

# Use a Scientific Approach to Prevent Slips and Falls

By Kenneth Fisher

**H**istorically, slip-and-fall injuries have plagued almost all industries across the United States, but costs have escalated so much in recent years that these incidents are now a major driving force behind rising workers' compensation and property liability insurance expenses.

As pressure intensifies, governmental and safety agencies are allocating more resources to focus on the science of why a slip or fall event occurs—and on prevention. More emphasis is being placed on measuring the slip resistance values of floors when exposed to various contaminants and changing conditions, with the goal of creating a science-based process to help prevent slips and falls.

How can floors be made safer scientifically? Standardizing measurement in a program approach is key.

## THREE STEPS TO SAFER FLOORS

Measurement enables collecting data, laying the basis for appropriate action. There are three steps to slip/fall prevention involving data collection: 1) measuring and recording the condition of floors, 2) improving then maintaining that condition to a desired benchmark level through effective treatments and routine care, and 3) regularly auditing/documenting the state of floors to help ensure (and demonstrate) the proper degree of due diligence and care (the opposite of negligence) and compliance with safety norms.

## MASTERING MEASUREMENT

It is important to first benchmark the wet Coefficient of Friction (COF) of the floor surface. The wet COF is basically a measurement that records how slippery the floor surface is when it is wet or contaminated. This should be done by a trained, certified operator to ensure the test measurement is reliable.

Several organizations use or recommend a device called the BOT-3000, or Binary Output Tribometer. This U.S. tester has passed ASTM's rigorous precision and bias requirements and is capable of measuring both the static and dynamic COF.

Once a baseline COF has been established and corrections have been made to bring the floor up to the safety compliance benchmark, regular audits should be performed to help ensure the floor is being maintained properly or to prompt corrective adjustments as needed.

## LEARNING FROM INCIDENTS

If slips and falls have already occurred at a facility, examining the qualitative and quantitative loss data will help identify how, where, and under what conditions incidents have occurred so remedial efforts can be properly planned and directed. Performing physical

inspections of incident areas may offer insight on causes, enabling a more focused and effective loss control process.

Qualitative analysis examines conditions, frequency, severity, and other patterns. What type of footwear was being worn? Was there a contaminant on the floor? Were "wet floor" signs in place? Was there a floor mat? Could this have been a trip fall instead of a slip fall? What time of day did the event occur?

Quantitative analysis determines the value or amount of the losses, projected direct losses based on past losses, and estimates of the overall future cost of risk. This enables projecting ROI based on the cost of loss control measures versus projected costs of "business as usual."

## PREVENTION, PRODUCTS, AND TREATMENT

In a newly planned facility, carefully review the specification of floor surfaces. Eliminate inappropriate types of flooring in the design stage of floor selection and, as needed, establish traffic controls or restricted areas in facilities.

If an existing floor's COF demonstrates that it is slippery when wet, consider applying a specialized treatment or product to the surface that increases wet slip resistance.

## ABOUT the AUTHOR

Kenneth Fisher is COO of Nu-Safe Floor Solutions. He serves on the ANSI B-101.1 committee, which is establishing a test method for measuring wet Static Coefficient of Friction of common hard floor materials, and is chairman of a sub-Committee (ANSI B-101-2) that is developing a standard for chemicals and treatments for hard tile surfaces. He also served on ASTM's F-15 Committee dealing with slip/fall issues.

Two product categories have proven effective in raising slip resistance on wet surfaces and thus provide an excellent means to help ensure floor slip safety in general: 1) Surface modifiers that raise traction levels of mineral-containing floors (marble, ceramic tile, stone, quarry tile, etc.), and 2) Mop-on cleaners/treatments that raise traction on finished and other floors.

### HUMAN FACTORS AND FALLS

Human locomotion—walking and using stairs—is a relatively complex activity taken for granted by all except those who are disabled. Photographic studies show that there is a constant threat of falls during walking and stair movement, counteracted only by controlled shifts in body weight and exact placement of the feet. Considering the precise coordination involved, it is remarkable that the pedestrian fall is a relatively rare occurrence.

Slip resistance, as determined by the frictional force of shoe materials against the walking surface, is important in preventing falls. The stability of both the heel strike and the push-off is dependent upon sufficient opposing surface friction. Measurements of the horizontal component of foot force at the heel strike have shown that it is about 15 percent of body weight, and it is 20 percent for the push-off. This corresponds to the minimum walking surface coefficient of friction—the resistive force necessary to maintain the stability of the heel strike and push-off in the walking cycle—of 0.5 COF.

Tripping is likely to occur when the leg is swung forward and there is insufficient ground clearance for the foot. Minimum ground clearances of the toe when the foot is swung forward were observed to average 0.6 inch and range between  $\frac{3}{8}$  and  $\frac{1}{2}$  inches in one controlled study. (Source: "Pedestrian Falling Accidents in Transit Terminals," U.S. Department of Transportation,

*Federal Transit Administration*). According to the U. S. Department of Energy, a study of workers at DOE facilities who had experienced injuries involving slips and falls showed that approximately  $\frac{3}{4}$  of the indoor slip/fall events reported involved water.

### OSHA ON SLIP RESISTANCE

A reasonable measure of slip resistance is static coefficient of friction (COF). A COF of 0.5, which is based upon studies by the University of Michigan and reported in "Work Surface Friction: Definitions, Laboratory and Field Measurements, and a Comprehensive Bibliography," is recommended as a guide to achieve proper slip resistance, according to OSHA, which says a COF of 0.5 is not intended to be an absolute standard value. A higher COF may be necessary for certain work tasks, such as carrying objects, pushing or pulling objects, or walking up or down ramps.

OSHA says slip resistance can vary from surface to surface or even on the same surface, depending upon surface conditions and employee footwear. Slip-resistant flooring material (or treatments) such as textured, serrated, or punched surfaces and steel grating may offer additional slip resistance. These types of floor surfaces should be installed in work areas that are generally slippery because of wet, oily, or dirty operations. Slip-resistant type footwear may also be useful in reducing slipping hazards, according to the agency.

By implementing a scientific, measurable, audited, and documented program that identifies and prevents the causes of slips and falls, contractors will reduce injuries, insurance premium dollars, and direct costs. Moreover, contractors will be protecting their company's employees, customers, and future profits. ■

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