

How Tribology Transforms Slip, Trip, and Fall Prevention

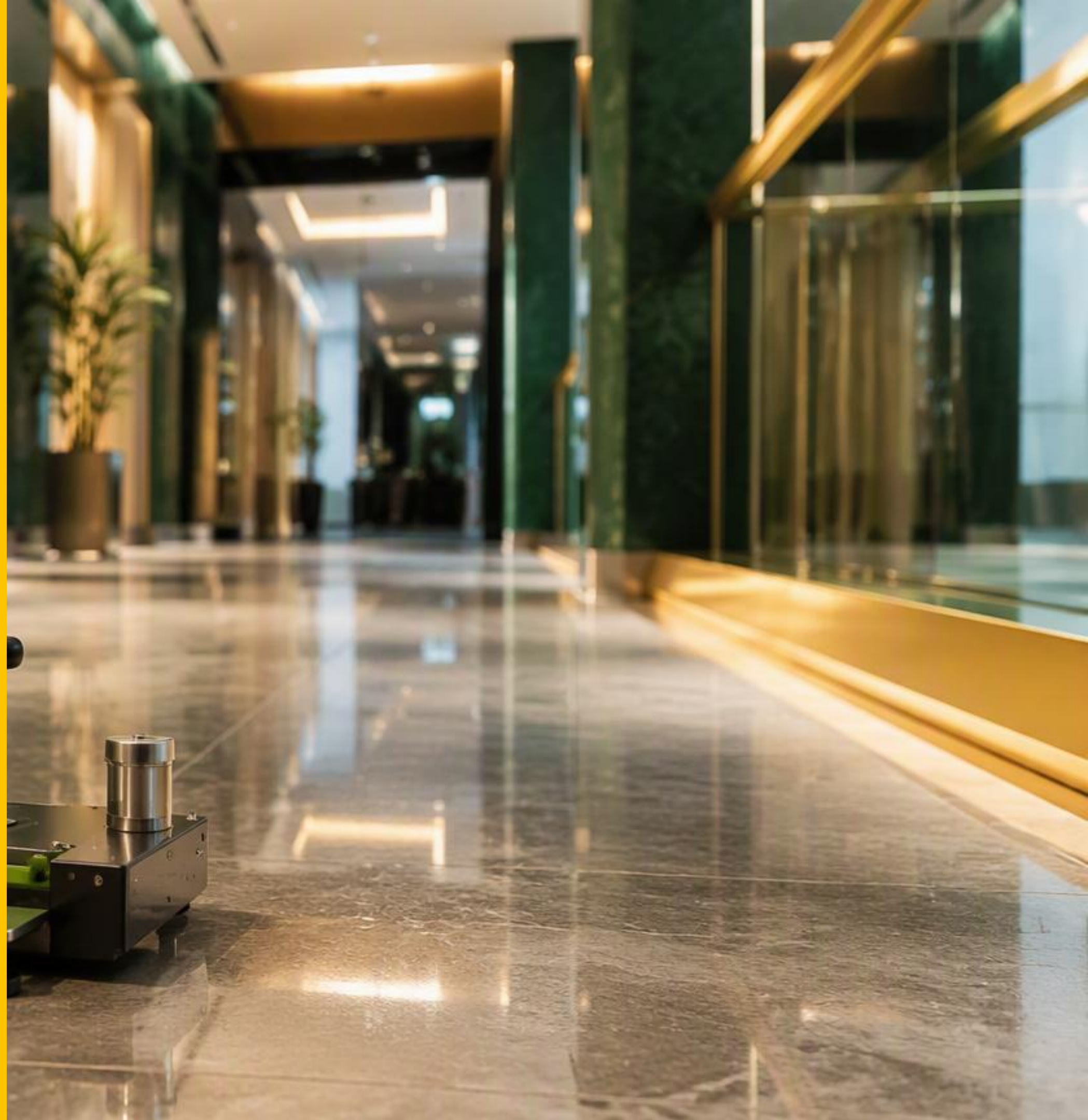
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Steve Simon , MS, CPE, ARM
Sr. Risk Control Manager
Safety National



Erica Baird , CSP, CPCU, ARM
Risk Control Manager
Safety National



Course Objectives

A streamlined learning path from science to field application.

- 01

Tribology Overview

Understanding the friction, wear, and surface-science concepts that drive STF risk
- 02

Statistics & Claims

Connect incident patterns and claim outcomes to business impact
- 03

Root Causes

Organize the people, environment, flooring, maintenance, and footwear variables
- 04

Slip Testing

Translate observable floor conditions into measurable traction data
- 05

Leading Practices

Apply design, matting, cleaning, stairs, and innovation controls



Tribology Overview

The science behind friction, wear, and walking-surface safety

What it means

Tribology is the study of how surfaces interact when they move against one another. It focuses on friction, wear, and surface conditions

Friction

Resistance between surfaces in motion.

Wear

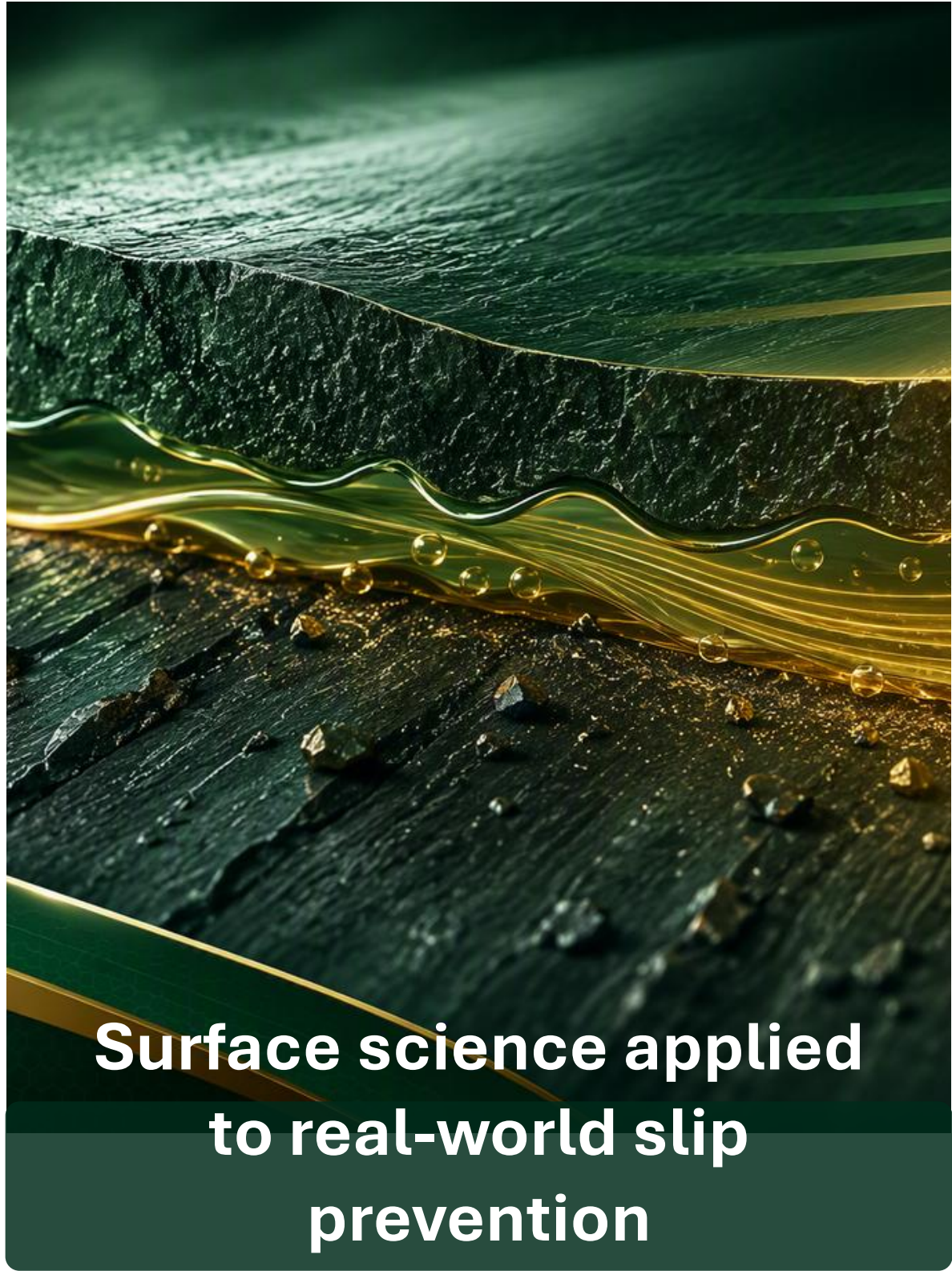
Surface change or degradation over time.

Contaminants

Materials that may reduce or alter traction.

Why it matters for STF prevention

Tribology connects flooring materials, surface conditions, contaminants, footwear, and movement patterns to slip potential.



Slip, Trip and Fall (STF) Standards

Select the right method for the surface, use condition, and risk question.

Framework	Practical use	Risk-control interpretation
NFSI B101 Series	Walkway audits, wet SCOF/DCOF, matting, floor-safety programs, and trip-hazard guidance.	Useful for structuring testing, remediation, and floor safety management practices.
OSHA 1910.22	General industry walking-working surface expectations for clean, dry, hazard-free, inspected, and maintained surfaces.	Supports baseline expectations for inspection, maintenance, repair, and hazard control.
ASTM Methods	Selected tests may address footwear, flooring, contaminants, or test devices depending on exposure.	Apply the method that best matches the real-world surface and contaminant condition.
International References	EN and AS/NZS frameworks may be relevant for global operations or multi-national specifications.	Useful when facilities, products, or standards programs cross jurisdictions.

Avoid treating any single COF value as universally “safe.” Method, surface condition, contaminant, and intended use all matter.



Statistics & Claims

Understanding the business impact of slips, trips, and falls.



STF Statistics

A concise snapshot of why walking-surface risk deserves executive attention.

65% same-level walking surface involvement

30% moderate to severe injuries reported by slip/fall sufferers

2nd leading cause of injury are slips, trips, and falls

480K STF incidents requiring days away from work in 2024 (NSC)

844 slip-and-fall deaths in 2024 (BLS & NSC)

\$46K average workers compensation payout (NSC)

17% Workplace fatalities tied to STF (NSC & BLS)

\$70B medical costs & compensation associated with STF (CDC & NSC)

Costly Consequences of Claims

Slip, trip, and fall incidents can escalate into high-severity Workers' Compensation and liability claims



High-severity verdict exposure

Severe permanent injuries from a slip-and-fall involving water on a train car led to a reported **\$58.4 million** jury verdict.



Catastrophic Fall Exposure

A university student sustained catastrophic spinal injuries after falling into an uncovered manhole, resulting in an **\$18 million** claim.



Premises liability exposure

A woman slipped on a wet substance at a retail store and suffered a traumatic brain injury. A jury awarded **\$16.4 million**.

STF Root Causes

Shift from isolated hazards to a systems view of exposure.



Primary Root Causes

A four-part model for organizing observations, testing, and corrective actions.

People

Exposure profile, mobility, behavior, and task demands.



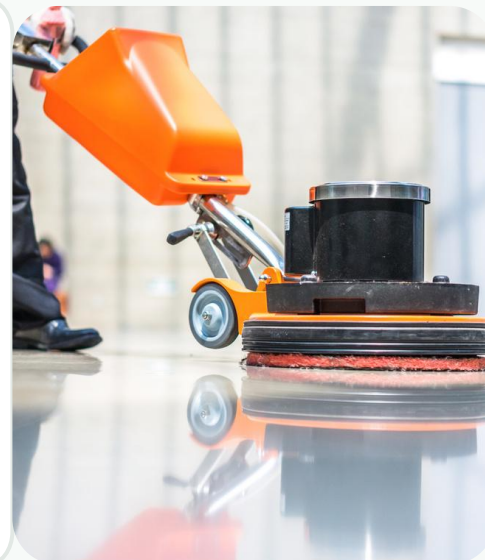
Ambient Parameters

Lighting, handrails, warnings, weather, transitions, and uneven surfaces.



Floors & Maintenance

Surface porosity, restoration, cleaning process, chemicals, and dry-time.



Footwear

Shoe type, tread, sole material, wear pattern, and use condition.



Integrate the model with checklists, slip testing records, and claim analytics to target high-value controls.

People: Exposure Profiles

Different user groups interact with walking surfaces in different ways.



Older adults / mobility considerations



General public / crowd density



Employees / work tasks



Children and young adults

Align controls to the population, traffic pattern, likely footwear, and surface condition — not the floor alone.

Ambient Parameters

Environmental and design conditions can amplify or reduce walking-surface risk.



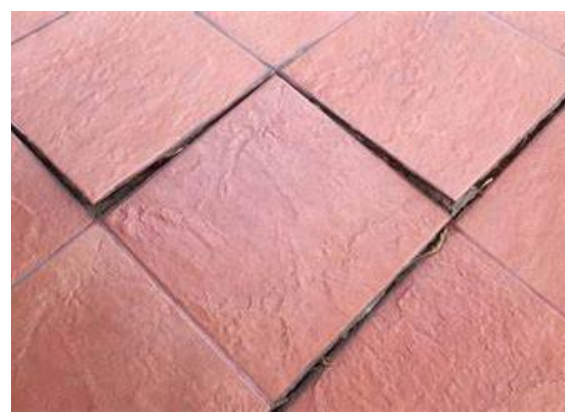
Walking & working surfaces



Handrails and warning postings



Lighting



Uneven surfaces



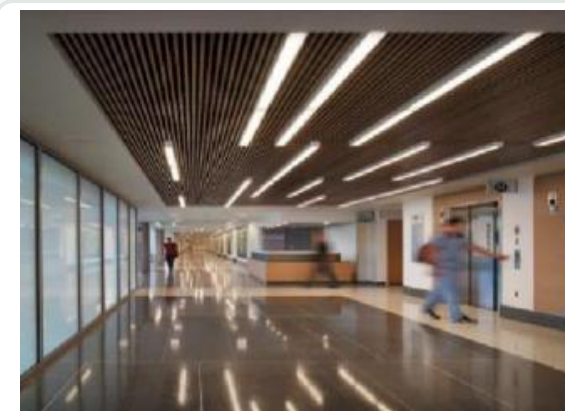
Environmental exposures



Entrances / transitions



Handrail condition



Interior lighting



Exterior pavement



Contamination

Floors & Maintenance

Surface performance depends on material, condition, cleaning chemistry, and process discipline.



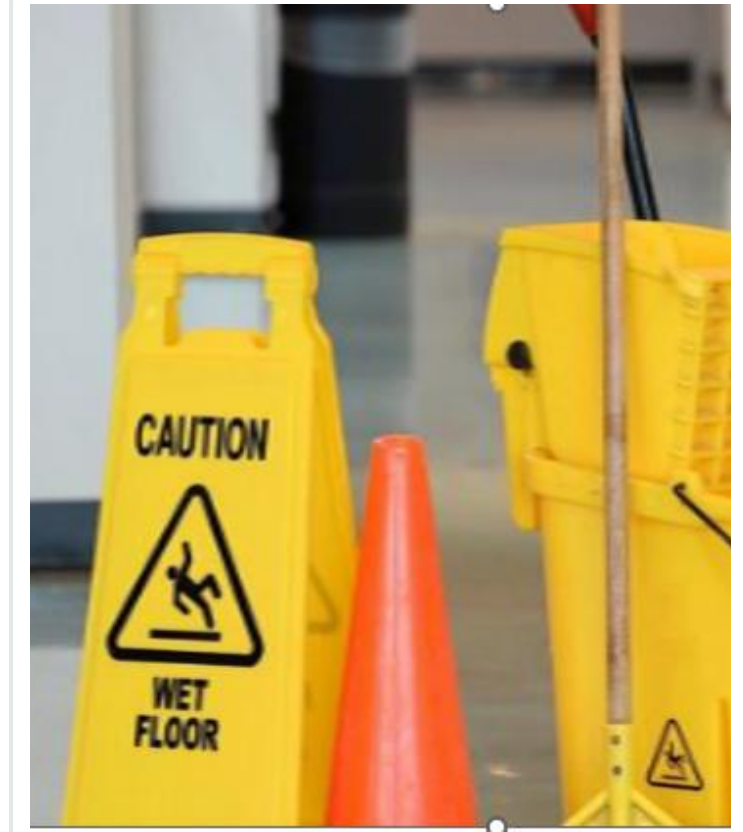
Floor porosity



Floor restoration



Daily cleaning program



Flooring chemicals

Design implication

Porosity and texture influence contaminant retention and cleanability.

Process implication

Cleaning technique, frequency, and dry-time can change traction conditions.

Verification implication

Periodic testing can validate whether maintenance practices are effective.

Footwear: The Human-Surface Interface

Footwear selection and condition are critical variables in real-world slip resistance.



Dress shoes



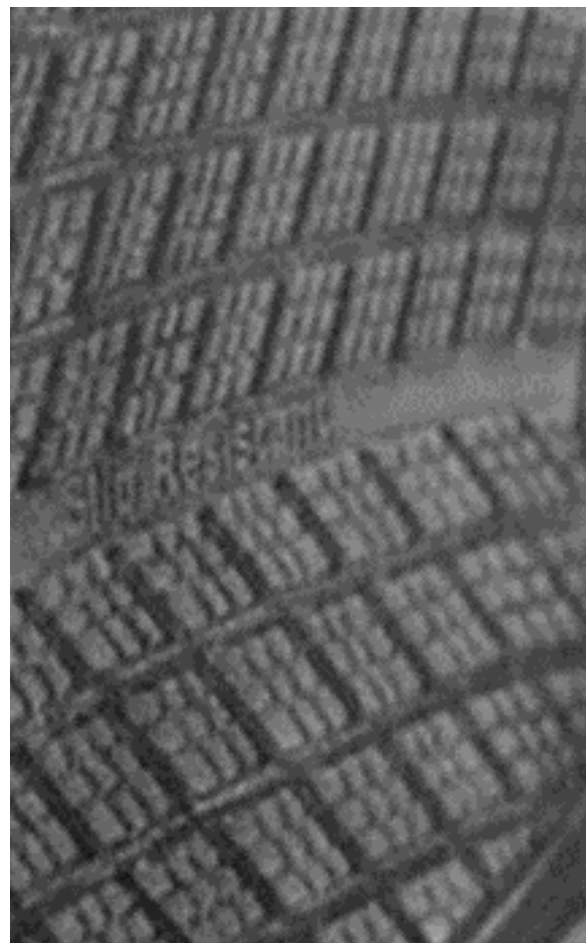
Athletic shoes



Work shoes



Casual shoes



Slip-resistant tread

Integrate footwear requirements with floor testing, incident analysis, and proactive hazard controls.

**CAUTION
WET FLOOR**



Slip Resistance Testing

Turning floor-safety observations into measurable risk intelligence.

What Is Slip Resistance Testing?

A data-driven evaluation of walking-surface traction and slip potential.

Core concept

Testing measures coefficient of friction (COF), including dynamic coefficient of friction (DCOF) where applicable, to evaluate how walking surfaces perform under expected conditions of use.

1

Measure

Capture objective traction data using recognized methods and calibrated equipment.

2

Interpret

Compare results with the selected method, surface type, and likely contaminants.

3

Prioritize

Convert findings into targeted actions for high-exposure areas.

Key takeaway: Floor data improves the quality of safety, maintenance, and liability decisions.



Why It Matters

Slip resistance testing supports more defensible, evidence-based decisions.

Prevent Injuries

Identify surfaces with elevated slip potential before incidents occur.



Reduce Liability Exposure

Document a proactive process for evaluating walking-surface conditions.



Validate Operations

Assess whether cleaning, matting, and maintenance practices are performing as intended.



Guide Investments

Prioritize corrective actions, flooring changes, and design decisions using measurable data.



Slip testing is not simply a compliance exercise — it converts floor conditions into actionable business intelligence.

From Data to Action

A practical workflow for converting test results into measurable risk improvement.



Bottom line: what gets measured can be managed, documented, and improved.

Leading Practices & Solutions



From isolated recommendations to an integrated STF prevention system.

Floor Designs

Build slip resistance and visibility into the walking path before incidents occur.



Entrance transition



Level change



Edge / material change



Design criteria

Consider slip resistance characteristics and surface roughness early in selection and renovation decisions.



Use-condition testing

Evaluate flooring under wet, dry, cleaning, traffic, and transition conditions where feasible.



Path performance

Account for the full walking path, from parking lot to entrance, including changes in elevation and surface materials.

Floor Mats That Absorb and Abrade

Use matting as a engineered control — not a decorative accessory.



Entrance matting



Walk-off matting



Water exposure areas

Entrance length

Use adequate mat length: source deck cites 8–10 walking steps, approximately 12–15 feet, during rain.

Operational readiness

Prepare to exchange mats when saturated and use more than one mat during rainy periods.

Targeted placement

Use absorbent material near water fountains, ice machines, restrooms, and other wet-condition locations.

Innovative STF Prevention Strategies

Pair traditional controls with emerging technology and measurable validation.



COF boosters



Spill detection cameras



Liquefied floor treatments

Surface enhancement

Use traction treatments where appropriate; verify effectiveness with testing and maintenance plans.

AI-enabled detection

Use cameras and alerts to shorten spill response time in high-traffic areas.

Treatment governance

Document approvals, application intervals, compatibility, and post-treatment performance.

Best Strategies for Stairs

Improve visibility, hand support, and consistency throughout the stair system.



Control focus

Make the stair edge, nosing, handrail, and lighting conditions easier to see and use.

- Install handrails with visible color contrast.
- Maintain lighting levels; 12–15 lumens per square foot as a leading practice.
- For stairs wider than 88 inches, source slide notes intermediate handrails may be required.
- Maintain handrail height from 34 to 38 inches.
- Evaluate stair nosing, edges, and surface visibility.

Conclusions

Recommended leading practices for a more defensible STF prevention program.



Testing

1 Formal STF Program



Checklist

2 Specific STF Checklist

3 Formal Matting Plan

4 Formal Cleaning Process



Cleaning process

5 Slip Testing Program

Build a program that prevents claims, documents decisions, and validates performance.

Thank You

Questions and discussion

