conformance in advertising, promotion, and labeling.

ASC A108 Committee Members

This standard was processed and approved for submittal to ANSI by the Accredited Standards Committee (ASC) A108 responsible for material, testing, and installation standards for ceramic, glass, stone, and other hard surface tiles and panels, and related installation materials. Committee approval of a standard does not necessarily imply that all committee members voted for its approval.

The ASC A108 Committee had the following members at the time of publication:

Chairman	Chris Walker
Vice Chairman	Nyle Wadford
Secretary	Katelyn Simpson
Co-Secretary	Eric Astrachan

Organization	Representative
American Wonder Porcelain	James Neel
APA The Engineered Wood Association	BJ Yeh
Ardex Americas	Mark Pennine
Artcraft Granite Marble and Tile	James Woelfel
Arto Brick California Pavers	Reza Tabarrok
Atlas Minerals and Chemicals	Steve Abernathy
Bostik, Inc.	Chad Bulen
Ceramic Tile and Stone Association of Arizona	Sam Hibbs
Ceramic Tile and Stone Consultants	Donato Pompo
Ceramic Tile Distributors Association	Frank Donahue
Ceramic Tile Education Foundation	Scott Carothers
Chicago Tile Institute	Scott Conwell
Construction Specifications Institute	Genaro Salierno
Cox Tile, Inc.	John Cox
Crossville, Inc.	Noah Chitty
Custom Building Products	William White
Dal-Tile International	Terry Adams
David Allen Company	Martin Howard
Deltek	Barbara Larson
Detroit Ceramic Tile Contractors Association	Kurt Von Koss
Florida Tile, Inc.	Tyson Brass
Forensic Tile Consultants	Greg Mowat
Fortifiber Building Systems Group	Tim Moore
Glass Tile Consultants	Scott Fleming
Great Lakes Ceramic Tile Council	Gerald Chioini
Gypsum Association	Michael Schmeida

Institute of Inspection, Cleaning, and Restoration Certification	Martin Brookes
Interceramic	Eduardo Rios
International Union of Bricklayers and Allied Craftworkers	Mike Hawthorne
ISO TC-189 Committee	Svend Hovmand
James Hardie Building Products	Chad Diercks
Laticrete International, Inc.	Scott Kowaleski
Malibu Art Tile & Stone	Lindell Lummer
Mapei Corporation	Jim Whitfield
Materials and Methods Standards Association	Aiping Lu
Metropolitan Ceramics/Ironrock, Inc.	Dan Marvin
Moore Engineering Services	Scott D. Moore
National Association of Home Builders	Gary Ehrlich
National Gypsum Company	Tony Fuller
National Terrazzo & Mosaic Association	Gary French
National Tile Contractors Association	Chris Walker
Natural Stone Institute	Chuck Muehlbauer
Neuse Tile Service, Inc.	Nyle Wadford
Noble Company	Eric Edelmayer
Oceanside Glasstile Company	Brian Fitzgerald
Portland Cement Association	Jamie Farny
Professional Consultants International, LLC	Richard Goldberg
Radiant Panel Association	Darren Huff
Schluter Systems	Sean Gerolimatos
SCS Global Services	Jenilee Hsu
Siena Tile & Stone Installation Products	Evidio Martin
Steel Framing Industry Association	Patrick W. Ford
StonePeak Ceramics, Inc.	Todd Ward
Summitville Tiles, Inc.	Joe Dutt
TCA Team, LLC	Ryan Marino
TCNA Underlayment Committee	Mike Micalizzi
Terrazzo, Tile, and Marble Association of Canada	Dale Kempster
Tile and Stone Council of Northern California	Rich Galliani
Tile Contractors Association of America	Brad Trostrud
Tile Council of North America, Inc.	Bill Griese
UL Environment	Josh Jacobs
United Brotherhood of Carpenters	Bryan Benke
United States Gypsum Corporation	Yanfei Peng
US TAG to ISO TC-189 WG3	Greg Schad

Contents

A326.3—STANDARD TEST METHOD

ANSI A326.3	American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials—2021	
	Introduction	1
1.0	Scope	2
2.0	Definition of Terms	2
3.0	Specification	2
4.0	Product Use Categories	4
5.0	Apparatus	6
6.0	Reagents and Materials	7
7.0	Testfoot Reconditioning Procedure	8
8.0	Validation Procedure	8
9.0	Test Procedure: Dynamic COF with 0.05% SLS Water	9
10.0	Dry Dynamic Coefficient of Friction (DCOF)—If Desired	11
11.0	Report	11
12.0	Discussion of Wet DCOF Method Precision	11
	Figures—A326.3	13
	Appendix A (informative)	17

**ANSI
A326.3**

**American National Standard Test Method
for Measuring Dynamic Coefficient of Friction
of Hard Surface Materials—2021**

Introduction

This introduction is not part of the American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials, ANSI A326.3.

The dynamic coefficient of friction (DCOF) measurement provided in this standard is an evaluation of a hard surface flooring material under known conditions using a standardized testfoot material prepared according to a specific protocol. As such, it can provide a useful comparison of surfaces, but it does not predict the likelihood a person will or will not slip on a hard surface flooring material.

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; and the DCOF of the material, 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. Further, while structure (e.g. three-dimensionally patterned or profiled surfaces) can assist in drainage, break the film of the contaminant, and mechanically impede slipping, such surfaces can produce misleading measured DCOF values due to test device constraints.

The presence on installed hard surface flooring materials of water (including standing water as can exist on floors which are not properly sloped for drainage or on exterior flooring surfaces immediately after a rain storm or on which snow is melting), oil, grease, and/or any other elements which reduce traction, creates slippery conditions where the risk of a slip cannot be completely eliminated. Applications with exposure to such elements require extra caution in product selection, use, and maintenance.

While specifying products with higher DCOF for use under contaminated conditions can be considered, surfaces with higher DCOF may have maintenance/cleanliness issues and be harder to remove contaminants and films from; this can cause hazardous and unfavorable conditions. In addition to maintenance issues, a surface with a high DCOF can create a difficult walking condition for that subset of the elderly and disabled who slide their feet on the floor. For them, smooth and dry flooring may be more appropriate, specifically flooring with a low wet DCOF that is kept dry when in use.

END OF INTRODUCTION

1.0 Scope

This standard describes the test method for measuring dynamic coefficient of friction (DCOF) of hard surface flooring materials. This method can be used in the laboratory or in the field.

This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of the standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2.0 Definition of Terms

Coating: A surface application, usually polymer-based, which is applied after firing (for ceramic manufactured products), after fabrication (for non-ceramic manufactured products), or after installation of hard surface flooring materials onsite, typically to protect and/or to enhance the surface. Grout release agents, grout sealers, or products which are not intended to be permanent applications are not considered to be coatings.

Dynamic Coefficient of Friction (DCOF): Sometimes called kinetic coefficient of friction. This is 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.¹ Different contaminants such as dirt, water, soap, oil, or grease can change this value.

3.0 Specification

3.1 DCOF \geq 0.42*: Unless otherwise declared by the manufacturer, hard surface flooring materials suitable for level² interior spaces expected to be walked on when wet with water shall have a measured wet DCOF value of 0.42* or greater when tested using SBR testfoot material and SLS solution as per this standard. However, hard surface flooring materials with a measured wet DCOF value of 0.42* or greater are not necessarily suitable for all projects. The 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,³ and manufacturers' guidelines and recommendations.

3.2 DCOF $<$ 0.42*: When tested using SBR testfoot material and SLS solution as per the procedure in this standard, hard surface flooring materials with a measured wet DCOF value of less than 0.42* (including by way of example, but not in limitation, polished surfaces), unless otherwise declared by the manufacturer, shall only be installed when the surface will be kept dry when walked upon and proper safety procedures will be followed when cleaning the hard surface flooring materials. Hard surface flooring not intended to be walked upon when wet shall have a dry DCOF value of 0.42* or greater when tested per Section 10.0 of this standard.

1 The values determined by this test method reflect the dynamic friction between the testfoot and the hard surface flooring being tested under specific, controlled conditions when using the apparatus specified in Section 5.0 and the methodology contained in Section 9.0 of this standard. No claim of correlation to actual footwear or human ambulation is made.

2 The term "level" referred to herein is used to describe nominally horizontal surfaces with minimal slope as permissible by local building codes and not exceeding 2%.

3 The DCOF of installed hard surface flooring materials can change over time as a result of wear and surface contaminants. In addition to regular cleaning, deep cleaning and traction-enhancing maintenance may be needed periodically to maintain DCOF values.

* Each instance of the 0.42 threshold limit value provided on this page 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.

3.3 Coatings: Hard surface flooring materials which have a coating applied after firing (for ceramic manufactured products), after fabrication (for non-ceramic manufactured products), or after installation of flooring materials onsite shall only be used in areas that can be kept dry, unless otherwise declared by the coating's manufacturer. If testing data is required after a coating is applied, use the test method specified by the manufacturer, or the dry testing procedure in this standard if no test method is suggested by the manufacturer of the coating.

3.4 Manufacturer-Declared Product Use Classification: 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,³ and manufacturers' guidelines and recommendations.

INFORMATIVE NOTE: *Hard surface flooring materials with a measured wet DCOF value less than 0.42* are often used in areas such as shopping malls (outside the food court), hotel lobbies, office buildings, etc. where a certain appearance (e.g. glossy) and ease of cleaning are highly desired and measures are in place to keep the floor dry when walked upon.*

INFORMATIVE NOTE: *Normative measured DCOF limit values are not provided in this standard for exterior applications, interior ramps and inclines, pool decks, shower floors, or flooring that is contaminated with material other than water or where minimal or no footwear is used.*

For exterior applications, the suitability of the installed hard surface flooring materials depends significantly on drainage of the assembly, physical structure of the hard surface flooring, expected footwear, intended use, and the variety of contaminants present, in addition to other factors already discussed. Accordingly, a single DCOF limit value for exterior applications is not provided.

For interior ramps and inclines, the suitability of the installed hard surface flooring materials depends significantly on the degree of incline, the nature of any non-pedestrian use, and the physical structure of the hard surface flooring, in addition to other factors already discussed. Accordingly, a single DCOF limit value for ramps and inclines is not provided.

For pool decks, the suitability of the installed hard surface flooring materials depends significantly on drainage of the assembly, physical structure of the hard surface flooring, and the variety of contaminants present, in addition to other factors already discussed. Accordingly, a single DCOF limit value for pool decks is not provided.

* Each instance of the 0.42 threshold limit value provided on this page 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.

For shower floors, the suitability of the installed flooring depends on the size and drainage of the assembly, the size and number of grout joints, the structure/texture of the floor surface, and whether barefoot use is expected, in addition to other factors already discussed. Accordingly, a single DCOF limit value for shower floors is not provided and flooring with a wet DCOF less than 0.42 is not precluded where suitable.*

Similarly, a single DCOF limit value for hard surface flooring contaminated with materials other than water is not provided due to the variety of possible contaminants and the effect of such on traction.

4.0 Product Use Categories

4.1 Product Use Classification: Hard surface flooring products shall be classified into one or more of the product use categories provided in Table 1 and described in Sections 4.1.1 through 4.1.5.

4.1.1 Interior, Dry: Product shall be kept dry, level, and free of contaminants when in use.

INFORMATIVE NOTE:

Possible Areas of Use: Subject to determination by specifier and the criteria in this standard, may include, but are not limited to, indoor shopping malls (excepting food courts), hotel lobbies, office buildings, showrooms, home interiors without water sources and other level areas where surface will be kept dry and contaminant free when walked upon and proper safety procedures will be followed when cleaning the hard surface flooring materials. Walk-off mats may be necessary for use in entrance areas of the possible areas of use where water or other contaminants would otherwise be occasionally or consistently transported onto the flooring surface. Hard surface flooring not intended to be walked upon when wet shall have a dry DCOF value of 0.42 or greater when tested per Section 10.0 of this standard.*

4.1.2 Interior, Wet: See Section 3.1. Product shall have a minimum measured wet DCOF value of 0.42* or greater when tested per this standard or be manufacturer-declared for this category based on manufacturing parameters, internal quality control criteria, and manufacturer experience with similar surfaces (see Section 3.4). Attributes to consider for products manufacturer-declared for this category include, but are not limited to, product size, texture, structure, and drainage.

INFORMATIVE NOTE:

Possible Areas of Use: Subject to determination by specifier and the criteria in this standard, may include, but are not limited to, entry foyers, public restrooms (without showers), grocery stores, "front of the house" in fine and casual dining restaurants with a closed kitchen, home interiors including bathrooms and kitchens, and other areas where floors may be walked upon when wet if level, clean, maintained, and free of standing water or other contaminants.

4.1.3 Interior, Wet Plus: See Section 3.4. Product shall be manufacturer-declared for this category based on manufacturing parameters, internal quality control criteria, and manufacturer experience with similar surfaces. Attributes to consider include, but are not limited to, product size, texture, structure, and drainage. Products meeting Interior, Wet Plus criteria may require frequent maintenance to keep clean.

INFORMATIVE NOTE:

Possible Areas of Use: Subject to determination by specifier and the criteria in this standard, may

* Each instance of the 0.42 threshold limit value provided on this page 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.

include, but are not limited to, public showers, interior pool decks, locker rooms, covered exterior areas, steam rooms, “front of the house” applications in restaurants with an open kitchen, and in “front of the house” applications in quick service, fast-casual, and self-service restaurants, food areas in gas stations, and other similar areas where floors may be walked upon when wet if clean, maintained, and free of standing water or other contaminants.

INFORMATIVE NOTE: *In the absence of superseding manufacturer-declared product use classification, excepting where measured DCOF is lower due to the impact of structure on the DCOF measurement, it is generally accepted that hard surface flooring in this category should have at least a minimum wet DCOF value of 0.50*, with factors other than wet DCOF also taken into consideration. Such factors include, but are not limited to, expected contaminants, drainage, surface structure, effect of structure on the DCOF measurement, number of grout joints (see Informative Note in Section 9.1.7), traction-enhancing features, and intended use, in addition to the other criteria in this standard. As the suitability of the installed hard surface flooring depends significantly on such factors, a single normative DCOF limit value is not provided.*

INFORMATIVE NOTE: *Interior, Wet Plus products for applications intended to be walked upon with footwear can, but are not required to, have physical surface characteristics different from products in the same category intended to be walked upon barefoot. Such characteristics can include, but are not limited to, more aggressive surface structure and traction enhancing features for use with footwear, and potentially less texture and lower wet DCOF in barefoot applications.*

4.1.4 Exterior, Wet: See Section 3.4. Product shall be manufacturer-declared for this category based on manufacturing parameters, internal quality control criteria, and manufacturer experience with similar surfaces. Attributes to consider include, but are not limited to, product size, texture, structure, and additionally in wet applications, drainage. Products meeting Exterior, Wet criteria may require frequent maintenance to keep clean.

INFORMATIVE NOTE:

Possible Areas of Use: Subject to determination by specifier and the criteria in this standard, may include, but are not limited to, level outdoor living spaces including pool decks, walkways, patios, and sidewalks, where such floors may be walked upon when wet (excluding ice or snow) if level, clean, maintained, and free of standing water or other contaminants.

INFORMATIVE NOTE: *In the absence of superseding manufacturer-declared product use classification, excepting where measured DCOF is lower due to the impact of structure on the DCOF measurement, it is generally accepted that hard surface flooring in this category should have at least a minimum wet DCOF value of 0.55*, with factors other than wet DCOF also taken into consideration. Such factors include, but are not limited to, expected contaminants, drainage, surface structure, effect of structure on the DCOF measurement, number of grout joints (see Informative Note in Section 9.1.7), traction-enhancing features, and intended use, in addition to the other criteria in this standard. As the suitability of the installed hard surface flooring depends significantly on such factors, a single normative DCOF limit value is not provided.*

NOTE: *Exterior, Wet labeling does not refer to frost resistance. For ceramic tile, refer to ANSI A137.1 for frost resistance criteria.*

* Each instance of the 0.50 and 0.55 threshold limit values provided on this page 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.

4.1.5 Oils/Greases: See Section 3.4. Product shall be manufacturer-declared for this category where oil, grease, and/or fats may be present, based on manufacturing parameters, internal quality control criteria, and manufacturer experience with similar surfaces. Attributes to consider include, but are not limited to, product size, texture, structure, and drainage. Products meeting Oils/Greases criteria may require frequent maintenance to keep clean.

INFORMATIVE NOTE:

Possible Areas of Use: Subject to determination by specifier and the criteria in this standard, may include, but are not limited to, level areas regularly exposed to automotive fluids, “back of the house” fast food or family style restaurants, food preparation areas with grills or deep-fry equipment, and any area where oil, grease, and/or fats may be present so long as such floors are level, regularly cleaned, maintained, and free of standing water and contaminant build-up.

INFORMATIVE NOTE: *In the absence of superseding manufacturer-declared product use classification, excepting where measured DCOF is lower due to the impact of structure on the DCOF measurement, it is generally accepted that hard surface flooring in this category should have at least a minimum wet DCOF value of 0.55*, with factors other than wet DCOF also taken into consideration. Such factors include, but are not limited to, expected contaminants, drainage, surface structure, effect of structure on the DCOF measurement, number of grout joints (see Informative Note in Section 9.1.7), traction-enhancing features, and intended use, in addition to the other criteria in this standard. As the suitability of the installed hard surface flooring depends significantly on such factors, a single normative DCOF limit value is not provided.*

Table 1: Product Use Classification

Classification	Reference Category	Criteria
Interior, Dry	ID	≥ 0.42 dry DCOF* (per Section 10.1)
Interior, Wet	IW	≥ 0.42 wet DCOF* (per Section 9.1) or Manufacturer-Declared
Interior, Wet Plus	IW+	Manufacturer-Declared
Exterior, Wet	EW	Manufacturer-Declared
Oils/Greases	O/G	Manufacturer-Declared

5.0 Apparatus

5.1 Testing device⁴ : Automated dragsled-type tribometer device capable of testing dynamic coefficient of friction in wet and dry conditions. The tribometer shall be equipped with a strain gauge which shall be verified prior to testing using the verification method provided by the testing device manufacturer.

* Each instance of the 0.42 and 0.55 DCOF threshold limit values provided on this page 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.

⁴ The BOT 3000E or the equivalent has been found satisfactory. The BOT 3000E is manufactured by Regan Scientific Instruments, Inc., 400 Gerault Rd, Flower Mound, TX 75028. The upper measurement limit for the BOT 3000E is 1.00. If while testing, the BOT 3000E measures a value of 1.00, report the value as ≥1.00. Devices being used as equivalent to the BOT 3000E device 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. The 0.42 threshold limit value provided in this standard applies to the BOT 3000E device. This is not an endorsement of the BOT 3000E device nor its supplier nor any other device and supplier.

5.2 SBR testfoot: With a new rubber thickness of 4.0 mm ± 0.2 (0.16 in. ± 0.01), Shore A hardness of 95 ± 3, density of 1.23 g/cm³ ± 0.2, tensile strength of >10 MPa, flexibility of >250%, and wearability of <250 mm³. Discontinue use when rubber thickness is less than or equal to 2.5 mm (0.10 in.). The SBR testfoot shall be provided by the testing device manufacturer and compatible for use with the testing device.

5.3 Testfoot reconditioning tool: A device used to resurface the testfoot in a uniform fashion. The testfoot reconditioning tool shall be provided by the testing device manufacturer.

5.3.1 Sand paper: 400 grit, aluminum oxide, as recommended by the testing device manufacturer.

INFORMATIVE NOTE: *While alternative sand papers meeting the above specifications may be available, using sand paper other than what is recommended by the testing device manufacturer for the test procedure contained in this standard may change test results.*

5.4 ANSI A326.3 validation surface.⁵

6.0 Reagents and Materials

6.1 0.05% Sodium-Lauryl Sulfate (SLS): Commercially available at higher concentrations than required for this testing. Dilute with distilled or de-ionized water to reach 0.05% SLS solution. For example, if SLS solution is purchased at 29% concentration, mix 6.54 mL of 29% SLS solution with 1 gallon of distilled water to obtain 0.05% SLS solution.

6.2 Denatured alcohol: Shall not leave surface residue after wiping with a microfiber cloth or paper towel.

6.3 Light-use cleaner:⁶ Shall be commercially available, pH neutral, water-based, light-use, non-degreasing, non-disinfecting, and non-wax stripping. Cleaner shall not leave surface residue after wiping with a microfiber cloth or paper towel nor alter the test specimen surface.

6.4 Acetone: As necessary for cleaning of the ANSI A326.3 validation surface.

6.5 Additional cleaners: As necessary for field testing to remove topical coatings, waxes, or contaminants. These cleaners include, but are not limited to, citrus degreasers, solvents, sealer strippers, or other appropriate cleaners specified for the floor being tested. Cleaners shall be non-etching, suitable for the surface being tested, and used per manufacturer's instructions.

6.5 Microfiber cloth or paper towel: Shall not leave lint or residue after use.

6.6 Soft bristle brush or light duty scrubbing pad: Shall not alter the test specimen surface.

6.7 Stiff bristle brush: Where necessary for field testing.

6.8 Paint or chip brush.

⁵ The ANSI A326.3 validation surface or the equivalent has been found satisfactory. The sole source of supply of the ANSI A326.3 validation surface known to the committee at this time is Tile Council of North America, 100 Clemson Research Blvd, Anderson, SC 29625. This is not an endorsement of this product nor its supplier.

⁶ Bona® Stone, Tile and Laminate Cleaner or the equivalent has been found satisfactory. It is commercially available at various retail locations. This is not an endorsement of this product nor its supplier.

7.0 Testfoot Reconditioning Procedure

7.1 Follow testing device manufacturer's testfoot reconditioning procedure.

INFORMATIVE NOTE: Refer to *Informative Appendix A* for further information on use of the BOT 3000E device in conjunction with the apparatus specified in Sections 5.2 – 5.4 of this standard.

7.2 Attach new sand paper to the testfoot reconditioning tool before testing begins.

7.3 Insert SBR testfoot into the testfoot reconditioning tool.

7.4 Recondition the testfoot, periodically removing the testfoot to view the rubber surface. Brush sand paper and testfoot with a dry paint or chip brush to remove excess material.

7.5 Once the testfoot no longer has a wear line across the center and the surface of the testfoot appears uniform, it is ready for use (Figures 1 and 2).

8.0 Validation Procedure

8.1 The ANSI A326.3 validation surface shall be clean and free of contamination prior to use.

8.2 Clean the ANSI A326.3 validation surface using denatured alcohol or light-use cleaner.

8.2.1 If cleaning with denatured alcohol, disperse onto the ANSI A326.3 validation surface and wipe using a clean, dry microfiber cloth or paper towel that does not leave residue to remove any dust, debris, or other contaminants that have collected on the surface. Rinse thoroughly with water to remove any remaining material.

8.2.2 If cleaning with light-use cleaner, disperse onto the ANSI A326.3 validation surface and wipe using a clean, dry microfiber cloth or paper towel that does not leave residue to remove any dust, debris, or other contaminants that have collected on the surface. Rinse thoroughly with water to remove any remaining material.

8.3 Allow to air dry or dry with a clean, dry microfiber cloth or paper towel that does not leave residue.

8.4 Wet the path that the testfoot will follow with enough 0.05% SLS water such that the testfoot will remain within the wetted path throughout the entire test.

8.5 Make one 8 in. (203.2 mm) measurement then rotate the testing device 180° and make a second 8 in. (203.2 mm) measurement on the ANSI A326.3 validation surface. Calculate the average.

8.6 If the average is within ± 0.03 of the value stated for wet DCOF testing on the ANSI A326.3 validation surface, proceed with testing. If the value falls above or below that range, repeat Sections 7.2 – 7.4 and re-clean the ANSI A326.3 validation surface. If after multiple attempts reconditioning the testfoot and re-cleaning the validation surface, the result does not fall within the stated range, disperse acetone onto the ANSI A326.3 validation surface and scrub using a soft bristle brush. Then, wipe off any excess material or residue using a microfiber cloth or paper towel that does not leave residue, repeat Sections 7.2 – 7.4, and test the ANSI A326.3 validation surface. If the result does not fall within the stated range after scrubbing with acetone, repeat the entire test procedure with a new SBR testfoot or with a new ANSI A326.3 validation surface.

8.7 Repeat Sections 7.2 – 7.4 after validation procedure before proceeding with testing.

9.0 Test Procedure—Dynamic COF with 0.05% SLS Water

9.1 Laboratory Test

9.1.1 All test specimens shall be cleaned prior to testing.

9.1.1.1 Using light-use cleaner, clean the test material and scrub using a light duty scrubbing pad or soft bristle brush to remove any dust, debris, or other contaminants that have collected on the surface. Rinse thoroughly with water to remove any remaining material.

9.1.1.2 Allow to air dry or dry with a microfiber cloth or paper towel that does not leave residue.

9.1.2 Place the test specimens on a flat, solid surface. If necessary, place specimens on either side of the specimen being tested to accommodate the wheels of the test device as it travels over the surface.

9.1.3 Wet the path that the testfoot will follow with enough 0.05% SLS water such that the testfoot will remain within the wetted path throughout the entire test.

9.1.4 Set the test travel distance of the testing device to 8 in. (203.2 mm). If the material being tested has any dimension less than 8 in. (203.2 mm) and greater than or equal to 4 in. (101.6 mm), run the test with the longest possible travel distance that fits on the surface. For test materials with any dimension less than 4 in. (101.6 mm), bond enough pieces of the specimen to a solid surface to provide at least 8 in. (203.2 mm) travel distance and test with the 8 in. (203.2 mm) travel distance setting.⁷

9.1.5 Make a total of four dynamic measurements on the specimen. Make one measurement then rotate the testing device 180° and make the second measurement. Remove the SLS solution from the surface with a microfiber cloth or paper towels that do not leave a residue. Re-wet the surface in a path 90° to the previous one. Take the final two measurements, along the new path, in the same fashion as above.

9.1.6 Record all four dynamic measurements, then calculate the average.

9.1.7 Repeat Sections 9.1.2-9.1.6 on two additional specimens, repeating Sections 7.2-7.4 before each specimen.

INFORMATIVE NOTE: *DCOF measurements taken across grout joints and protruding features of three-dimensionally patterned or profiled walkways can produce misleading measured DCOF values due to test device constraints. Additionally, for surfaces where direction of testing may influence DCOF results (mosaics, three-dimensionally patterned or profiled surfaces, etc.), consider additional measurements in varying orientations relative to the test specimen surface to evaluate potential variation in DCOF results based on test direction.*

9.1.8 After testing all specimens, recondition the SBR testfoot (Sections 7.2-7.4) then recheck and record the value measured on the ANSI A326.3 validation surface (Sections 8.4-8.6). If the value falls outside the range in Section 8.6, determine the source of error, take corrective action, and repeat the entire testing procedure.

⁷ Bond mosaics in sheet form without grouting. For loose mosaics, bond with the joints not exceeding 1/8 in. (3.18 mm) and do not grout. During bonding, place mosaics face down on a flat surface to ensure a planar test surface.

9.2 Field Test

- 9.2.1** Determine the area(s) to be tested based on the test objective. An area is a contiguous space with hard surface flooring of the same or similar type.
- 9.2.2** Determine test locations required per area based on the test objective.
- INFORMATIVE NOTE:** *The following are typical locations that should be considered for testing: Locations that are representative of both high and low traffic conditions, locations that evaluate varying material sizes or textures, and locations commonly exposed to contaminants or other risks.*
- INFORMATIVE NOTE:** *If testing on a sloped surface is required, confirm that the slope of the test location(s) is within the constraints of the testing device as recommended by the testing device manufacturer.*
- 9.2.3** For each test location, choose a minimum of three test samples of size sufficient to accommodate the test travel distance (see Section 9.1.4).
- 9.2.4** Determine if the test will be conducted under clean conditions or under prevailing conditions (without pre-cleaning the surface before testing).
- INFORMATIVE NOTE:** *If the test objective is to measure a contaminant-free floor, clean the surface prior to testing. If the test objective is to measure the floor under prevailing conditions, test the floor “as is” without cleaning.*
- 9.2.5** When testing the prevailing conditions, the test shall be conducted in the “as-is” condition. Remove any obvious solid contaminants (e.g., dirt, crumbs, coffee grounds, etc.) from the surface prior to testing. Take note of any solid contaminants which are removed from the surface.
- 9.2.6** When results are required under clean conditions, use cleaning chemicals as listed in Sections 6.3 and 6.5, and a soft bristle brush or light duty scrubbing pad, as needed to remove surface contaminants. Additional scrubbing using a stiff bristle brush may also be required to reach a clean condition as long as such does not damage the flooring material. Rinse thoroughly to remove residual cleaning chemicals.
- 9.2.6.1** Remove rinse water with a dry microfiber cloth or paper towels that do not leave a residue. Inspect microfiber cloth or paper towels. If any contaminants are visible from the rinse water, conduct another cleaning cycle. Repeat until the microfiber cloth or paper towels appear clean after removing the rinse water.
- INFORMATIVE NOTE:** *Use of cleaning chemicals on hard surface flooring materials, including but not limited to, acidic cleaners, citrus degreasers, solvents, sealer strippers, or other cleaners, can potentially change the DCOF of the flooring surface. Caution should be exercised when using such cleaners. Caution should also be exercised when cleaning with a stiff bristle brush, as the use of such can potentially alter the surface of test specimens.*
- 9.2.7** Wet the path that the testfoot will follow with enough 0.05% SLS water such that the testfoot will remain within the wetted path throughout the entire test.
- 9.2.8** Take a total of four dynamic measurements at each test sample being measured. Take one measurement then rotate the testing device 180° and take the second measurement. Remove the SLS solution from the surface with a microfiber cloth or paper towels that do not leave a residue. Rewet the surface in a path 90° to the previous one. Take the final two measurements, along the new path, in the same fashion as above.
- 9.2.9** Repeat Sections 7.2-7.4 before each test sample.

- 9.2.10** Record all four dynamic measurements then calculate an average for each test sample.
- INFORMATIVE NOTE:** *DCOF measurements taken across grout joints and protruding features of three-dimensionally patterned or profiled walkways can produce misleading measured DCOF values due to test device constraints. Additionally, for surfaces where direction of testing may influence DCOF results (mosaics, three-dimensionally patterned or profiled surfaces, etc.), consider additional measurements in varying orientations relative to the test specimen surface to evaluate potential variation in DCOF results based on test direction.*

10.0 Dry Dynamic Coefficient of Friction (DCOF)—If Desired

- 10.1** Repeat Sections 7.0-9.0, except recondition the testfoot and run the test and validation procedure in the dry condition. All specimens/test areas must be completely dry before conducting the test. For validation procedure, use a range of ± 0.04 of the value stated for dry DCOF testing on the ANSI A326.3 validation surface.

11.0 Report

- 11.1** Report the following information:
- 11.1.1** Type of surface, including unique identifying name or number.
 - 11.1.2** Temperature during testing and relative humidity if testing in the dry condition.
 - 11.1.3** Testing device used and calibration due date of testing device.
 - 11.1.4** Testfoot material.
 - 11.1.5** Cleaning chemicals used.
 - 11.1.6** SLS water concentration (wet DCOF testing only).
 - 11.1.7** Statement of validation procedure including actual dynamic coefficient of friction values measured on the ANSI A326.3 validation surface before and after testing and whether or not each fell within the appropriate range.
 - 11.1.8** Individual and average wet dynamic coefficient of friction for specimen/test area.
 - 11.1.9** Individual and average dry dynamic coefficient of friction for each specimen/test area (if desired).
- 11.2** Additional reporting for field testing:
- 11.2.1** Note if the measurements were made in areas that had been cleaned or in a prevailing (“as-is”) condition.
 - 11.2.2** Description/photographs of test areas sufficient to re-locate the test areas.
 - 11.2.3** Note general environmental conditions, such as (but not limited to): contaminant type present, coatings or sealers present, traffic conditions, maintenance equipment, and presence of walk off mats.

12.0 Discussion of Wet DCOF Method Precision

- 12.1 Precision:** The precision of Section 9.0 of this test method is based on an interlaboratory study

conducted in May 2011. Each of six laboratories tested seven different materials. Every “test result” was calculated using the average of four individual wet dynamic coefficient of friction measurements. The laboratories obtained three replicate test results for each material.

12.1.1 Repeatability: Two test results obtained within one laboratory shall be judged not equivalent if they differ by more than the “r” value for that material; “r” is the interval representing the critical difference between two test results for the same material, obtained by the same operator using the same equipment on the same day.

12.1.1.1 “Sr” represents the repeatability standard deviation.

12.1.2 Reproducibility: Two test results shall be judged not equivalent if they differ by more than the “R” value for that material; “R” is the interval representing the difference between two test results for the same material, obtained by different operators using different equipment.

12.1.2.1 “SR” represents the reproducibility standard deviation.

12.1.3 Any judgment in accordance with these two statements would have an approximate 95% probability of being correct.

12.2 The precision statement was determined through statistical examination of 126 results, from six laboratories, representing six different BOT 3000 devices, on seven materials. Descriptions of the seven surfaces tested are as follows:

- Surface 1: Polished porcelain
- Surface 2: Glazed porcelain, lightly textured
- Surface 3: Glazed porcelain, heavily textured
- Surface 4: Standard tile, glazed ceramic, smooth
- Surface 5: Unglazed mosaics
- Surface 6: Unglazed porcelain, textured
- Surface 7: Glazed porcelain, smooth

Table 2: Dynamic Coefficient of Friction with 0.05% SLS Water

Surface	Average (x)	Standard Deviation (Sx)	Repeatability Standard Deviation (Sr)	Reproducibility Standard Deviation (SR)	Repeatability (r)	Reproducibility (R)
1	0.36	0.02	0.02	0.02	0.05	0.05
2	0.44	0.02	0.01	0.02	0.03	0.05
3	0.43	0.02	0.02	0.02	0.06	0.06
4	0.27	0.01	0.01	0.01	0.03	0.03
5	0.63	0.02	0.01	0.03	0.04	0.07
6	0.65	0.03	0.01	0.03	0.03	0.08
7	0.24	0.01	0.01	0.01	0.02	0.02

ANSI A326.3 | FIGURES

Figure 1: SBR sensor with wear line.

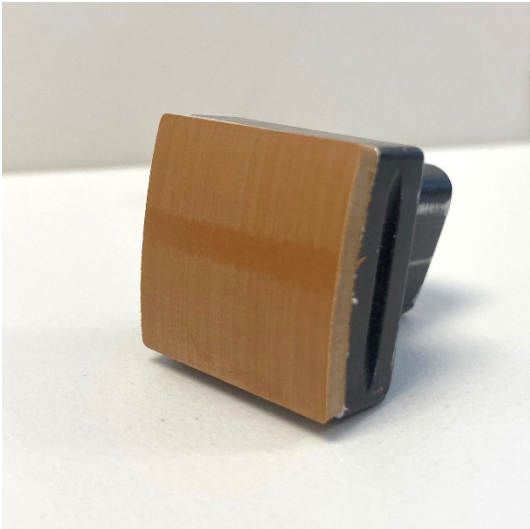


Figure 2: SBR sensor without wear line.



END OF ANSI A326.3

THIS STANDARD IS UNDER CONTINUOUS MAINTENANCE AND ALWAYS OPEN FOR COMMENT AND PROPOSED REVISIONS. PLEASE SUBMIT COMMENTS AND PROPOSED REVISIONS TO THE COMMITTEE SECRETARY, KATELYN SIMPSON, KSIMPSON@TCNATILE.COM.

Appendix A (Informative)

This appendix is informative and is not part of ANSI A326.3.

A1. Testfoot Reconditioning Procedure for the BOT 3000E Testing Device

1. Insert a strip of new sandpaper into the testfoot reconditioning tool.
2. Using a paint brush or chip brush, brush out loose particulate from the new sandpaper strip.
3. Insert SBR testfoot into the testfoot reconditioning tool using the correct orientation.
4. Rotate the SBR testfoot in either direction until no debris or wear lines are visible on the testfoot surface.
5. Remove the SBR testfoot and thoroughly brush its surface to remove any loose material.
6. Brush out loose particulate from the sandpaper surface.
7. Re-insert the SBR testfoot into the testfoot reconditioning tool and rotate for 10 revolutions.
8. Remove the SBR testfoot and thoroughly brush its surface to remove any loose material.
9. Wipe the surface of the SBR testfoot with a clean microfiber cloth or paper towel that does not leave residue to ensure the removal of any loose material and/or contaminants.

For a video demonstration of the procedure listed above, please refer to the section titled “Sensor Reconditioning Procedure” (beginning at time 0:16 and ending at time 1:51) in the following educational video: https://youtu.be/_SV5mhrEwzQ?t=16.



Product Performance Testing Laboratory

Antiviral, Microbiology & Cell Culture Services

Long after the pandemic is over, a heightened call for hygiene will remain.

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.

Viruses available for testing*

SARS-CoV-2 - NOW AVAILABLE

Adenoviruses

Hepatitis B

Hepatitis C

Norovirus

Influenza H1N1 Human

MSO bacteriophage (viral screening tool)

* Additional viruses available upon request

IAS

ACCREDITED

Testing Laboratory

ISO 17025

TL-720

www.tcnatile.com



Know Your Number.

- ➔ Manufacturers
- ➔ Specifiers
- ➔ Installers
- ➔ Distributors
- ➔ Building Managers
- ➔ Maintenance Professionals

Rely on the expertise of the TCNA Product Performance Testing Laboratory to perform these tests and be sure you have a more complete analysis of your product's appropriate use.

ANSI A326.3

Know the Coefficient of Friction (COF) of your chosen material.



DIN 51130

Know the friction property of your material through the "German Ramp" test, particularly helpful for evaluating textured surfaces.



Combine ANSI A326.3 and DIN 51130 for a comprehensive evaluation of a flooring material's friction properties.

www.TCNAtile.com/lab
testing@TCNAtile.com
864-646-8453



Be sure you understand these important standards for hard surface flooring.



STANDARDS. SCIENCE. EDUCATION. ADVOCACY.



Standards

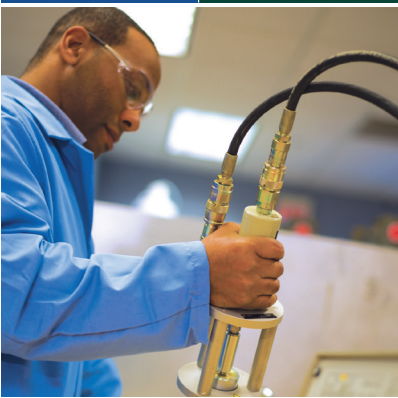
Leading Association for National and International Standards for Tile, Installation Materials, and Sustainability

Secretariat of ANSI Accredited Standards Committee and U.S. Technical Advisory Group for ISO Technical Committee 189

Publisher of the *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation*

Science

Largest Independent Tile and Installation Materials Testing Laboratory in North America
Leading Research Laboratory for Standards Development



Education

Founding Partner in Installer Education and Certification Programs in the U.S. and Mexico

Provider of Tile Industry Economic Reports



Advocacy

Consumer and Industry Interests in Legislative, Regulatory, and Environmental Matters



TILE COUNCIL OF NORTH AMERICA

864.646.8453 ♦ www.TCNAtile.com

100 Clemson Research Blvd. Anderson, SC 29625