Preventing Slip, Trip, and Fall Accidents

CHUBB®

A Guide for Airports

Chubb Risk Consulting


We never forget
that half of a
Customer Service Center
Telephones
Terminals 2 3 5
Concourses B E F
Gates C1-C19 C
Baggage Claim
Ground Transport
Gate C20
It's time to fly.
Terminals
Concourses B E
Baggage Claim
Ground Transport
Hilton
Gates C18,C18a
Customer Service
Center
Telephones
It's time to fly.
Terminal 2
Concourse
Escalator
10:59
C2
CAUTION

Slip, trip, and fall accidents at airports are a primary source of injuries, resulting in millions of dollars of liability claims.

In addition to direct liability payouts, slip, trip, and fall incidents have significant hidden costs, such as lost productivity, increased administrative activity, and potential negative publicity within the community. All of these costs negatively impact an airport's bottom line, yet they are largely preventable. The fact that so many airports have experienced slip, trip, and fall incidents should motivate terminal, landside, property and risk managers to review their safety and risk management programs and to take action to enhance their slip, trip, and fall accident prevention practices.

Chubb has created this resource to help the aviation industry take steps to reduce their liability and other losses from slips and falls. Most of the information it contains was derived from Chubb's loss history and risk consulting best practices. However, please note that this guide is no substitute for legal advice from an expert in slip, trip, and fall risk consulting.

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Interior

Flooring Selection

The choice of flooring materials and treatments is one of the most important decisions in preventing slip, trip, and fall accidents. Many factors go into the selection process including cost, aesthetics, maintenance requirements and what activities are taking place. With these factors in mind, time should be taken up front to thoroughly evaluate the advantages and disadvantages of different flooring materials, whether the project involves new construction or is a renovation.

Research studies of how people walk show how even slight elevation changes can result in a trip. Best practices indicate elevation changes of less than a ¼ inch can be safely navigated. Changes between 1/4-inch and 1/2-inch should be beveled with a slope of 1:2 (rise:run) and changes greater than 1/2-inch should be accomplished by means of a ramp. Source: ASTM 1637, NFPA 101-7.1.6.2, ADA Standards for Accessible Design, Part 303.

How well a floor surface performs under its expected environmental conditions is another important consideration. A best practice is to compare samples of different flooring under the expected conditions using a properly validated, calibrated and maintained slip meter used by a trained and qualified person and operated in accordance with the manufacturer's instructions. For example, flooring that could become wet with water should be tested under similar wet conditions. Using the same slip meter and conditions is the best way to compare several different types of flooring. Two standards that can be referenced by qualified individuals include ANSI 137.1 and ANSI B101.1.

The location of the flooring material being installed should also be considered. It is important to review the manufacturer's ratings and warnings to ensure that a flooring material is used in a compatible environment. For example, the slip-resistant rating and qualities of any material used near entrance/exit doors should be reviewed to ensure it will function with minimal maintenance under wet and snowy conditions and maintain a high slip resistance. Materials that have lower ratings under wet conditions may not be a good choice for this area. Floor surface materials at terminal entrances should provide high traction ratings under both wet and dry conditions. Interior and exterior ramps/inclines should not be coated with slippery paint, sealants or waxes.

New construction and interior remodeling is focused on "going green" with an eye towards sustainability. Green building standards such as the United States Green Building Council (USGBC) and their LEED certification program have a credit in the environmental quality category that specifically focuses on entrance way contaminant control. When achieving this credit option, it is important that it doesn't create an unintended consequence in terms of reducing your entranceway's slip resistance.

Floor Maintenance

Airports frequently use a combination of flooring materials in the terminal and on the concourses such as terrazzo, various tiles, carpeting, and others.

Flooring is typically damaged during normal wear, through settling of the building structure, or by physical damage from dropping or dragging heavy objects such as suitcases, luggage carts, supply carts, etc. Failure to quickly identify and repair these deficiencies can lead to injuries.

It is critical to ensure that a floor wax is compatible with the flooring material being maintained and to carefully follow the application instructions.

Improper cleaning and finishing techniques by janitorial personnel can turn floors into slip and fall hazards. To prevent unintended consequences, the application of any floor cleaner or wax should be conducted in accordance with the manufacturer's recommendations and with a high slip resistance in mind. When wax is necessary, care should be taken to use a high traction nonslip wax, designed for occasionally wet conditions as many wax products can actually reduce the slip-resistant rating of a floor. Furthermore, many floor waxes are not designed for high-speed buffing, which can further reduce the floor's slip resistance. It is critical to ensure that a floor wax is compatible with the flooring material being maintained and to carefully follow the application instructions.

Stairs

Injuries on stairs or steps are a major source of trip and fall accidents and can lead to severe injuries. A number of factors contribute to these types of accidents, including:

- Irregular steps
- Busy floor patterns
- Poor illumination
- Poor maintenance
- Slippery steps
- Improperly positioned, absent, or broken handrails
- Doors that open directly onto stairs
- Articles left on stairs
- Broken or eroded treads
- Loose floor covering
- A step in an unexpected place
- Distracting views.

Contact the local building authority regarding staircases to ensure that your building is in compliance with current building codes.

Escalators and Moving Walkways

Escalators are a frequent source of falls, especially for the elderly, who may suffer from poor balance issues, and those travelers handling a large amount of luggage. Other causes include distractions from children, cell phones, not holding onto handrails, rushing to catch a flight and inappropriate footwear. Escalator step treads should be highlighted with a visible yellow edge to improve the visibility of the step. This helps ensure people step squarely on the step tread when stepping onto the escalator. The comb plates should also be painted a highly visible yellow paint as well. Comb plates with missing "teeth" should be replaced so as not to catch straps or clothing which could lead to a fall. CCTV coverage on escalators is valuable in accident investigations and defense of claims.

When not operating, escalator steps do not generally meet the standard step geometry of a staircase, which increases the likelihood of a fall. Install barricades, signs or other barriers and do not allow escalators to be used as stairs when they are not working. Place a sign with an arrow indicating the location of the nearest elevator.

Moving walk ways are essentially level/flat escalators. The comb plates should be inspected periodically for missing comb teeth. Pedestrians walking on the moving walkway experience a sudden deceleration when stepping off the moving walkway. In order to warn users of the necessary change of pace, "you are approaching the end of the moving walkway" audible alerts or signage should be installed at the end of each moving walkway.

Elevators
Elevator thresholds should be level with the elevator carriage at each level and be slip resistant.

If your airport has multiple elevators, consider staging one on each level with the doors in the open position to encourage their use as an alternative to the escalator.

Displays
At times, local artists or vendors will have lobby exhibits for travelers to view or even interact with. Exhibit plans and displays, especially those with elevations involved, should be designed primarily with the visitor experience and safety in mind. Adequate provisions for visitor traffic flow, crowds and clustering, strollers and wheelchairs, sight-lines and object protection should be provided. To prevent visitors from touching objects that are openly displayed, it is common practice to maintain 3-4 feet of separation around the display. Elements used to prevent visitors from touching objects can include permanent railings or barriers, stanchions or raised platforms. Consideration should be given to ensure that these barriers do not create trip and fall hazards. Raised platforms should be at sufficient height and of contrasting color with the floor that they are visually discernible. Permanent railing and barriers should be 42 inches above the floor. Temporary barriers such as stanchions should be at least 24 inches in height. Regular inspections to ensure the stability of barriers or stanchions should be documented whether they are affixed to the floor or free standing.

Displays, such as pools or fountains, can result in water being splashed on the floor. Consideration should be given to providing walk off mats, slip resistance flooring and conducting regular inspections when fountains are operating. Camera coverage is a good practice in areas where water is part of an exhibit or building aesthetics.

Product displays including clothing and travel souvenirs, etc. may be staged in front of the doorway of the leased tenant space. If your airport allows this practice, these areas and displays should be evaluated for eye-level visibility since they may impede pedestrians walking through the terminal. This includes travelers rounding corners or individuals who may be preoccupied with their cell phone or children. Low profile display tables should be avoided and all racks and sales displays set up in front of their store space in the terminal should be evaluated as a potential trip hazard.

Jet bridges
When boarding or disembarking aircraft, passengers are frequently hurried and focused on trying to manage their personal belongings and luggage. Passengers may be unstable on their feet after having sat for an extended period during a long flight. Consequently, their attention is not drawn to floor transition zones. To highlight these common trip-fall areas, the portable bridge plates and side gutters should be conspicuously marked with yellow and black high-visibility tape. Overhead signs reading "CAUTION, UNEVEN SURFACES" should be posted directly above the transition ramps. Newer jet bridges typically come from the manufacturer with handrails installed; however, older jet bridges may lack this equipment and strong consideration should be given to retrofitting them with handrails.

Children's Play Areas
Children's play areas in airports are often equipment with climbing structures. This poses a hazard of falling from heights. Controls should include proper floor cushioning (attenuating mats) to prevent serious injuries from a fall. Further guidance is available from the U.S. Consumer Product Safety Commission's Public Playground Safety Handbook at https://www.cpsc.gov/s3fs-public/325.pdf

Having a well-managed slip, trip and fall prevention program makes good business sense.

Raised platforms and steps should be equipped with handrails and guardrails. Signage should be posted alerting parents or guardians to their responsibility for supervising children.

Exterior

Walkways

The most important characteristic of exterior walkways is that they must be smooth without posing trip hazards or being slippery. Walkways may crack due to settling surfaces, storm damage, or the action of tree roots.

Walkways should be level wherever possible, well-maintained and free of debris. Walkways should also be pitched enough to provide proper drainage so that puddles and ice do not collect on them, and be properly illuminated at night. In the event you find that your external walkways are too slippery, chemical treatments and other coatings are available that will increase the slip resistance of these surfaces.

Ramps/Inclines

Slip, trip, and fall accidents commonly occur on ramps/inclines, which are used to allow access by those unable to easily negotiate steps. Ramps may need higher levels of slip resistance due to environmental factors and the increased slope. This can be accomplished by the use of brushed concrete, cross cleats (cuts by a concrete saw), friction strips, and nonslip paints or coatings. Generally, wheelchairs can navigate a slope of 7° or less without excessive effort. Ramps with a slope of less than 4° may be difficult to detect visually and can surprise a pedestrian, especially when handrails are absent.

Parking Lots

Slip, trip, and fall exposures in parking lots and garages can be mitigated by making sure that:

- The surface is regular, smooth, and free of potholes and other depressions.
- Expansion joints are level and secure with no raised or loose edges, due to missing screws or fasteners.
- Utility valve covers are installed flush with the pavement.
- Bolts or other remnants from removed signs should not be left to protrude above the paved surface.
- Safe, conspicuously marked crosswalks, sidewalks, and marked pathways are provided for pedestrians and vehicles.
- Illumination is adequate.
- Effective ice and snow removal procedures are implemented.
- Broken or damaged concrete wheel stops are repaired or removed.

Parking lots should be included in any formal slip, trip and fall inspection program, to determine condition and schedule maintenance. Extra attention should be focused on handicapped parking areas since visitors using these spots are already physically impaired. An adequate budget should be maintained for parking lot repair and maintenance.

Speed Bumps and Wheel Stops

Speed bumps, if necessary, should be located in areas that are not in the direct walkway of pedestrians. They should be painted a bright color (such as safety yellow) with slip-resistant paints. They should be designed so that a flat, three-foot walking area is provided at both ends.

Wheel stops present tripping hazards, usually because they are out of sight at the time the driver exits the vehicle. When possible, the use of wheel stops should be eliminated by good parking lot design and

engineering. They are a particular hazard to individuals with disabilities. If they must be used, paint them a bright color, and also ensure that they are positioned in such a way to prevent parked vehicles from extending into the pedestrian walkway. Existing wheel stops installed at the rear of parking spaces are frequently secured to the ground using a rebar post driven into the pavement. The wheel stops may become dislodged over time leaving the rebar post extending above the pavement surface. Concrete wheel stops may also become damaged or crumble resulting in pieces of concrete debris littering the walking surface posing a trip-fall hazard.

Cell phone lots and airport-owned satellite parking areas are normally located some distance away from the terminal and the primary parking lot. In some cases, such as during spring break or other busy travel weeks, temporary overflow parking may be established in grass fields or have unpaved, dirt and gravel surfaces. Just like the main surface lots, temporary parking areas should be evaluated for adequate lighting, holes or depressions, and other trip hazards.

Multi-story parking structures may include various exposures found in a terminal including stairways, moving walkways, and elevators, and water or ice on walking surfaces. To ensure that these supplementary parking areas are not overlooked, these areas should be included on the periodic inspection checklist.

Land Leases
If the airport owns buildings and leases them to tenants, routine inspections of these properties should be conducted. Property lease agreements should contain hold-harmless language to indemnify the airport of any liability claims. It is a best practice to periodically inspect any building or facility owned by the airport or municipality to assure tenants are meeting contractual safety requirements.

Construction Areas
During renovation or new construction projects, temporary walkways may be needed to help travelers navigate or bypass construction areas in order to reach the terminal or departure gate. Because these areas and surfaces are not permanent installations and may be more susceptible to wear and tear damage, they should be inspected on a more frequent basis than other areas on the airport

Conducting a Hazard Analysis

Taking control of slip, trip, and fall hazards, like any other systemic problem, requires a methodical and coordinated hazard analysis process. Fully document the process to ensure management control and to demonstrate management's commitment to eliminating this hazard.

A good starting point in a safety program is to conduct a complete hazard analysis of the workplace. The elements of a hazard analysis include:

- Identifying the type of floor in each area to ensure that it is compatible with the environment and normal usage of the area.
- Reviewing maintenance procedures for floors, staircases, walkways, parking areas, etc.
- Observing the overall physical condition of walking surfaces to ensure they are not damaged by routine use or foundation settlement.
- Identifying changes in levels of walk surfaces or in the type of flooring materials along walkways.
- Analyzing prior claim and incident reports. These may contain actual accidents, near misses, and/or maintenance records that point to areas that have already resulted in injuries and suggest the need for corrective action.

The data derived from the hazard analysis can provide the information needed to develop the following ongoing accident prevention activities.

It can be valuable to use checklists, such as the sample checklist included in this guide, which help to identify slip, trip, and fall hazards.

Inspections
It can be valuable to use checklists, such as the sample checklist included in this guide, which help to identify slip, trip, and fall hazards. A good, detailed checklist not only helps identify hazards but also translates the hazards into work orders that can be quickly corrected. Make sure a knowledgeable person is responsible for conducting detailed inspections and providing the results to management for review and follow-up.

To augment these inspections, conduct informal daily walk-through inspections to identify serious hazards, such as lighting failures, poor housekeeping practices, damage to or deteriorating walking surfaces, furnishings that may have been moved etc., which may pose hazards between formal inspections.

Maintenance Protocol
All walking surfaces should be maintained on a regular schedule. It is important, however, to realize that maintenance procedures themselves can cause slip, trip, and fall accidents. For example, a poorly trained custodian may not know that specific types of flooring require specific types of care, as discussed in the previous section on floor maintenance. Continually monitor maintenance procedures followed by janitorial staff, whether they are tenant managed, contract personnel, or airport employees.

A best practice for restrooms is to position paper towel dispensers and hand dryers close to sinks to reduce dripping water across the floor. Inspection logs are helpful in maintaining regular maintenance schedules to address wet floor conditions.

Water fountains and roof leaks are another source of wet floor conditions. Water pressure at drinking fountains should be adjusted to minimize accumulation of water on the floor. Consideration should be given to placing non-slip floor mats beneath drinking fountains. Roof leaks should be repaired quickly and methods of capturing leaks should be employed to prevent water on floors.

Safe Use of Floor Mats
Selection and proper use of mats is an important aspect to slip, trip and fall prevention. Mats are made of a variety of materials, including rubber, polypropylene, and carpet to help remove water and debris from footwear. Each is intended for use in a specific circumstance. Debris removal mats are located in terminal vestibules while absorbent mats are best suited to locations inside the building entrances.

The color of the mats should contrast with the color of the flooring, and mat edges should taper down to the floor for a smooth transition to the floor's surface.

Proper positioning of the mats can increase their effectiveness. Debris removal mats should be located such that travelers walk on the mat prior to entering the terminal. Absorbent mats should be located at the threshold so travelers walk on the mats prior to the floor surface.

It is important to ensure that mats are not adding new risks to your facility. Mats should be secure and in good condition with no curling or buckling at the edges. Any mat that is not in good condition or does not lay flat should immediately be removed from service.

The Carpet & Rug Institute's "Carpet Maintenance Guidelines" states that extending mats 6' - 15' inside the entrance will trap 80% of the soil and moisture from the first five or six steps. As a rule of thumb, footprints or water prints should not be seen on the floor beyond the last mat.

Given the potential for injury and liability, claims, a formal written slip, trip, and fall prevention program makes good business sense.

Inclement Weather Precautions
Develop precautions and assign them to specific employees to enact under certain poor weather conditions such as rain, snow, sleet, ice, etc. One important precaution is the placement of walk-off mats at all entrance doors.

During heavy rainstorms or snow storms, mats should be inspected regularly to verify that they have not become saturated, thus rendering them ineffective. Avoid overlapping mats as it creates a raised area increasing the likelihood of trip hazard.

Under severe conditions, consider assigning janitorial staff to post a "caution-wet floor" sign to warn employees and customers entering the area about the possible slip hazard and to manually mop any excess water that may accumulate

Employee Training
Train employees to identify and report all slip, trip, and fall hazards so the hazards can quickly be corrected. Due to constant change in the airport environment, this is an important element of the program.

Also, to avoid employee slip, trip and fall accidents, educate employees and inform airport tenants on the role that shoe selection plays, and encourage them to wear shoes that are slip resistant with the flooring surfaces in their work areas.

Monitoring Results
Finally, monitor the results of the safety program. Periodically audit the procedures for all the activities noted above to ensure they are properly and consistently followed. Furthermore, implement and regularly review a thorough accident and incident investigation procedure to ensure that the actions being taken are effectively preventing slips and falls.

Conclusion
Slip, trip, and fall accidents are a frequent and costly occurrence at many airports. Given the potential for injury and liability, claims, a formal written slip, trip, and fall prevention program makes good business sense.

Sample Checklist
A detailed slip, trip, and fall prevention checklist can help identify hazards and then translate them into work orders to quickly correct or address the dangerous condition. The following sample is offered to help illustrate how a checklist might look and be used to minimize slip, trip, and fall incidents at your airport. The actual checklist you use should be tailored to your particular facility. Follow the checklist on a regularly-scheduled basis, perhaps weekly. Any "No" answer should have an entry in the "Location/Action/Comment" column to document the corrective action.

Slip, Trip and Fall Prevention Checklist

Airport Terminal Interior	Yes	No	N/A	Location/Action/Comment
Floor Conditions				
Are flooring surfaces inspected regularly?				
Are floor surfaces including carpets, tile, or terrazzo free of damage? (Holes, missing/broken tiles, raised edges, etc.)				
Are "Caution-Wet Floor" cones displayed until the floor is completely dry and then removed?				
Are absorbent and non-slip floor mats used at terminal entrances to absorb moisture during snow and rain events?				
Do all floor mats lie flat? (e.g. no tears, curling or buckling at the edges)				
If multiple floor mats are used, do floor mat edges overlap?				
Are electrical cover plates flush with the surrounding flooring?				
Are custodians/janitorial staff available in these areas to address spills and other floor conditions?				
Restrooms				
Were all restroom floors found to be dry with no excess moisture on the floor?				
Are restrooms inspected on a regular schedule documenting the time, date and staff initials?				
Is a rigid cleaning and mopping schedule in place to keep floors clean and dry?				
Are "Caution: Wet Floor" signs placed in and at the restroom entrances, when floors are being mopped?				
Escalators/Moving Walkways/Stairs				
Are safety "Caution" signs posted and clearly visible on all escalators?				
Is there a sign near each escalator indicating the location of the nearest elevator?				
Are escalator comb plates painted yellow for visibility?				
Is the yellow paint on comb plates bright? (i.e. not faded or worn?)				
Are escalator comb teeth all in place (i.e. none broken/missing)				
Are the escalator step tread perimeters highlighted in yellow for improved visibility?				
Are brush guards provided on the sides of the escalators?				
Are barricades posted to prohibit public access and use when escalators are not operating?				

Airport Terminal Interior	Yes	No	N/A	Location/Action/Comment
Escalators/Moving Walkways/Stairs				
Are audible warnings operating to alert travelers approaching the end of the moving walkway?				
Are all stairs equipped with handrails?				
Are staircases, ramps, and landings well-illuminated?				
Jet Bridges				
Do jet bridge floors have non-slip surfaces?				
Is floor carpeting in good condition?				
Are jet bridges equipped with handrails?				
Are transition areas equipped with handrails?				
Are transition areas maintained so as not to pose a trip hazard?				
Are jet bridges well-illuminated?				
Do jet bridge side troughs have black and yellow striping for improved visibility?				
Are overhead signs reading “CAUTION, UNEVEN SURFACES” posted directly above the transition ramps?				
Are jet bridges clear of obstructions, i.e. portable boarding bridge, wheelchairs, trash receptacles, cleaning materials?				
Food Courts				
Are floors monitored regularly for spills, etc.?				
Are “Caution: Wet Floor” signs used, when floors are being mopped?				
Are tables and chairs set up to ensure the adequate aisle ways exist and are well maintained to permit traffic flow and to minimize trip and falls?				
Tenant/Vendor/Art Displays				
Are concessionaire promotional displays arranged so as not to protrude excessively into the main path of travel?				
Are promotional displays conspicuous at eye-level? (avoid low profile display tables, etc.)				
Do the art displays or their bases create a trip hazard?				
Are warning signs or barriers installed around the art display to prohibit public access?				

Airport Terminal Interior	Yes	No	N/A	Location/Action/Comment
Children's Play Areas				
Is equipment appropriate for the age group?				
Does the equipment and floor surfaces comply with the Consumer Product Safety Commission (CPSC) guidelines?				
Is climbing equipment kept to minimum heights and only positioned over soft surfaces?				
Are handholds/handrails provided for climbing equipment?				
Are safety policies/instructions/disclaimers clearly posted? (e.g. Adult Supervision Required, No Food or Drink in Play Area, Parents are Responsible for Child Safety)				

Airport Exterior	Yes	No	N/A	Location/Action/Comment
Parking Lots/Garages/Cell Phone Lots				
Are parking lots regularly checked for potholes, cracks and depressions, and are they repaired on a regular basis?				
Are parking lot lights checked weekly to identify bulbs that need replacing?				
Is there adequate illumination in the parking lots and on all levels of the parking garage?				
Is an annual illumination survey performed to measure and document lighting levels in parking lots and the garages, including stairways?				
Are expansion joints and covers in parking garages well maintained, secure and level?				
Are parking lot curbs and speed bumps painted or otherwise well-marked?				
Are wheel stops positioned so they do not permit vehicles to extend into walkways and do not present a tripping hazard to pedestrians?				
If wheel stops are used, are they in good condition, secure to ground, undamaged and with no rebar exposed?				
Are storm water drain grates cleaned on a regular schedule?				
Are there signs instructing pedestrians to not use vehicle ramps?				
Is snow and ice removal performed continuously during snow accumulation events?				
Is there any standing water on the floors of parking decks/ garages?				

Airport Exterior	Yes	No	N/A	Location/Action/Comment
Front Sidewalks, Curbs, Crosswalks				
Are pedestrian crosswalks painted and clearly identified?				
Are there traffic signs alerting vehicles of the pedestrian crosswalk?				
Are the curbs or cub-cuts painted yellow for visibility?				
Are sidewalk surfaces level with no obvious defects or trip hazards?				
Are automatic lawn sprinkler heads and downspout gutters oriented so excess water or ice doesn't accumulate on walkways?				
Are remedial controls in place during winter months for ice melt and hand shoveling?				
Construction/Temporary Walkways				
Do temporary walkways restrict travelers from access to construction zones?				
Are temporary walkways of solid construction, illuminated and offer protection from the weather?				
Are handrails installed where necessary for stairs and ramp areas?				
Is the surface of temporary walkways level and clearly identified?				
Do temporary walkways (wood or metal) require grip tape or other non-slip surfaces?				
Miscellaneous				
Are employees and tenants trained about slip, trip and fall prevention and offered ongoing training and education as necessary?				
If falls occur, are employees trained to provide travelers with prompt attention, which may include alerting emergency services and aiding in the investigation and documentation of the incident?				

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