Liability

Walkway Safety: Introduction to Slip, Trip, and Fall Risk Control

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Abstract

This report is intended to define the scope of slip, trip, and fall incidents, as well as define terms associated with walkway safety. It provides a description of body mechanics; how slip resistance is measured and examples of litigation. The cost of injuries related to this exposure can be significant. Stairs, ramps, or falls from elevations are beyond the scope of this report. This report also is not intended to address occupational slip and trip injuries because in a workplace, the employer can direct the use of footwear, workplace behavior, etc.

Introduction

Slips, trips, and falls (STFs) are the leading cause of non-fatal, unintentional injuries treated in hospital emergency departments according to the All Injury Program, a cooperative program involving the National Center for Injury Prevention and Control, the Consumer Product Safety Commission, and the Centers for Disease Control. According to the National Safety Council, there are 25,000 STF occurrences daily. The National Center for Health Statistics (NCHS) collects data from multiple providers and estimates non-fatal injuries. They estimate that in 2007 (the most recent year for which the data is available) over 8.9 million people were injured by falls serious enough to seek medical attention.

NCHS tracks falls from elevations, balconies, stairs, escalators, etc. separately. Considering that the numbers cited exclude falls from ladders and elevations, it is easy to grasp the significance of same level STF incidents. Hazardous conditions that contribute to same level STFs include: uneven or slippery walkway surfaces, contaminants on walkways, inadequate lighting, poor housekeeping, inadequate maintenance, poorly designed walkway surfaces, or adverse weather conditions. STF occurrences are not simply related to weather; the data show that deaths from falls are evenly divided by month. So, preventing STF is not a seasonal activity, it requires ongoing, systematic effort to address hazards that could lead to injury.

For many property owners, STF occurrences result in litigation. A person who sustains an injury by falling at a commercial property may claim that the property owner was negligent in their duties to maintain a safe walkway. This claim is considered a premises liability tort. The injured person alleges that there was an unreasonably dangerous condition; that the insured had knowledge of the condition; that the insured failed to reduce or eliminate the condition; and that the failure to use reasonable care was the proximate cause of the injury. These claims and lawsuits are costly. See Claims and Litigation section later in this report for specific examples.

There is no debating that the number of injuries from STFs is increasing, but there is great debate regarding the reasons for the increase. A property owner that is familiar with STF hazards is able to look for them, identify them, correct them, and, in some cases, eliminate them. The next section provides a list of terms and definitions used by practitioners who study the effects of STF occurrences, as well as attempt to reduce or eliminate them. This area of risk control requires some understanding of physics and biomechanics.

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Definitions

Contaminant

A contaminant is any substance between and not a part of either of, the two surfaces, meaning the foot/shoe bottom and the walkway.

Coefficient of Friction (COF or μ)

COF is a ratio of two forces acting at the interface of two contacting solid bodies, such as a shoe bottom and a walkway surface. The force used in the numerator is parallel to the surfaces, while the force used in the denominator is perpendicular to the surfaces. This ratio is expressed as the Greek letter 'mu' (μ) or COF. Slip resistance is the ratio of the force required to slide an object parallel to a surface to the normal force that the object exerts on that surface. Static COF, or SCOF, uses the force required to start an object sliding. Dynamic COF, or DCOF, uses the force required to keep an object from sliding at a constant velocity. Slip meters determine the coefficient of friction by pushing, pulling, or striking a horizontal surface (tile, flooring, etc.) with an object.

Exterior Walkway

Exterior walkways are natural surfaces, such as parking lots, fields, playing fields, paths, walks, or footpaths, or a combination thereof. Exterior walkway conditions that may be considered substandard and in need of repair include conditions in which pavement is broken, depressed, raised, undermined, slippery, uneven, or cracked to the extent that pieces may be readily removed.

Fall

Slips and trips frequently lead to falls. Falls occur when the body shifts too far, throwing off one's center of balance. A person is injured by the exchange of energy between the person falling and the objects upon which he or she is falling. The degree of injury depends upon the distance of the fall and how the energy is exchanged.

Friction

The resistance that one surface or object encounters when moving over another. For example, there is friction or resistance between a shoe bottom and a walkway surface.

Slip

Slips represent the loss of balance caused by too little friction or traction between a person's feet and the walkway. Often, slips will occur when there is a contaminant on the walkway and a person's heel or foot strikes the item on the walkway surface, resulting in the foot slipping. Examples of contaminants might include: wet floors; oil/grease spills; ice, snow, or mud; loose carpet, tile, or matting; and flooring or other walking surfaces that do not have the same degree of traction in all areas.

Slip Index

Slip index is the value reported by the Horizontal Pull Slipmeter (HPS). Slip index can be affected by surface roughness, presence of water, contaminants, such as grease and other foreign materials, and floor surface wear over time. Slip index, as determined by the HPS, most likely will not give useful information for evaluating liquid-contaminated surfaces, and therefore, will not provide an effective assessment of a potential slipping hazard on a walkway surface under these conditions.

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Slip Resistance

Slip resistance is the relative force that opposes the tendency of the shoe or foot to slide along the walkway surface. Slip resistance is related to a combination of factors including the walkway surface, the footwear bottom, and the presence of foreign materials between them. Slip resistance is often quantified as the coefficient of friction (COF).

Sustainable Slip Resistance

Sustainable slip resistance (SSR) is a test method and selection criteria for use in choosing and sourcing slip-resistant flooring that maintains effective walkway surface characteristics over its life cycle.

Tribology

A branch of mechanical engineering that deals with the design, friction, wear, and lubrication of interacting surfaces (as bodily joints) in relative motion.

Trip

Trips represent the loss of balance caused by the interruption of the forward or backward movement of one or both feet. Common causes of tripping include: obstacles cluttering or blocking hallways; uneven floor surfaces; wrinkled carpeting or matting; loose cables; and abrupt changes in walkways, such as thresholds or steps.

Traction

Traction is another name for the adhesive friction between two surfaces. The units of traction are those of force, or if expressed as a coefficient of friction, a ratio. Specifically, traction refers to the maximum frictional force that can be produced between surfaces without slipping.

Walkway

Walking surfaces constructed for pedestrian usage include floors, ramps, walks, sidewalks, stair treads, parking lots, and similar paved areas that may be reasonably foreseeable as pedestrian paths.

To hone in on the areas where STFs is likely to occur, it is recommended that the focus be on areas where the public has access. Typical areas of concern include building entrances, parking lots, bathrooms, escalator landings, high traffic areas, or other frequently wet areas. Any location where the floor surface changes from one level to another is also considered a hazard.

Biomechanics and STFs

Why is it that a slip or trip only sometimes results in a fall or stumble? The answer lies in the biomechanics of walking (see Figure 1). Heel slips occur in early stance when weight is transferred to the lead leg. A heel slip results in forward acceleration of the weight-bearing leg, which results in a more unstable situation. Toe slips are considered less hazardous for a walker because of where they occur in the gait cycle. Toe slips take place in late stance as weight is being transferred to the forward leg. Even though weight is not evenly distributed, it is a more stable situation for the body and the walker may not lose his/her balance.

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Figure 1. Gait Cycle of Walking Includes Heel Strike and Stepping Off

Measuring Slip Resistance

Since the 1930s, researchers have been attempting to quantitatively describe the interaction that occurs between the shoe bottom and a walkway surface. Friction or traction is the resistance to lateral movement caused by the contact between two surfaces. Slipperiness is the result of too little traction. By dividing the horizontal force by the vertical force, a number called the coefficient of friction (COF) is generated. Most researchers (though not all) believe that COF is closely correlated with the tendency to slip. The mere application of the concept of slip resistance can be misleading unless it is paired with information on the test method used to make the measurement.

The device used to measure slip resistance on a walkway surface is called a tribometer. There are many different types of tribometers each is designed using different mechanical principles to arrive at a measurement of slipperiness. Manufacturers claim that their tribometers can predict the probability of safe human ambulation on a walkway surface.

Research studies have shown that different tribometers yield different measurements of friction for the same flooring material. These friction differences are often pronounced in the presence of a contaminant. Typically, slips do not occur under dry conditions. If a value obtained from a given tribometer may or may not represent a measure of a pedestrian's risk of slip, then defining a value as "slip-resistant' has little validity. And it would be very important not to compare measurements when using different tribometers.

What should a risk control professional do with the tribology research? How does the information impact commercial property or simulate real-world conditions? The awareness of differentiation amongst different tribometers is essential for the risk control professional. The importance of selecting and documenting the brand of tribometer used to measure slipperiness is influenced by this knowledge. Subsequent measurements should be performed with the same brand, and the unit should be calibrated in a consistent way in order to be able to compare measurements over time.

Even though there is controversy and inconsistency with regard to various tribometers and measurements obtained, using a tribometer can be a useful tool when evaluating walkway surfaces. The risk control professional should rely on three systematic methods when evaluating walkway slipperiness: observation, evaluation, and validation. Using this critical thinking approach, rather than relying on a device's measurements, should help the risk control consultant evaluate walkway surfaces.

Significant Slip Meters

The following tribometers are commonly recognized by practitioners for measuring slip resistance in various environments:

- **The James Machine**: The James Machine was developed in the 1940s and is still in use today. The James Machine is not designed for use in field applications. The James Machine (see Figure 2) is used

to test flooring surfaces in a laboratory setting. Each unit has advantages or disadvantages. ASTM D2047 is the basis of the testing of floor polishes for slip resistance under laboratory conditions. The testing device is the James Machine, a leather friction pad. This test method specifies that all testing must be performed on dry surfaces. It cannot be used for field tests because the unit is not portable. A satisfactory precision and bias study has not been completed.

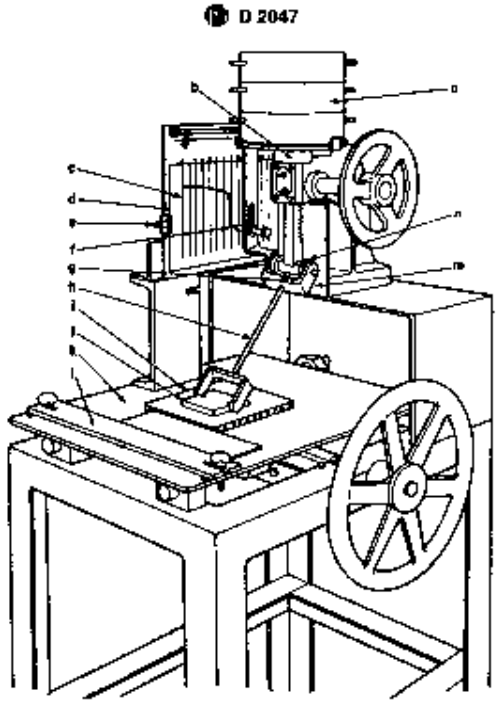

Figure 2. Schematic of James Machine

- **The English XL**: The English XL was designed primarily for wet testing and is considered a Variable Incidence Tribometer (VIT) device. The angle and velocity of the leg-operating mechanism, and the size and shape of the test foot, were developed to replicate the heel strike of a human walking; the machine has a functional ankle. The leg of the XL VIT is free to accelerate once a slip occurs, as with a real-world human slip event.

Figure 3. English XL Tribometer

Testing protocols, described in ASTM F1679, *Standard Test Method for Using a Variable Incidence Tribometer* (VIT), are used by practitioners who own English XL units. The standard was officially withdrawn by ASTM on September 30, 2006 for failure to include an approved precision statement and for including reference to proprietary apparatus where alternatives exist. The 2004 version of the standard is still available for sale and is purchased by those who use the unit to perform slip resistance testing.

- **The Brungraber Series (Mark I, Mark II, Mark III)**: A portable, inclinable, articulated, strut, slip tester (PIAST) is a gravity-based device designed on an inclinable frame and a test foot suspended just above the walkway surface. The Brungraber Mark II is approved for wet and dry testing under ASTM F1677, *Standard Test Method for Using a Portable Inclinable Articulated Strut Slip Tester*. The slip resistance reading can be taken directly from the Brungraber Mark II tribometer. (ASTM 1677 was officially withdrawn by ASTM, but it is still available for sale.) The Brungraber Mark III is a new and an improvement design of the Mark II.

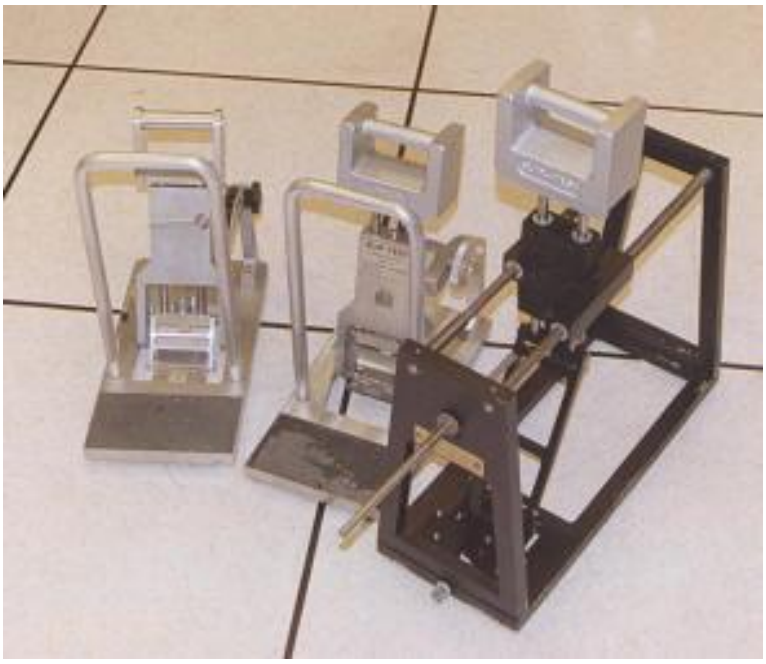

Figure 4. Brungraber Mark I, II, and III Tribometers

- **Horizontal Pull Slip Meter:** The Horizontal Pull Slip Meter (HPS) is a laboratory and field instrument designed to provide information about the slip index characteristics between walkway surfaces and a test foot material under dry conditions only. The HPS can be used on inclined surfaces. No adjustment for slope is needed for measurements in the direction perpendicular to the slope and when averaging four measurements at one location. The ASTM-approved version, ASTM F609 - 05 *Standard Test Method for Using a Horizontal Pull Slipmeter (HPS),* is no longer in production.

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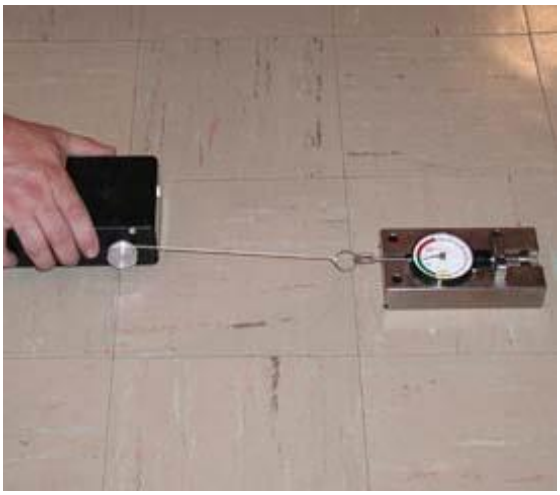

Figure 5. Horizontal Pull Slip Meter

- **BOT-3000**: The BOT-3000 (BOT is an acronym for Binary Output Tribometer) can measure both static and dynamic coefficient of floor friction on a variety of test sliders in both wet and dry conditions. The BOT-3000 provides a printed record of test parameters and results. The unit is available with sliders of different composition including Neolite. Dr. Jens Sebald of the University of Wuppertal (Germany) tested the BOT-3000 against traction of actual walking humans, with 72 test points including 12 surfaces, two different lubricants, and three shoe bottom materials. The correlation coefficient of 0.93 with the BOT-3000 proved excellent correlation. The testing results produced thorough and close correlation of measured human traction with any available tribometer. The National Floor Safety Institute (NFSI) recognizes the unit as capable of measuring wet static coefficient of friction (SCOF) within a defined range, and used with a reference calibration tile.

Figure 6. BOT-3000 Tribometer

Tribometer Comparisons Constraint

The different design elements seem to account for various walkway surface environments. A risk control consultant should be aware of a rather unique constraint. Measurements taken with one type of tribometer cannot be compared with measurements taken by a different type of tribometer. What makes them unique is that they cannot be used interchangeably or compared to one another. Unlike a thermometer, which is designed to measure temperature, regardless of the type of device (digital, thermal, etc), different tribometer

results cannot be compared to one another. In fact, a tribometer designed to measure slipperiness on a dry surface may not be capable of measuring walkway surface slipperiness on a wet or contaminated surface.

Related Standards

The practice of measuring slip resistance of walkway surfaces at properties is an evolving one. A calibrated tile is used by practitioners when performing slip resistance measurements. Here are some additional standards designed to support testing slipperiness of walkway surfaces:

- The National Floor Safety Institute (NFSI) sponsors active development for an American National Safety Institute (ANSI) relative to slip, trip, and fall prevention. The B101 committee's scope is "to develop safety standards intended to provide preventative measures in all manner of pedestrian ambulatory safety in regards to slips, trips, and falls" and is titled B101 Safety Requirements for Slip, Trip and Fall Prevention. They have released the first standard, ANSI B101.1, *Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials,* and it is available from the National Floor Safety Institute (NFSI) at: http://www.nfsi.org/.

- ASTM C1028 for the Horizontal Pull Dynamometer is for factory-quality assurance testing of ceramic tile. It is a 50-pound drag weight that is pulled by a handheld force meter, and the COF is calculated using the H/V formula. As with all dragsleds, this 50-pound device is for testing dry surfaces; a satisfactory precision and bias study has not been completed. As it is designed for ceramic tile, be aware of flooring manufacturers who claim that their other products are designed for or meet this standard.

- UL410, *Slip Resistance of Floor Surface Materials*, covers the requirements for the testing of floor and finishing materials to determine if their minimum, average, and maximum individual, static COF meet or exceed the specified requirements with respect to slip resistance. The floor surface materials covered by this standard include floor covering materials (FCMs), floor treatment materials (FTMs), and walkway construction materials (WCMs). The most recent edition of these protocols should be used along with the most recent version of the device's operating instructions.

- NFPA 1901, *Standard for Automotive Apparatus*, 13-7.3 recognizes only the VIT and the PIAST for testing wet surfaces. Amidst the controversy regarding use of tribometers on various walkway surface conditions, there is emerging yet another option for quantifying a measurement of slip resistance. There is no ASTM value for slip resistance approved in a standard as 'safe' or 'slip-resistant.' In much of the literature, there is mention of a value equal to 0.5 COF measured with a variable incidence tribometer (VIT), the English XL.

- The person performing walkway safety analysis should rely on the protocols outlined in ASTM F2048 - 00(2009), *Standard Practice for Reporting Slip Resistance Test Results,* to document slip resistance measurement results.

Misconception of Walkway Safety Threshold

The requirement of having a SCOF of 0.5, without referencing the associated method of testing or materials specified, is of little value. Research has provided ample evidence that it is not practical or reliable to compare results from different tribometers on the same flooring surface. Because the value has been touted as the "standard,' many practitioners falsely believe that it is a value that must be met to provide for safe walkway surfaces. Considering the variability in measuring devices and operator testing, it is no wonder that it is quite unlikely that any walkway surface can consistently produce test results. Measuring slipperiness on walkway surfaces is influenced by the type of measuring device used; the presence of contaminants; and how the operator performs the testing, the calibration of the tribometer, and the calibration of the test foot. Other environmental conditions could also impact the results of walkway slipperiness testing.

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See Liability Report LB-92-36, *Walkway Slip Resistance Measurements and Federal Standards* for more information.

Developing a Universal Standard

A consensus seems to be building to bypass establishing any type of 'universally safe SCOF' and adopting a series of standards that use specific, calibrated materials to establish a degree of slipperiness. Recent research performed using tribometers for the purpose of assessing slip risk helped define a tribometer reference standard. The research showed that 'gait-based measures' of slipperiness can be used to create reference standards against which tribometer measurements can be validated. Following the protocols defined in the study, a tribometer, calibrated, could be used to measure, rank, and compare walkway slipperiness in a standard order from non-slippery to very slippery.

There is no single recognized measurement protocol or device technology for field testing of walkway slip resistance. Because of this, data collected using one device and one method is not comparable to data collected by another device. Of note, there is an international debate over whether the static or dynamic/kinetic coefficient of friction (COF) more accurately represents the slip resistance of a material. These issues raise questions about the validity, accuracy, and meaningfulness of results obtained when measuring slip resistance of a walkway surface. Regardless of the tribometer selected, it is strongly advised to include slip resistance measurement of walkway surfaces as part of an overall forensic, incident investigation.

Government standards making organizations have elected not to clarify their standards by requiring quantitative COF values for various walking/working surfaces. An ASTM Committee is working to establish a single standardized test method, independent of test instruments, to resolve inconsistencies in the measurement of slip resistance. Using a performance-based approach shifts the viability of testing walkway surface slipperiness. Thus, tribometer measurements would be validated using calibrated materials with results that are reproducible and accurate.

To read more about this, see Liability Report LB-92-36, *Walkway Slip Resistance Measurements and Federal Standards*.

Factors that Influence Same Level STFs

Some of the more common reasons for increasing exposure or compromised walkway safety are described below. The hazards are in no particular order. There is ample evidence of increasing numbers of STF occurrences in adverse weather, if a property is not maintained, if cleaning is not performed, etc. Research to learn more about how aging or obesity relates to STF exposure is ongoing. Other hazards, such as adverse weather, the importance of cleaning, and maintaining walkway surfaces, are well-documented. Regardless, when preparing to address STF hazards at a property, consider the following factors:

Adverse Weather and Contaminants

Common slip, trip and fall hazards result from: wet or contaminated floors (e.g., grease, liquids, ice, oil, dust, fine powders, etc.). Rain water is transmitted from open, external doors or from the feet, coats, or umbrellas of pedestrians. Contaminant sources, such as fluids from spills, plumbing leaks, cleaning, ice machines, dust, debris, or food residue, are often the cause of STF incidents. Property owners have the most control over how these hazards are mitigated.

Mats and runners are used to control the hazards introduced by these contaminants. Absorbent or abrasive matting systems are used depending on the hazard. When mats get dirty or saturated, they must be exchanged for clean ones. Many property owners whose buildings see a good bit of foot traffic offer plastic bags at the entrance for umbrella storage when it is raining, so visitors do not shake out water from their

umbrellas. At the same time, a poorly managed and maintained mat program can significantly increase the likelihood of reducing the slip resistance of flooring surfaces.

Client Handout CH-40-17, *Did You Know? A Best Practices Guide for Floor Mats and Runners,* provides tips for addressing this exposure.

Vision and Lighting

Reduced visual acuity has been observed as people age. Some abilities are diminished. For example, how clear things appear, one's peripheral visual field is reduced, one's depth perception is compromised, and the ability to see contrast is diminished. At the same time, it has been observed that the sensitivity to glare and time to adapt to large and sudden changes in lighting increase. These types of changes have been observed in increasing frequency for those over 60 years of age.

Good visibility is essential for the prevention of STF occurrences. Lighting changes in the facility and around the grounds during different times of the day and seasons of the year must be considered. It is suggested that a review of the property and grounds be performed to determine if lighting is adequate. A property owner should keep in mind the earliest and latest times when visitors, pedestrians, or employees are on the premises. Areas found to be deficient should be equipped with additional lighting for walking surfaces, as needed. This review should include parking areas and interior and exterior walkways. Replacing any burnt-out bulbs must be a priority.

Transitions

Transitions are often identified as a contributing factor to an STF event. Footwear can get caught when a person walks from a tile floor onto carpeting. Flooring materials with vastly different slip resistance are sometimes installed in walkways; when there are other distractions in the area, it can increase the likelihood of an STF occurrence. There are many theories and explanations for why this is so. The most practical one is that a pedestrian makes observations about the flooring below them and its perceived slipperiness. If this changes suddenly, then the pedestrian is not able to adjust their gait, increasing the chance of an STF. This has been found in research studies: pedestrians that walk from a smooth surface to a rough surface without warning were more likely to experience an STF incident.

Perception of Slipperiness

Hazardous conditions that contribute to STFs include slippery surfaces, uneven surfaces, contaminants on walking surfaces, and adverse weather. Research and experience has shown that the perception of slipperiness is a factor in determining the likelihood of whether or not someone slips or trips on a walkway surface. For example, if there are signs posted that an area is slippery when wet, and a puddle is observed on the floor, the walker will make an effort to avoid the puddle, or slow down considerably to limit the chance of falling. Research has established that awareness of a potential slip and prior slip experience can generate alterations in human gait.

Cleaning and Maintenance

The importance of cleaning and maintenance cannot be overstated when it comes to preventing STF hazards at a property. If floors are not cleaned regularly, then dirt particles are tracked along walkway surfaces, eroding coatings and compromising the surface roughness of the walkway. This, in turn, leads to a reduction in slip resistance. If the slip resistance or traction is reduced, and other factors are present, then the chance of an STF incident goes up significantly. Establishing a cleaning program and adhering to the instructions provided by the flooring manufacturer and cleaning product supplier is essential for a property owner. The actual cleaning procedures can be overlooked. Incident reviews of claims identified that where the floor cleaning staff did not follow the defined cleaning protocol, it led to: removal of special slip-resistant coatings designed to maintain safe walkways; a slippery walkway surface because the cleaning solution

was not compatible with the walkway material; and the awareness that the cleaning solution was not being used in accordance with its directions.

For example, some floor cleaners contain active enzymes that eat oil and grease. When using this type of floor cleaner, the temperature of the water and the amount of time that the solvent is allowed to penetrate the walkway surface are essential. These parameters are described in the floor cleaner instructions. If hot water is used with this particular solution, it may kill the active enzymes and render the cleaning solution ineffective. In a nutshell, cleaning and maintenance require educating all workers and cleaning staff, inspection to verify that the instructions are being followed, and ongoing corrections to make sure that the goal of cleaning and maintaining walkway surfaces is being met.

Age

The statistics show that the number of falls increases with age. For reasons not totally understood, the STF event can result in traumatic injury or death. A variety of chronic conditions can affect one's ability to walk including arthritis, diabetes, macular degeneration, etc. These changes are gradual and highly variable, affecting some people and not others. Changes due to normal aging may affect an older person's ability to walk due to decreasing muscle strength and range of motion. When looking at factors associated with falling in healthy elderly people, the use of medication, diseases, body composition, and decreased muscle strength were all associated with falling. Property owners should take heed of the changing demographics and plan to adapt their property accordingly.

Obesity

Obesity can affect the risk of injury by accelerating the onset of fatigue and increasing risk factors associated with musculoskeletal disorders, trips, and falls. Obesity is a factor that has been associated with an increase in STF occurrences. Research studies in this area are finding that obesity can be a contributing factor that leads to STFs and a property owner should be vigilant about maintaining walkways inside and outside their buildings. Changes in elevation should be minimized whenever possible. Good housekeeping, regular inspection, and repair all contribute to walkway surfaces free of STF hazards.

Emerging Hazards

For both men and women, texting while walking presents new hazards. Property owners are encouraged to maintain safe walkways, post warning signs in conspicuous locations, and be aware of the changing nature of those who visit their property.

Claim and Verdict Information

Certain points must be established to prove the negligence and liability of a property owner. The term 'premises' refers to land and buildings that are considered property. Note that the term 'premises' is used even for singular units like a building. The concept behind premises liability is that the owner of a property has the obligation to maintain that property in a way that makes it safe for the public and/or anyone who may be affected by its maintenance. There are certain considerations to establish a premises liability case. A defendant owns or rents the property and has control of the property. The defendant is expected to be aware of the condition of the property; though this is often contested in litigation.

Negligence is a tort, or civil wrong, and generally means a person's conduct does not meet the standard of a reasonable or prudent person. Acts of either omission or commission, or both, may constitute negligence. The four elements of negligence are: a duty owed to a plaintiff; a breach of that duty by the defendant; proximate cause; and an injury or damage suffered by the plaintiff. A duty owed means a duty of care has been established to prevent injury or damage, such as the duty to prevent someone invited to your home from being injured. Breach of duty is basically one party's failure to protect another party from injury or damages.

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Fraudulent claims and trial practices that favor plaintiffs are contributing to an increase in slip and fall lawsuits around the country. In some jurisdictions, the property owner finds expanded liability to those who slip and fall on their property. Even if a business owner exercises all reasonable care, a jury may rule in favor of the claimant. Property owners, even if not at fault, may incur substantial legal expenses even if a claim is fraudulent or they were not responsible. This unfortunate situation leads to increasing numbers of settlements.

According to Jury Verdict Research (JVR) data, the median award for all plaintiffs' verdicts in personal injury cases combined was $47,136 in 2008. A summary of recent cases is available to illustrate what a property owner may be obligated to pay in the event of similar STF litigation in their industry or state. Examples of litigation are available in the Appendix, see Exhibit 1.

Using claim information in the design or renovation of a property helps identify issues to address so that walkway surfaces are designed to be slip resistant under expected environmental conditions and use. Slip resistance measurements should be considered for slip, or slip-and-fall, incidents when serious personal injuries occur.

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Exhibit 1. Examples of Slip, Trip, and Fall Litigation

Commonly known as "slip and fall" cases within the legal system, these cases involve the everyday incidents that occur when: someone slips on ice that has not been cleared away from a business establishment's parking lot, or on something spilled on the walkway, or catches a heel on broken concrete on a sidewalk in disrepair. Slip and falls are the most frequently cited cause of large-loss general liability claims, as well as the basis for many premises liability lawsuits. The following summary of verdicts and settlements, compiled by TotalInjury, LLC. should convince any property owner to prepare and implement a slip, trip, and fall prevention plan.

- *Bauer v. Eatontown Plaza Associates*. Store's manager slipped in puddle, tore shoulder. He claimed puddle was a result of 10-year-old roof leak that had baffled four contractors. Defense argued hazard was obvious to plaintiff. MON-L-3869-07 (2009). Verdict/Settlement in amount of $77,500.

- *Diop v. Madison Immobillier, LLC.* Plaintiff fractured ankle in fall on icy sidewalk, claimed application of salt caused melting and refreezing of snow. Defense contended incident occurred while storm was in progress. (N.Y.; Sup. Ct.; No. 117945/06, 2009). Verdict/Settlement in amount of $150,000.

- *Darelyn Haynes v. Fountain View Condominiums*. Claimant was walking up a stairway when the railing fell, which she claimed caused her to lose her balance and fall. She suffered a herniated disk and is now permanently disabled. Haynes alleged that the condominium association was negligent because it had been notified about the broken railing three years earlier and had done nothing to fix it. Another tenant, who claimed to have notified the association of the broken railing, had used duct tape to repair it. (No. CV-05-5000135-S). Verdict/Settlement in amount of $742,000.

- *Mary Ann Nolan v. Union College*. Mary Ann Nolan, 24, was a Union College senior on Jan. 26, 2003, when she walked across a dark parking lot on the Schenectady campus and plunged hip-deep into the hole. Testimony revealed that the manhole cover had been scraped off by a plow and buried in the snow. Unable to locate it, maintenance workers placed plywood over the hole, but the plywood was not in place on the night of Nolan's injury. (Index 50854). Verdict/Settlement in amount of $15.8 million for manhole-fall injuries.

- *Flo Wilson v. Christus St. Elizabeth Hospital*. Flo Wilson was visiting her sister in June 2005 when she missed a step in the parking garage and fell, breaking her hip. Wilson claimed in her lawsuit that at the time of her injury, the hospital had not painted the edge of the uneven landing with the bright yellow stripe required by law. Verdict/Settlement in amount of $723,000.

- *Robert Yusem v. Hey Industrial Park, Inc*. A Bucks County jury awarded a Philadelphia man $390,000 for injuries sustained in a slip and fall injury in an icy industrial park parking lot. The lawsuit claimed that the owner of the industrial park allowed rainwater to drain directly on to the parking lot and did not salt, shovel, or clear the ice and snow in the parking lot, which led to the man's fall. Verdict/Settlement in amount of $390,000.

- *Ritzmann v. Miller Oil Company Inc.* Annette Ritzmann sued Miller Mart after she slipped on the raised sidewalk in front of Miller Mart and lost consciousness upon striking the ground. Ritzman's attorney said the store did not adequately warn customers or prevent them from stepping on dark algae that had formed on the ground. Case Richmond (07-T-105). Verdict/Settlement in amount of $12.2 million.

- *Susan Crawford v. Cahokia Nursing and Rehabilitation Center*. Susan Crawford filed a lawsuit claiming she sustained injuries to her left shoulder, neck, back and coccyx after falling at a Cahokia nursing home. Crawford claims she visited the nursing home on April 1, 2008, when she encountered a wet floor that had recently been mopped, causing her to fall. Crawford blames Cahokia for failing to warn its customers of a recently mopped floor, for allowing a wet floor to exist in an area where it knew its

customers would walk and for failing to barricade a passageway where a wet floor existed. (No. 10-L-118). Verdict/Settlement in amount of $50,000 plus costs.