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TECH TIPS

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Slip Resistance

By Clifford Marvin AIA Assoc., CSI, CCS, SCIP, LEED AP

Providing compete construction specifications documentation, systems and performance descriptions, and risk and quality advisory services.

Conspectus's Tech Tips received the national Communications Award from the Construction Specifications Institute.

ABSTRACT:
Slip resistance is an important quality of a flooring material, but exactly how slip resistant should a surface be? How is slip resistance measured on both level and sloping surfaces? Is there a test for wet conditions? Know the regulations and understand how materials perform in adverse conditions.

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KEYWORDS:
Slip-Resistance, Slip Resistant, Performance Requirements, Surface Treatment, Static Coefficient of Friction

REFERENCES:
Americans with Disabilities Act of 1990 (ADA).
ASTM C1028 "Standard Test Method for Determining the Static CoF of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method"
BS 7976: Pendulum CoF Test
BS 8204 Conc. wearing surfaces.
DIN 51097:1992 “Testing of floor coverings…ramp test”
DIN 51130:2004 “Testing of floor coverings…Ramp test”

Background

Serious discussion about slip resistance started after laws were passed requiring access to public buildings by people with disabilities. Chapter 3, Section 302.1 of the current ADA states that “Floor and ground surfaces shall be stable, firm, and slip resistant…” Back then, it may have been worded a little differently, and originally, ASTM C1028 was referenced in the earlier versions of the regulations, but this vague requirement for slip resistance remains today, making it a concern for all property owners.

ADA Regulations

The required static coefficient of friction (CoF) stipulated in the original ADA regulations was based on testing in accordance with ASTM C1028, which measures the CoF of ceramic tile and other surfaces under both wet and dry conditions. Since slips and trips are the most common causes of injury at work, and a prevalent source of lawsuits in public facilities, especially in the hospitality industry, it makes sense to rely on standards that will result in a safer workplace, but this standard simply doesn’t cover all possible conditions. Now the ADA regulations only generally require “slip resistance” but do not define it quantitatively in any way. ASTM C1028 was not renewed for some time while the committee considered revising it, but according to the current version of the standard, the method of measuring the static CoF remains unchanged.

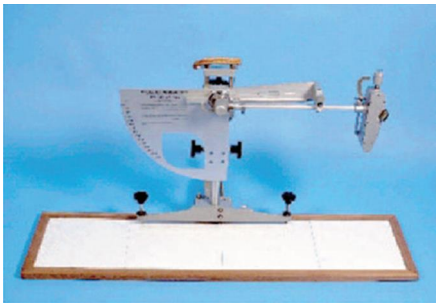
British Standards

In Britain, the Health and Safety Executive (HSE) issued a Technical Information Sheet about a year ago to assess the levels of “slip potential” of particular surfaces. Slip potential is measured using a testing method slightly different from the American standard known as the “Pendulum CoF Test.” Refer to photo and Table 1, below.

Table 1 Slip potential classification, based on pendulum test values (PTV)

Potential	PTV
High-slip	0-24
Moderate-slip	25-35
Low-slip	36+

In addition to pendulum testing, electronic meters capable of measuring surface microroughness are readily available. Surfaces are categorized with high, moderate or low slip potential depending on their range of surface roughness. Surface microroughness data is used to supplement pendulum test data or is interpreted on its own in conjunction with Slip Assessment Tool (SAT) software.



German Standards

The Germans have two standards which include testing on a ramped surface. The first test method (Table 2) uses barefoot operators with a soap solution contaminant, and the second (Table 3) uses heavily-cleated safety boots with a motor oil contaminant. It is worth noting that Britain reserves judgment on referencing these standards since soap and motor oil are not commonly found in many workplaces and so the way the test results are applied may not be appropriate for the particular flooring material in question. Classification per DIN 51130 as R9 signifies a surface that is slippery when wet, while R13 is the least slippery surface. Surfaces classified according to DIN 51097 as A, and in many cases, B will be slippery when wet.

There are other tests but it is generally thought that the sled-type tests available to measure slip resistance do not suitably replicate the way a human being walks well enough to produce reliable results. In Britain, the compliance of concrete wearing surfaces with BS 8204 can be determined through the SlipAlert test, which produces useful data regarding the slip resistance of a large floor area, but may not identify small trouble areas.

Other Standards

Owners may have their own concerns or even standards with regard to slip resistance. A grocery retailer, for example, may have strict requirements for floor finishes in wet areas to ensure employees work in a safe, non-slippery environment. Federal, state or municipal agencies may have specific CoFs they want specified for certain occupancies. A private owner may have concerns about getting sued if someone slips on their property and hurts themselves. A foreign or sophisticated client familiar with the European standards may ask you to invoke them in the specifications.

Conclusion

The measurement and regulation of slip resistance is unfortunately an extremely slippery slope. The slip resistance of a surface can change over time due to inappropriate maintenance or just normal wear. When evaluating materials for selection, remember that the type of CoF test used affects the validity of its measurement. Select floor finishes to balance the need for slip resistance with the design intent for the space.

Inform the Owner. During the early design phase, explain to the Owner that there is no prescriptive level of slip resistance according to current regulations. Become familiar with the various standards and know their limitations. Base flooring material recommendations on the intended use of the space, while anticipating the contaminants that may be present in that particular area under normal use. At Project Closeout, make sure the Owner is informed as to the proper maintenance of their flooring materials to ensure their slip resistance is maintained throughout their useful life.

Table 2 DIN 51130 R-Value slipperiness classification

Classification	R9	R10	R11	R12	R13
Slip angle (deg)	6-10	10-19	19-27	27-35	>35

Table 3 DIN 51097 slipperiness classification

Classification	A	B	C
Slip angle (deg)	12-17	18-23	>24

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