

# autostone

floor systems

## ANSI A326

*STF (Slip, Trip, & Fall) Standard*

*or*

## DCOF

*Higher Test Requirements*

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This new standard requires tile manufacturers to designate their products appropriate for use in specific environments with new DCOF ratings.

**This impacts automotive environments locations such as:**

- Service Drives (and type of enclosure)
- Workshop environments
- Tech Locker Rooms (showers and wet areas)

**Only AutoStoneUSA lists and designates:**

***driveseries!***  
advanced surface technology

**enviroshop**  
smarter, better, workshops

for specific automotive use, read the following ANSI information

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**ANSI A326.3 American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring 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.<sup>1</sup> 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 level<sup>2</sup> 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,<sup>3</sup> 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.

<sup>1</sup> 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.

<sup>2</sup> 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%.

<sup>3</sup> 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,<sup>3</sup> 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.*

AutoStoneUSA shop floor series:



enviroshop - includes manufacturer declared used classification.

See below (in this document) and enviroshop Tile Guide for listings.



driveseries - includes manufacturer declared used classification.

See below (in this document) and driveseries Tile Guide for listings.

Note: tiles that previously were rated > .42 DCOF that have been used for automotive service drive and workshop environments, do NOT meet this new standard.

Tile manufacturer MUST declare applicable for use in automotive service and workshop areas, as well as the type of exposure to elements faced in service drive design, etc.

\* 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.*

**4.1.3 - Interior, Wet Plus (IW+)** - describes service drive & workshop environments with:

- \* roof.
- \* (4) walls.
- \* high speed doors\*\*

\*\* roll-up doors do not mitigate the environment (rain, sleet, etc.) and are considered exterior applications.

**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.*

**AutoStoneUSA shop floor series:**



enviroshop - is rated for Interior, Wet

Plus (IW+) - see environment for use.

Note: DCOF rating is > .50



driveseries - is rated for this category use (IW+) and more categories, see below.

Note: DCOF rating is > .50

**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 (EW) -** describes service drive & workshop environments with:

- \* roof.
- \* (4) walls.
- \* roll-up doors (California Bay)
- \* No doors.

See other requirements for site conditions for a tile product to be used.

**AutoStoneUSA shop floor series:** driveseries - is rated for Exterior, Wet Plus (EW) - see environment for use.

**driveseries!**  
advanced surface technology

Note: DCOF rating is > .55

AutoStone driveseries is the only industrial tile with brightfinish, a permanent sealant, baked-in during manufacturing retards permanent staining and aids dealership cleaning practices.

This is a critical function as having a high-rated DCOF that is difficult to clean results in degradation of DCOF values as oils, grease, rubber transfer and other elements embed in the tile surface, darkening the tile because it is difficult to clean.

Later, moisture reactivates the embedded chemicals which decrease the DCOF rating and the floor becomes slippery and poses STF risk to dealership operations.

**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 (O/G)** - describes service drive, workshops, oil & lube change environments with:

- \* roof.
- \* (4) walls.
- \* high-speed doors.
- \* roll-up doors.
- \* no doors.

See other requirements for site conditions for a tile product to be used.

**AutoStoneUSA shop floor series:**

**driveseries!**  
advanced surface technology

driveseries - is rated for Oils/Greases

(O/G) - see environment for use.

Note: DCOF rating is > .55

Automotive workshops, oil & lube changing and other environments with exposure to grease, oil and such are subject to this standard.

Only driveseries by AutoStone meets these new ANSI declared used standards.

**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 in 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 device<sup>4</sup>:** 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.