

Tiptoeing around Daubert: The shell game.

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Just before Christmas, to ease the boredom of a company party, I searched for the topic “slip and fall” on the internet using the host’s computer. I discovered an article called, “The Daubert Dilemma in the Slip & Fall Case.<sup>1</sup>” The article discusses the minimum acceptable level of scientific evidence necessary for use in the courts. The authors begin their thesis with the notion that when ASTM canceled two slip resistance measurement standards it left a vacuum. The courts, they believe, had lost a valuable tool applying evidence required for the application of Daubert test in Slip-and-fall litigation. Their notion is reasonable, but only if the devices they favored produced valid scientific evidence. They did not.

Many of us have worried about meeting the demands of the Daubert ruling. When OSHA and ASTM removed the test protocols used by the English slip meter from acceptable standards, things began to change. However, we don’t all agree that current changes are bad. During the last decade, the ADA, the NFPA, ANSI, and ASTM have been the object of marketing abuse claiming that one product or another held official standing for testing floors. The greatest barrier to effective expert testimony came from witnesses that have inadvertently included testimony based upon marketing claims into their testimony and the lawyers they prepped. Most did so innocently, but many of their notions were false. Our effort here is to provide you with the information you need to sort out claims by slip meter manufacturers. I hope this helps.<sup>2</sup>

### **Amontons**

Measuring safe surfaces, and the measure of friction rests largely upon the work of Guillaume Amontons.<sup>3</sup> He became deaf in his teens and spent most of his life developing gadgets that could test and report physical properties of matter. He invented the thermometer for example, Through his investigations, he discovered that friction was determined by the number of asperities projecting from the interface surface of objects in contact. Since there was no way of measuring micro projections (in millionths of a meter) in 1700, he spent his life studying ways to approximate these interactions.

Today, almost all slip meters determine the friction of a surface by pushing, pulling, or striking a horizontal surface with an object. The output is a useful concept called the “coefficient of friction”. Coefficient of friction is a ratio gathered from measurement of vertical and horizontal surfaces after considering the choice of interface materials used. The meaning of this theoretical concept called “slip resistance” adds a third element based upon assumptions about human ambulation. Slip Resistance depends on both theory and value judgments. We will return to Amonton’s theory shortly.

### **The Loss of Innocence**

OSHA’s professional staff must assume the responsibility for today’s confusion about surface testing. OSHA commissioned a tainted study, shoved it down the throats of American industry, and when confronted by a federal court with their error, OSHA tiptoed away.

To say that OSHA has egg on its regulatory face is an understatement.

A former employee of OSHA, with a financial interest in the outcome and his closest supporters, were paid to study slipmeters. Of course, they studied only their own device. OSHA's "experts" gave reasons why the product each owned, used, and promoted was studied exclusively but their justification was later found unpersuasive by the Second District Court of Appeals. For a period, their product was sold to the public with a catch phrase, "OSHA is tightening up."

. When OSHA attempted to use their questionable findings in a code, the professional community exploded and went to federal court. The federal judge permitted OSHA to revisit its decision and the Englishxl slip meter and the Brungraber MII slip meter were removed from federal practice.

OSHA reported the cancellation of the special status of the listed test devices along with mandatory quantitative criteria from the federal code because the two listed devices had never completed ASTM precision and bias requirements.<sup>4</sup> It took years for OSHA to remove the suspect code requirement and for ASTM to invalidate the provisional standard. We speculate, that OSHA had a tiger by the tail and had no way of letting go. In fact, OSHA mishandled every part of what could have been a useful effort. As of now, OSHA has never issued a complaint caused by slippery surfaces as measured by any brand of slip meter,

### **Information Shortfall**

Myths lead to false conclusions. Here are a few myths that create confusion within the courts, in government, and in the private standardization process.

1. *"All ASTM standards for measurement of slip resistance have been canceled."*

A number of reasonable standards were canceled because they had no patents and therefore no champions to revise them under the six year review rules of the society. ASTM F609 describes a patent free device sponsored by Liberty-Mutual. It was just renewed and other generic devices based upon the same principal and will remain active for years.

. The only standards dismissed for shortcomings were ASTM F 1677 and F1679. Both devices failed to meet the precision and bias requirements necessary for an ASTM ethical protocol. For those who don't understand the terms- precision is the ability of a device to repeat its own readings, and bias is the comparative measure of the readings with an absolute standard or quantity. Most observers would object to court acceptance of devices that could not meet ASTM requirements.

2. *"A major tool in the Plaintiff's arsenal of proof has been lost."*

The legal profession hasn't lost anything it ever had. The courts (and many experts) were fooled. The courts and OSHA were led to believe that one or two devices had ASTM blessing and were reliable, accurate, precise, and the represented a completed national consensus. This was never true. The standing of two devices, was championed by OSHA's paid consultants who

promoted devices they owned or used, while in the mean time, OSHA administrators stumbled blindly ahead.

*3. Powerful interest groups conspire to control the efficient measurement of surfaces.*

To some extent, that is true. The frustrations and the confusion within the legal profession are understandable. So is abuse. It happens in part by the relative secretiveness of standards process which then lends itself to false claims. When all of the facts are known, your attitude may depend on if you are looking for an equitable solution or if you are looking for a quick advantage or a long term equitable solution.

*4. No standard exists that can measure wet surfaces.*

There are other validated methods available both within ASTM standards, within industry accepted practice and in international practice that measure wet surfaces. These include analysis done with the Brungraber Mark I, used for forty years in American practice. In two recently proposed standards, committees at ASTM and ANSI directly address the measurement of wet surfaces. Other methods that meet important needs of the legal profession include:

The British Pendulum tester: ASTM E303 adapted as a new standard by the American Tile Council. The device has been around for many years. It was invented in the United States, is generic, and is internationally accepted.

The BOT machine recommended by the National Floor Care institute is well known in Europe and It is well liked in the United States.

The Slip-Alert system is covered by European standards.<sup>5</sup> The German scientific community has tested the Slip alert system along with what is called the German Ramp, and validated research is available.

Drag sled devices like the computerized ASM 725 or the manual VOSI Model 80, are covered by the generic use of ASTM F609-95 or VOSI V41.21 application standards.<sup>6</sup>

Others, like the Kirtchenburg Slider<sup>7</sup> (also patent free) has been studied and validated in Great Britain.

The improved Brungraber Mark III, and the Tortus II both received high marks in USC studies published in 2007.<sup>8</sup>

5. *Woe is me, all is lost* This is wrong. The University of Southern California, and the ASTM F13 committee is developing performance-based criteria by which slip meters can be measured in relation to each other and to human bio mechanics. This work ,while not complete, is active.

### **New Methodologies**

The micro measurement of surface asperities referenced by Amontions is now practical, it is no surprise that Great Britain has established micro measurement of surface projections as their standard for public places. Their version of OSHA uses strict rules to govern Field testing of surfaces and to penalize those that do not conform to national standards. In an effort to extend the usefulness of their methods, the Health and Safety Laboratory of Great Britain has created necessary charts and data to directly compare the output of various meters. ASTM 303, the pendulum tester developed in the United States and free of patents, is their national reference.

Although previous health and safety legislation had always required action against slip and trips risk, recent regulations have re-emphasize the importance of these measures and shown how to take them...slipperiness may be simply assessed by measuring the surface micro-roughness of flooring materials. Many types of roughness tests exists, but research

has shown that measurement of “RZ” ...allows slipperiness to be predicted accurately. RZ is a measure of total surface roughness, calculated as the mean of several peak-to-valley measurements. This measure is simple, quick, and a good indication of floor slip resistance. It has recently been shown that floor surface RZ roughness levels of a least 20 um are required to enhance the slip resistance standard of hard floor materials, such as ceramics and concrete in water-wet conditions. This figure may be reduced slightly when considering soft flooring materials. (e.g. vinyl, linoleum)<sup>9</sup>

### **Test Discipline**

ASTM recently balloted a new standard based upon the research from the University of Southern California for the first time. Standard “Practice for Validation and Calibration of Walkway Tribometers using Reference Surfaces.” establishes standards for measuring, test devices against each other.<sup>10</sup>

Setting aside the Newsom fear for the practice of lawyers, one must really look at the opinions of the important consensus standard groups active in the United States now.

### **What Do Consensus Standards Groups Say**

The Society for Protective Coatings with its many members describes their action as follows.<sup>11</sup>

In its response submitted to OSHA by the October 13 deadline, SSPC and its co-signatories recommended that the agency withdraw section 754(c)(3) of the proposed slip resistance standard until such time as an appropriate standard and criterion for testing can be established. SSPC’s own extensive testing and analysis concluded that the two methods identified in Appendix B of the OSHA Standard, ASTM F1679, “Test Method for Using a Variable Incidence Tribometer (VIT),” and ASTM F1677, “Test Method for Using a Portable Inclined Articulated Strut Slip Tester (PIAST),” are not sufficiently reliable to test the wet slip resistance of coated structural steel as required under Para.

754(c)(3). SSPC's response to OSHA also notes that ASTM intends to withdraw these standards in the next few years. Therefore, it cannot be determined whether commercial coatings currently available or expected to be available by 2006 will provide acceptable compliance with the minimum 0.50 slip index in 754(c)(3) for heavy industrial or light industrial/commercial structural steel.

Seven Months later, after granting the makers of the Englishxl a final opportunity to present adequate test results, ASTM cancelled all ASTM standards cited by users of the Englishxl.

#### **Formal Statement By ASTM**

There are no longer any actively maintained standards for F1677 and F1679. Formerly under the jurisdiction of Committee F13 on Pedestrian/Walkway Safety and Footwear, these test methods were withdrawn as active ASTM standards by action of the Committee of Standards (COS) on September 30, 2006 for failure to include an approved precision statement (violating Section A21 of the Form and Style for ASTM Standards), and for including reference to proprietary apparatus where alternatives exist (violating Section 15 of the Regulations Governing ASTM Technical Committees).<sup>12</sup>

Marketing once claimed that the Englishxl Slip meter was the only device adopted for the enforcement practices by the Department of Justice. That was never true and led to the publication of Bulletin # 4.

#### **BULLETIN #4: GROUND AND FLOOR SURFACES: From Access Board**

This is a significant point. An informal comparison of data collected under three different research protocols, involving four different friction-testers and four different shoe sensor materials, all applied to the same 8-inch by 8-inch ceramic tile surface, resulted in thirty readings ranging from a low of .29 to a high of .99-for its static

coefficient of friction. Even limiting values to those measured by the James machine but using both leather and Neolite sensor material resulted in a range of 0.57 (leather) to 0.79 (Neolite) for the same surface being tested.

It is impossible to correctly specify a slip-resistance rating without identifying the testing method, tester, and sensor material to be used in evaluating the specified product and equally invalid to compare values obtained through one methodology to those resulting from different testing protocols. Because a consensus test protocol has not yet been identified, the Access Board did not specify a value or testing method for determining the coefficient of friction along an accessible route.

The ***National Fire Protection Association*** is the most frequently used accessibility standard group in the United States. It is incorporated by reference in the building codes in most cities. The organization is often drawn into discussions and frequently misquoted on the subject of slip resistance values and testing. While the determination of .5 as a legal or societal measure of slip resistance has never been established by law, proposals are everywhere. The opinion found in Bulletin 4 as described above on the quantification of slip resistance here is the same.

#### **7.1.6 Walking Surfaces in the Means of Egress (NFPA)**

The current provisions applicable to walking surfaces are minimal... They address elevation changes that might cause tripping hazards, maximum slope and slip resistance that relates to safe use...It is expected that the provisions of 7.1.6 will be further expand, such as by codifying measureable slip-resistance criteria, for future editions of the code. The technology has not yet evolved to the degree needed to achieve technical committee consensus on which provisions need to be mandated. General 7.1.6.1.2.<sup>13</sup>

**INSTITUTE OF AMERICA CERAMIC TILE**

*Endorsement of Improved Test Methods and Slip Prevention Standards for New floors.* The Slip Resistance Committee of the Ceramic Tile Institute of America (CTIOA) is endorsing the following:

- (1) The variable-angle ramp laboratory test methods for slip resistance that are already a national standard in Australia, Germany, Italy, and New Zealand and a Final Draft standard in 17 other nations
- (2) The spillage volume displacement test that is a national standard in Australia, Germany and New Zealand
- (3) The detailed pedestrian slip-resistance safety standards for new flooring that are already national standards in Australia, Germany, and New Zealand <sup>14</sup>

**National Building Code Council** answers a common question. In spite of what we have heard about enforceability of one slip meter or another, what should we expect when trying to understand the role of slip resistance in code enforcement?

The Building Codes Commentaries: Considering an engineering methodology, these Building Codes do not recognize or specify a quantitative definition of slip resistance in part because there are many field testers, sensors and test procedures, which give varying results. Additionally, field tests conditions do not represent conditions at a prior time because of pedestrian traffic, environmental effects and human error.

### **The Resilient Floor Covering Institute<sup>15</sup>**

...testing with the English XL demonstrated "sticktion" between the test foot and the surface.\* "Test results of devices subject to sticktion can produce unrealistically

high slip resistance readings on wet surfaces - sometimes producing results indicating greaterF

slip resistance than the same surface when metered dry." DiPilla & Vidal, *supra* note 8 at 38. Wet testing by RFCI members has confirmed that the English XL suffers from sticktion.

**Standards Australia** operates a scientific laboratory for the development of floor material standards in Australia and New Zealand. The output of the laboratory has legal standing in both countries. The organization has an active consensus group within ASTM.

[different walkway-safety tribometers, operating on a number of different Principles, often give different results as an inherent function of the tribometer and, thus, may underestimate or overestimate the traction available to a pedestrian. Moreover, since the result also depends on the nature of the surfaces being measured (the walkway surface and the surrogate test foot), a tribometer might overestimate the available traction in some circumstances and underestimate it in others. This poses Difficulties in establishing appropriate compliance criteria for the tribometer, let alone a generalized universal threshold for all test methods. Bowman et. al, *supra* pp. 11 at 113. It follows that reliance on the English XL and Brungraber Mark 11, or on any devices for measurement of slip resistance on wet surfaces, is at best premature and clearly not supported by substantial evidence.’

ANSI B101 The committee of the American National Standards institute throughs another dimension in the floor test methodologies. They say.

The following devices are neither recognized or approved because they do not measure wet static coefficient of friction: the English XL, the Brugraber Mark 1, 2, or 3, the Wessex Pendulum, the Sigler Pendulum, the Munro Skid Resistance Tester, and other pendulum-based devices.<sup>16</sup>

## **Legally sufficient scientific evidence**

Jean Piaget, the French Educational psychologist carried three straws in his coat pocket. He also carried a flask of colored water, some cups, and a few other novelties. With these simple tools, a little conversation, and a lot of incite, he could assess developmental learning in young , preliterate children. It wasn't the straws or the water nor his manipulation of these items that did the work.. These were simply tools he had used for so long he could judge a child's relationship to each and to tasks a child could be expected to perform with different levels of maturity Today, a court might not allow Piaget to testify about his straws and colored water, but he was the expert.

Strictly applied under Daubert, the court requires a level of testing that goes beyond today's humble gadgets. Slip meters can not become a tool for making the Daubert rulings disappear. Things are improving quickly. In our experience, the expertise is not in the floor test device. Tribometers are simply the tools available to a practitioner to assist in evaluating the surface. The reader should understand that no two devices produce exactly the same measurements. Properly used, they reinforce intuition. Validated comparisons of many floor test devices will be available soon.

I liked the way the Newsome article returned to a traditional, balanced, less mechanical approach to the scientific method. I think their conclusion is correct. An inquiry can be systematic and follow a scientific method without depending on a device to act as a judge. Slip meters have never been radar guns and even radar guns are often wrong. At best, they serve as supporting evidence for thoughtful expert opinion. Most courts will find such an inquired acceptable. They suggest that evidence might fall into three systematic parts: Observation, Hypothesis, and Experimentation. The final step is to rely, if possible, on some device, or some test, or some laboratory method to serve as Validation.

A short term solution is to follow the new directions of ASTM:

All standards are generic, listing name brands only if necessary.

Forbidding endorsements of  
any product.<sup>17</sup>

Initiating a standard for the comparison and validation of slipmeter output.

The calibration and validation of these devices by private NIST laboratories may be used to compare individual test devices instead of relying on the manufacturer's truthfulness.

## **Conclusion**

Many professionals believe that the fate of justice and civil litigation is dependent on the fate of the fate of two slip meters. They are mistaken. In fact, an informed judiciary will be only slightly inconvenienced by a complete understanding of the facts. In the future, all methods will prove their ability to reproduce meaningful human slip events and to define safe walkways. Several manufacturers have made themselves the center of public attention. That is only appropriate if they can demonstrate that they mimic human ambulation and produce consistent results. So far, they cannot.

An expert is a person, who, by reason of his experience or study can help the court focus

its inquiry and assist in making a just decision. Slip meters are tools to assist the expert, they don't replace the expert or the judge. The last decade produced a lot of propaganda and little quality. The National Fire Protection Association among others has endured tremendous pressure from one device manufacturer demanding acceptance of their product. When ASTM and other standards organizations refused to issue new proprietary standards, one manufacturer claimed special legal status anyway. This was possible because of the secretiveness of the standards process.

It is important for an expert to use available technology to balance their own intuition and reason, and there are numerous quality products that can be relied upon to provide supporting evidence. Most work well. Their output can be cross-reference and to large degree to human ambulation and to other test devices. This will improve, however we are a decade behind our European counterparts in the development of walkway safety standards. We should expect better.

#### Sources

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<sup>1</sup> . The Daubert Dilemma in the Slip & Fall Case.  
<http://www.jurispro.com/uploadArticles/Newson-Daubert-revised.pdf>

<sup>2</sup>. <http://safety-engineer.com/comingsoon.htm>

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.Guillaume Amontons (16663-1705), <http://www.nndb.com/people/573/000097282/>

<sup>4</sup>.OSHA Letter <http://safety-engineer.com/oshaspeaks.htm> Note: Precision is the ability of a device to produce repeatable measurements, and Bias is the comparison of the measurements made by a device with absolute values.

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A modernized version of the Kertchinburg slider is now available in the United States. A cart of fixed mass is rolled down a ramp of known dimensions. The measurement of distance is then taken and a coefficient applied in this way is a simple application of the laws of momentum. The methodology and mathematical proof are acceptable in American courts and have been used in courts for the reconstruction of motor vehicle accidents for at least fifty years.

<sup>6</sup>Voices of Safety International, <http://www.voicesofsafety.com/index.html>

<sup>7</sup> Each thesis has some small justification.. Each side will fight to the death to stop the other from taking its favorite tool. Slip resistance wars are efficient and ruthless. Devices previously treated as completed standards were allowed exertions of time and still could not demonstrate it positive benefit. It was canceled along with OSHA standing and ASTM initiated a new direction of research and validation

<sup>8</sup>Assessment of Walkway Tribometer Reading in Evaluation Slip Resistance: a Gait Based Approach, Journal of Forensic Sciences, Vol 52, No. 2, March 2007. pp400-405.

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Office of Public Sector Information, <http://www.hse.gov.uk/copyright.htm> , and <http://www.hse.gov.uk/slips/index.htm>

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<sup>10</sup> ASTM work product # 6587

<sup>11</sup> Society for Protective Coatings <http://www.sspc.org/regnews/OSHA/erectionmain.html>  
<http://cc.msnsccache.com/cache.aspx?q=astm+f1679&d=75371974699976&mkt=en-US&setlang=en-US&w=a744f939,dc676709>

<sup>12</sup>

<sup>13</sup> NFPA 101, tenth edition, 7.1.6.1.2 Page 122.

<http://dockets.osha.gov/vg001/V046A/01/42/44.PDF>

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<sup>15</sup> <http://dockets.osha.gov/vg001/V046A/01/42/44.PDF>

<sup>16</sup> Letter of Interpretation: ANSI/NFSA B101.1

<sup>17</sup> In January 2009, the F13 committee meeting in Atlanta as a committee of the whole rejected the membership supporting the Englishxl for an endorsement under standard 802. The members present voted to strike the proposal.