



## Engineering Sciences Section – 2010

### C23 Practical Engineering Applied to Aid in Assessing Walkway Slip Resistance

Ronald F. Zollo, PhD\*, University of Miami, College of Engineering, 1251 Memorial Drive, Room 322, Coral Gables, FL 33124

After attending this presentation, attendees will have both a background and a working knowledge of what is required to avoid the consequences of improperly specified, constructed, or maintained walkway surfaces by learning how to evaluate design alternatives as a function of architectural type of occupancy and conditions of use as slip resistant. Attendees will also understand, how to quantify limits of slip resistance on a scientific basis, how to choose among available slip resistance measurement technologies, and how to best choose and qualify experts to assist both in the choice of a walkway surface and in the prosecution or defense of personal injury claims.

The presentation will impact the forensic science community by helping assure that the constructed environment is built and maintained to a standard related to the type of use and conditions of occupancy that is suitable to the interests of public safety.

The subject of walkways and slip resistance is well known for the breadth of opinion that it attracts. Unfortunately, the state of the art on the subject provides little aid and comfort to walkway design decision makers. Talk (opinion) is cheap in comparison to the responsibility, or what lawyers call duty, that accrues to those who make the decision that determines the quality of a walkway surface. The walkway choice decision makers, "the choosers" for purposes of this discussion, have backgrounds that range from naive property owners or their agents to more sophisticated owners and architectural engineers.

The paper is intended both as an aid to benefit choosers who bear walkway safety decision responsibility and as an aid in the resolution of

disputes arising from claims of damage resulting from personal injury. The focus of the discussion is to provide practical guidance, based on existing standards, published research as to what is acceptable and what is defensible regarding the choice of a walkway surface. The goal is to help simplify what can be an overwhelmingly complicated subject by providing pragmatic advice to the choosers and litigators who wish to work in the public interest.

The presentation proposes a common language through definitions on which to base the discussion. It gives historical perspective leading up to the state of the art regarding what is suitably deployed as a walkway surface based on the architectural type of occupancy and conditions of use. It discusses, as an aid to understanding, why statics is appropriate rather than dynamics in the application of mechanics to the description of the physics of not slipping, though a decision on this matter is not actually required for assessing walkway safety issues. It poses and then answers rhetorical questions such as: what is the rationale and practicality for an approach that establishes a single parameter as a measure of walkway safety, what is the nature of the forces that represent slip resistant conditions, how can slip resistance be quantified and evaluated experimentally, how does one choose among the available technology for tribometry, and finally how are experts chosen to who can best perform the testing and analysis related to walkway performance. It divides the walkway system as it metaphorically is and can literally be argued to be that which exists below the walkway solid material interface (excluding porosity), and that over which little or no control is exerted including at the interface, as contamination or non-adhered covering, and that which exists or is happening above the interface.

The conclusions support the use of the force ratio, determined as the highest (limiting) value of a traction force that can be applied to an approximately level surface divided by the simultaneously applied normal force, both before slip occurs which is termed the Coefficient of Slip Resistance (CSR). It also discusses jurisprudence related issues without preference given to either those responsible for the choice of walkway surface, or to those prosecuting on behalf of or those defending against claims of defective conditions of either construction or maintenance resulting in personal injury claims.

**Slip Resistance, Walkway Safety, Traction Tribometry**