

SOTTER ENGINEERING CORPORATION
Floor Slip Resistance Consultants

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Licensed by the State of California
Board of Professional Engineers
And Land Surveyors

Certified by the City of Los Angeles
as an official slip resistance testing
laboratory for flooring

CERTIFIED

ANSI A326.3/A137.1 Flooring Slip Resistance Test Results

Client: XXXXXXXXXXXXXXXX

Report date: 7/4/2024

Flooring: XXXXXXXXXXXXXXXX

Page 1 of 4

Test no.: 2407-0421

Date tested: 7/4/2024

Figure 1 shows the sample. Red, green, blue, and white color references are included, with a U.S. penny (1/16 inch thick) for scale. The back of the sample is included to aid in positive identification.



Figure 1: (clockwise from top left) front, back and close-up of sample tested

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without the written approval of Sotter Engineering Corporation*

Flooring: XXXXXXXXXXXXXXXX

ANSI A326.3/A137.1 Dynamic Coefficient of Friction Test

The American National Standards Institute (ANSI) published the A137.1-2012 American National Standard test for measuring dynamic coefficient of friction (DCOF) of common hard-surface indoor level floor materials in 2012. This ANSI standard was incorporated as a requirement in “Section 2103.6 Ceramic Tile” of the 2012 International Building Code published by the International Code Council. (It was removed for the next edition in 2015.) That section states that “Ceramic tile shall be defined in, and shall conform to the requirements of, ANSI A137.1.” ANSI published A326.3 in 2017, which uses the same test method as A137.1 but allows for all hard flooring materials to be tested, adds lots of disclaimers, and describes the method for testing in the field. In 2021, ANSI A326.3 was updated again to include areas besides level indoor floors (clean exterior maintained areas, public restrooms, etc.), and many more disclaimers were added.

Vice President John C. Sotter conducted the testing and drafted this report.

Average Dynamic Coefficient of Friction (DCOF), cleaned with Renovator #120, and tested with BOT-3000E digital tribometer using SBR rubber slider and 0.05% SLS water solution:

Area #1 Wet: 0.42, 0.47, 0.41, 0.46; **Avg. = 0.44**

Area #2 Wet: 0.51, 0.46, 0.49, 0.53; **Avg. = 0.50**

Area #3 Wet: 0.51, 0.50, 0.54, 0.51; **Avg. = 0.52**

Overall average: Wet: 0.49

T = 57.9 degrees F; Relative humidity = 69%; BOT recalibration due July 3, 2025

BOT-3000E strain gauge verified on day of test.

ANSI A326.3: DCOF on validation surface (p. 8, 8.1-8.7) before/after testing and whether in range: passed/passed
Results apply only to sample(s) tested.

High dynamic coefficient of friction values indicate potentially good traction. However, the ANSI A326.3 test method states on page one that this test “**can provide a useful comparison of surfaces, but does not predict the likelihood a person will or will not slip on a hard surface flooring material.**”

That means this test was not designed to be a safety assessment. This test was created by representatives of the American tile industry and is not the result of international peer-reviewed research into real-world slips and falls. More information on this potentially dangerous test method (if the previous statements are ignored and this test is used as a safety assessment) is available at <https://safetydirectamerica.com/ansi-a326-3-acutest-does-not-predict-likelihood-of-slip/> and <https://youtu.be/fdt5sRaRWps?si=CsSi9x4qQ3BB0FFy>

The ANSI A326.3 standard, Section 3.1, states that

“Unless otherwise declared by the manufacturer, hard surface flooring materials suitable for **level interior spaces expected to be walked upon wet with water shall have a measured wet DCOF of 0.42* or greater** when tested using SBR sensor material and SLS solution as per this standard. However, hard surface flooring materials with a DCOF 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, and
manufacturers’ guidelines and recommendations.

Section 3.2 states: “...hard surface flooring materials with a measured wet DCOF of less than 0.42*... 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.”

The United Kingdom’s Health and Safety Executive (HSE), which is England’s version of OSHA, warned against using these types of drag-sled machines to assess slip risk [here](#). (see page 6 under “Other Tests”). The HSE says in their recommendations that, “The instruments that have been dubbed ‘sled tests’ (like the BOT-3000E) involve a self-powered trolley that drags itself across the floor surface. These tests do not recreate the conditions of pedestrian gait which give rise to most slip accidents. **Data from such machines is unlikely to be relevant to pedestrian slipping in contaminated conditions.**

The latest version of the ANSI A326.3 test standard, with the help of lawyers who aim to protect the creators of this test, goes on to say “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.”

Footnote 1 says, “**No claim of correlation to actual footwear or human ambulation is made.**”

An informative note says, “**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 some areas labeled as “Interior, Wet Plus”, such as locker rooms, public showers, self-service restaurants, etc., “...it is generally accepted that hard surface flooring in this category should have **AT LEAST A MINIMUM wet DCOF 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](#), traction-enhancing features, and intended use in addition to the other criteria in this standard...[so]...**a single normative DCOF limit value is not provided.**”

For areas defined as “Exterior, Wet” (which only include outdoor areas that are “clean” and “maintained”), and areas with “Oils/Greases”, similar disclaimers, warnings and other factors to consider besides the DCOF measurement are given. It states again here that “...it is generally accepted that hard surface flooring in [these] category[ies] should have **AT LEAST A MINIMUM wet DCOF of 0.55***, with factors other than wet DCOF also taken into consideration.”

The asterisk (*) behind each minimum DCOF given refers to a footnote that states these minimum values only correspond to those obtained by the BOT-3000E device.

This standard is full of these (and more) disclaimers and warnings that should not be ignored when specifying hard surface flooring. How to interpret all these disclaimers and warnings and how much more than the minimum DCOF is required for various situations is left up to the specifier.

We recommend using ASTM E303-22 or a similar pendulum DCOF test method to assess real-world slip risk. The pendulum tester has an official published test method in at least 50 nations and has been in use for over 50 years now. It's based on good science from all over the world. This ANSI test is not based on any good science and research. This ANSI A326.3 test is just the latest American test promoted by American tile manufacturers to help them sell slippery tile after their last attempt at fooling tile consumers, [ASTM C1028](#), was withdrawn by the ASTM in 2014.

ASTM C1028 had been repeatedly exposed for many years as being utterly useless in assessing slip risk. The ASTM was far too slow in withdrawing this test method, in our opinion, which gave the American tile industry ample time to create another bad test method that effectively said most slippery tile wasn't slippery.

As a responsible testing agency interested in helping prevent avoidable life-altering slip injuries to innocent pedestrians, we must emphasize again that the ANSI A326.3 test method says on page one that, "...it can provide a useful comparison of surfaces, but **does not predict the likelihood a person will or will not slip on a hard surface flooring material.**" To use this ANSI test as an assessment of slip risk is to ignore what the test method itself says. ANSI A326.3 should therefore never be used to determine the slipperiness of a flooring.

Respectfully submitted,
SOTTER ENGINEERING CORPORATION



J. George Sotter, P.E., Ph.D.
President

