



Coefficient of Friction Test

Testing Location:

**American Decorative Concrete
120 Commercial Ave
Lowell, AR 72745**

Prepared at the request of:

**Mr. Carl Cabot
V.P. Product Development**

**Prepared by:
Ben Jones**

Date: August 13, 2013

The Science of Slip Fall Measurement

1. Testing the slip resistance of a walkway surface is a scientific method of gauging how safe the surface is for the average human to navigate. Various factors can contribute to a slippery condition of the floor, the actual floor surface, i.e. the floor finish, the extent of honing to the surface, the products used to maintain the surface, the polish or floor wax being applied and the extent that foreign substances may have contaminated the floor surface. The likelihood that a floor surface has a slippery condition when walked on is greatly increased when a contaminant, something as simple as rainwater or soda, is present. This greatly increases the chances that the 'hydroplaning effect' will accelerate underfoot and change the dynamics of the floor surface making the floor much more slippery when wet and much more difficult to navigate.

1.1 The primary function of performing slip resistance measurements is to determine what extent a surface can contribute to a slip and fall event. Various standards have been written and published that are specifically designed to address many of the guidelines for slip resistant surfaces. ANSI A 1264.2, ASTM C-1028, ANSI-B101.1, and ANSI B101.3, all embrace attributes that will help quantify what could be considered a slippery floor surface.

2. Slip Resistant Measurement Definitions/Standards

2.1 The coefficient of friction is a term which assigns a value of resistance to movement between two surfaces. When the coefficient of friction (COF) is measured from a resting position, it is called the "static coefficient of friction" (SCOF). When the coefficient of friction is measured with two surfaces in relative motion, it is called the "dynamic coefficient of friction" (DCOF). Industry consensus has demonstrated that the dynamic COF value is a more realistic evaluation of the slippery condition of the flooring surface, since the majority of all slip and fall events happen when the individual is in motion.

The testing device utilized by Nu-Safe (BOT 3000) has passed the independent Precision and Bias testing protocol and is currently recognized throughout Europe, the US and numerous other countries as a consistently reliable means of measuring both dynamic coefficient of friction and static coefficient of friction testing for wet and dry conditions. It is now recognized as a state of the art instrument for measuring both SCOF and DCOF by The Tile Council of North America, ANSI, ASSE, and ASTM.

Finished Concrete surfaces that do not require a topical coating be applied, such as a floor finish, may utilize an industry standard referenced as the **ASTM C-1028**, or, **ANSI B101.0** for measuring the SCOF value of the floor when wet. Early in 2013 a new ANSI standard for measuring dynamic coefficient of friction was released. That standard is the **ANSI B 101.3**, a test method for measuring wet dynamic coefficient of friction values. Dry surfaces generally reference the **ASTM F-489** Standard, using a leather sensor, as outlined using the James Machine

Since the dynamic coefficient of friction is more recognized as a realistic means to define slip resistance values representative of real world experience, the BOT 3000's highly sensitive and consistent readings are providing documentation for several insurance companies, architects, and floor finish companies in the U.S. to quantify what constitutes a safe floor surface. (www.regansci.com). The COF values presented in this report are representative of both the wet SCOF and DCOF values, unless otherwise noted. Also included in this report is the dry SCOF values.

Scientific Equipment For COF Report

3.1 The BOT 3000 Slip Tester was designed by a German Company in accordance with the German Ceramic Research Association after undertaking detailed research into the action of people's feet on floors while walking. The main conclusion of this work was that the most critical time occurs as the edge of the heel of the shoe contacts the floor. At this point, the heel moves across the floor surface, albeit a very small movement during normal, safe walking. The amount of movement will increase on floors with poor slip resistance properties; possibly to a point when there will not be enough resistance to stop the heel from accelerating. At this point, the walker will lose control and slip in a manner in which it will be extremely difficult to recover and will, therefore, fall. The BOT 3000 is a precision instrument, which reproduces the action of the heel moving across the floor surface. It measures the slip resistance by sliding a leather, rubber or neolite pad across a floor and provides a direct reading of the static, dynamic and even replicates the James Machine coefficient of friction between the pad and the floor.

The BOT 3000 has been accepted by ANSI, ASSE, ASTM and numerous other standard writing agencies as a valid measuring device. OSHA has acknowledged that COF testing is a valuable safety approach as long as the test device can validate an acceptable degree of repeatability and re-productibility. The BOT 3000 completed the **ASTM E-691-99** "Inter-laboratory Study to determine the Precision of a Test Method" with results consistent with the level established by ASTM. It is the only scientific instrument for measuring the COF values that has published the Precision and Bias studies to date.



COF FLOOR EVALUATION

Client	American Decorative Concrete				Technician:	Ben Jones, Nu-Safe Floor Solutions				
Location/Address:	120 Commercial Ave, Lowell, AR 72745				Address/Phone No.:	44 Cummings Drive, Walton, KY 41094				
Date/Time of Tests:	8/8/2013				Serial #:	1107/1049				
Test Method:					Test Foot	Leather				
Zone Tested	Foot & Test Type		Surface Slope	Floor Material	Floor Finish	Floor Condition	Reading 1 North		Reading 2 East	Average
1. Burnished	Leather	Dry SCOF	Flat	Concrete	None	Clean	Dry	0.70	0.80	0.75
2. SR2 Burnished	Leather	Dry SCOF	Flat	Concrete	None	Clean	Dry	0.85	0.80	0.83
3. 3DHSL Burnished	Leather	Dry SCOF	Flat	Concrete	None	Clean	Dry	0.83	0.70	0.77
4. 3DHS/SR2/Burnished	Leather	Dry SCOF	Flat	Concrete	None	Clean	Dry	0.80	0.86	0.83
5. 3DHS Burnished	Leather	Dry SCOF	Flat	Concrete	None	Clean	Dry	0.76	0.68	0.72
6. 1500 Polished	Leather	Dry SCOF	Flat	Concrete	None	Clean	Dry	0.67	0.67	0.67
7. 3DHS/SR2/1500	Leather	Dry SCOF	Flat	Concrete	None	Clean	Dry	0.70	0.67	0.69
8. 3DHS/1500	Leather	Dry SCOF	Flat	Concrete	None	Clean	Dry	0.76	0.60	0.68
9. 3DHS/1500	Leather	Dry SCOF	Flat	Concrete	None	Clean	Dry	0.77	0.74	0.76
10. SR2-1500	Leather	Dry SCOF	Flat	Concrete	None	Clean	Dry	0.69	0.61	0.65

Safe 0.50 and above
0.40-0.49
Unsafe 0.39 and below



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Test Method:	DIN				Test Foot	SBR Rubber		
Zone Tested	Surface		Floor		Wet/Dry	Reading 1		Average
	Foot & Test Type	Slope	Material	Finish		North	East	
1. Burnished	Rubber	Flat	Concrete	None	Clean	0.53	0.60	0.54
	Wet DCOF					0.52	0.43	
						0.63	0.55	
2. SR2 Burnished	Rubber	Flat	Concrete	None	Clean	0.48	0.54	0.50
	Wet DCOF					0.53	0.56	
						0.49	0.37	
3. 3DHS Burnished	Rubber	Flat	Concrete	None	Clean	0.47	0.49	0.46
	Wet DCOF					0.51	0.44	
						0.46	0.40	
4. 3DHS/SR2/Burnished	Rubber	Flat	Concrete	None	Clean	0.53	0.54	0.50
	Wet DCOF					0.53	0.54	
						0.43	0.43	
5. 3DHS Burnished	Rubber	Flat	Concrete	None	Clean	0.48	0.42	0.42
	Wet DCOF					0.52	0.43	
						0.34	0.34	
6. 1500 Polished	Rubber	Flat	Concrete	None	Clean	0.46	0.45	0.49
	Wet DCOF					0.49	0.47	
						0.54	0.54	
7. 3DHS/SR2/1500	Rubber	Flat	Concrete	None	Clean	0.55	0.53	0.53
	Wet DCOF					0.54	0.55	
						0.47	0.51	

TRACTION LEVELS

High	0.43 and above
Acceptable	0.30-0.42
Low	0.29 and below



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Date/Time of Tests:				Serial #:								
Test Method:	ANSI B101.3			Test Foot		SBR Rubber						
Zone Tested	Surface		Floor Material	Floor Finish	Floor Condition	Wet/Dry		Reading 1 North		Reading 2 East		Average
	Foot & Test Type	Slope										
8. 3DHS/1500	Rubber Wet DCOF	Flat	Concrete	None	Clean	Wet	0.57	0.62	0.54			
							0.50	0.52				
							0.49	0.55				
9. 3DHS/1500	Rubber Wet DCOF	Flat	Concrete	None	Clean	Wet	0.52	0.48	0.51			
							0.47	0.51				
							0.52	0.58				
10. SR2-1500	Rubber Wet DCOF	Flat	Concrete	None	Clean	Wet	0.41	0.54	0.52			
							0.51	0.57				
							0.54	0.53				

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Date/Time of Tests:		8/8/2013				Serial #:		1107/1049																			
Test Method:		ANSI B101.1				Test Foot		Neolite																			
Zone Tested		*Risk Class		Foot & Test		Surface		Floor		Finish		Floor		Condition		Wet/Dry		Reading 1		Reading 2		Reading 3		Reading 4		Average	
1. Burnished		N/A		Neolite		Wet SCOF		Floor		Concrete		None		Clean		Wet		0.84		0.90		0.92		0.86		0.88	
2. SR2 Burnished		N/A		Neolite		Wet SCOF		Floor		Concrete		None		Clean		Wet		0.92		0.87		0.93		0.91		0.91	
3. 3DHSL Burnished		N/A		Neolite		Wet SCOF		Floor		Concrete		None		Clean		Wet		0.83		0.87		0.80		0.86		0.84	
4. 3DHS/SR2/Burnished		N/A		Neolite		Wet SCOF		Floor		Concrete		None		Clean		Wet		0.85		0.87		0.83		0.91		0.87	
5. 3DHS Burnished		N/A		Neolite		Wet SCOF		Floor		Concrete		None		Clean		Wet		0.81		0.89		0.75		0.75		0.80	
6. 1500 Polished		N/A		Neolite		Wet SCOF		Floor		Concrete		None		Clean		Wet		0.96		0.94		0.92		0.96		0.95	
7. 3DHS/SR2/1500		N/A		Neolite		Wet SCOF		Floor		Concrete		None		Clean		Wet		0.85		0.76		0.91		0.81		0.83	
8. 3DHS/1500		N/A		Neolite		Wet SCOF		Floor		Concrete		None		Clean		Wet		0.80		0.83		0.81		0.76		0.80	
9. 3DHSL/1500		N/A		Neolite		Wet SCOF		Floor		Concrete		None		Clean		Wet		0.90		0.92		0.83		0.87		0.88	
10. SR2-1500		N/A		Neolite		Wet SCOF		Floor		Concrete		None		Clean		Wet		0.99		0.96		0.95		0.92		0.96	

TRACTION LEVELS

High	0.60 and above
Acceptable	0.40-0.59
Low	0.39 and below

*A: Walkway normally dry & free of contaminants

*B: Walkway areas occasionally contaminated

*C: Floors intended for use in wet areas



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8/8/13



