Risk Control Bulletin

Slip, Trip and Fall Accident Control

RISK CONTROL

APSP
The Association of Pool & Spa Professionals®

Overall, slips, trips and falls are a major accident type in most industries, including schools and institutions. They account for 10% to 30% of injuries to employees and the general public, and have an average cost ranging from $2,500 to $12,000. According to the National Safety Council, slips, trips and falls are the second leading cause of accidental deaths.

Slips, trips and falls may occur on level walking surfaces as well as on ramps and stairways. Major hazards associated with slip, trip and fall injuries are slippery surfaces, holes or broken surfaces, poor drainage or inadequate clean-up of spills or mud, ice, and water during inclement weather. Falls are frequently the result of both unsafe conditions and unsafe acts. Personal factors such as age, illness, emotional state, fatigue, inattention, and poor vision also contribute to falls.

Slippery surfaces can occur from applying polymer over wax dressing; allowing inadequate drying time; buffing to a mirror–like gloss; incomplete removal of grease or oil; or allowing cleaning residue to mix with freshly applied finishes.

Materials used to prevent slips may become tripping hazards. These include mats with curled edges, tears or warps and abrupt changes in traction provided to adjacent walking surfaces. Mats that have become wet and dirty may make the soles of shoes wet and dirty rather than drying and cleaning them.

Floors

Floor surfaces and materials may contribute to slips and falls among employees and the general public. Proper choices in flooring materials, use of special finishes, mats, tapes, grooving, texturing and keeping the floor clean and dry can prevent slips and falls.

Evaluation

Major hazards are slippery surfaces, holes or broken surfaces, poor drainage or inadequate clean-up of spills or tracked in mud, ice and water during inclement weather. Identify and evaluate floor conditions during regular walk around surveys, and pay special attention to:

- Building entrances where water, mud, grit and dirt are tracked in
- Loading platforms that may be open to the elements
- Work areas around machinery or office equipment
- Areas where floor level changes due to steps or ramps

Any specific deficiencies observed should be discussed with management. Inquire into reasons for the deficiencies and review policies concerning floor maintenance, spill clean–up and actions during inclement weather.

A principal cause of floor accidents is the inherent slipping hazard of various types of floor surfaces. Terrazzo, marble, ceramic tile, painted wood or concrete, metal and some vinyl floors may be slippery unless non–slip measures are taken. Carpet is less slippery. Safety, appearance, initial cost, durability, and maintenance costs influence the selection of flooring type.

Regulations

OSHA General Industry Safety Standards 1910.22 require floors to be clean and dry. Proposed regulations require floor surfaces to be free of recognized hazards and if the surface cannot be maintained free of hazards such as snow, ice or oil, there should be a means to minimize exposure. Regular inspection and maintenance should keep the surfaces in safe condition.

Controls

Opportunities for improvement include:

- Increasing the slip resistance of slippery floor areas
- Replacing rotted, worn, loose and warped wood flooring
- Repairing cracks and holes in concrete floors
- Repairing tears in carpet
- Conducting regular and frequent housekeeping surveys
- Following flooring manufacturer's instructions
- Assigning maintenance and housekeeping personnel to specific designated areas
- Covering housekeeping principles and the need for clean-up of spills in new employee orientation

- Establishing a procedure to clean only one section of floor at a time so traffic can pass safely

Increase the slip resistance of slippery floor areas. Contact floor covering suppliers and safety product distributors to determine the best material for the floor involved. Most suppliers can furnish a floor finish to specification, so specify a friction level when ordering. Comparative tests of various treatments may need to be made to determine which one is most preferable from all standpoints.

Rotted, worn, loose, and warped wood flooring should be repaired or replaced to reduce tripping hazards. Repair cracks and holes in concrete floors to reduce tripping hazards. Folded or wrinkled carpets should be stretched and tears should be repaired promptly.

Conduct regular and frequent housekeeping surveys to identify and correct unsafe floor conditions. Inspections also stimulate satisfactory housekeeping standards. Surveys should be documented. Follow flooring manufacturer's instructions to keep floors clean and safe. Use of the wrong cleaning materials, methods and surface finishing can cause suitable flooring types to deteriorate and become slippery. Floor maintenance and housekeeping procedures should be standardized and written. Assign maintenance and housekeeping personnel to specific designated areas to assure they perform their function effectively.

Cover housekeeping principles and the need for clean-up of spills in new employee orientation. Procedures should include cleaning only one section of floor at a time so traffic can pass safely. Use warning signs, and rope off areas until floor cleaning is finished and the floor is dry. Post signs indicating alternate routes. Block doorways to stairs and escalators.

Stairs

In the United States, stair accidents annually result in about 800,000 injuries requiring emergency room treatment. Approximately one person in seven will receive hospital treatment for a stair accident in his or her life. The Bureau of Labor Statistics estimates there are nearly 33,000 disabling work injuries a year involving falls to lower levels on stairs. This accident type accounts for 1.3% of all lost time injuries and illnesses. Eighty percent of the workers lost 18 days from work with an average hospital stay of seven days.

Recognition

Factors associated with high accident rates include:

- Riser/tread dimensions such that the stairs are steep
- Location of the stair between first and second floor, high use
- Dimensional irregularities, turns
- Low head room
- Edges difficult to orient
- Age of user
- Careless and casual habits

A checklist for good stair features could be quite simple:

- steps should be readily seen
- treads are large enough to provide adequate footing
- handrails are reachable and graspable (Small children need to be considered in handrail height and grab bar spacing in residential, commercial and public buildings. A safe opening space for handrails is between 5 to 5.5 inches.)
- visual distractions in the vicinity of the stairs should be eliminated

Regulations

NFPA 101 Life Safety Code requires the following stair dimensions for new stairs:

Minimum clear width of stairs	44 inches, 36 in
Where less than 50 occupants use stairs	
Height of risers	4–8 inches
Minimum tread depth	9–11 inches
Head room	6 feet, 8 inches
Maximum height between landings	12 feet

Treads may have a maximum slope of 1/4 inch per foot in order to shed water. The Life Safety Code requires handrails on each side of new stairs and ramps with a slope of 1:15 or greater. Intermediate handrails are required within 30 inches of all portions of the required stair width. A person can only reach about 24 inches to the side to grasp a handrail.

The Life Safety Code, NFPA 101 requires guards on all surfaces that are 30" or more above the floor below to prevent falls over the open side. Such changes in elevation can occur at landings, balconies, corridors, passageways, floor or roof openings, ramps, aisles, porches or mezzanines. The code does not require guards on stairs with handrails on each side.

The Life Safety Code designates ramps as class A or B ramps: Class A
Class B
Minimum width
44 in
30 in
Maximum slope
1 in 10
1 in 8
Maximum height between landings
12 ft
12 ft

Proposed OSHA regulations require handrails on stairs over four risers, and guardrails when fall distance is over four feet. OSHA allows riser height between 6.5 and 9.5 inches and minimum tread depth for closed risers of 8 inches, 6 inches for open risers.

Controls

Major opportunities for improvement may include:

- make steps more apparent
- repair loose carpeting on treads
- turn guardrail and handrail ends into the wall
- install a handrail on the stair
- provide regular housekeeping inspections of stairs

Steps can be made more apparent by using handrails, warning signs, marking the nosing of the steps or through illumination.

Repair loose carpeting on treads. Carpeting can be fastened by providing eyes and rods where treads and risers meet. Metal nosing can be installed flush with the tread material to provide a tactile clue at the step edge. Gritty, self-adhesive tape can be applied to the stair tread and nosing, but it requires regular maintenance.

Turn guardrail and handrail ends into the wall to prevent them from catching clothing. Install a handrail on the stair or ramp to help prevent serious falls. A good handrail should be:

- Circular, oval or oblong in cross section for a good grip; the use of rectangular handrails that do not allow a power grip is discouraged.
- Handrail circumference should be no less than 4.4 inches and no greater than 5.2 inches. For cylindrical handrails this translates to a diameter between 1.4 and 1.65 inches.
- Handrail height, measured from the top surface of the handrail to the tread surface at the leading edge of the tread should range from 31 to 33 inches, with 33 inches the preferred value whenever possible.
- Handrails should have a 4-5/8 inch finger clearance from any other object. A clearance of 2-1/4 inches is considered minimum.

Regular housekeeping inspections can help to keep stairs clear and dry.

Sidewalks

Include sidewalks in your inspection and preventative maintenance program. Check the condition of sidewalks as well as what type of material was used to construct them. Smooth materials such as marble and terrazzo should be avoided, if possible. Rough finished concrete provides good slip resistance, even when wet.

Evaluation

Sidewalks should be level, with no ridges or height changes greater than 1/4 to 1/2 inch. They should have serrations or a tactile change of surface at any change of elevation. Sidewalks should have no holes large enough for a heel to fit into (not including spike heels). They should have a coefficient of friction greater than 0.6 when wet and have a non–slip textured surface finish.

Controls

Major areas of risk improvement include:

- Initiate a sidewalk maintenance program
- Train maintenance or security personnel to inspect sidewalk conditions
- Remove any worn or slippery sidewalk paint
- Improve sidewalk drainage
- Barricade sidewalk holes or repairs
- Install ramps or barricades over pipes or wires
- Install heated sidewalks

Remove sidewalk paint or finish that may be worn or non–slip resistant. Smooth, finished sidewalks can be very slippery when wet. Improve drainage to prevent the accumulation of standing water or ice on sidewalks. Ice and snow are major contributors to sidewalk slips and falls. Install a tactile change of surface if any visually impaired people use the sidewalk.

This will assist them in determining changes in elevation such as steps and curbs.

Barricade off any holes or areas under repair to draw attention to them and prevent unauthorized access. Cover any pipes or wires laid across the sidewalk with a ramp or barricade, to prevent trips and falls. Install heated sidewalks to prevent a build-up of ice and snow.

Train maintenance or security personnel to include sidewalk condition in their regular building checks. Initiate a sidewalk maintenance program which includes inspection of sidewalk conditions and prompt repair.

Aisles, Walkways

Aisles should be wide enough to allow workers to move about freely while handling materials and allow safe passage of equipment. Aisles should be kept free of obstructions and have dry, slip–resistant surfaces.

Regulations

OSHA General Industry Safety Standards 1910.22 require aisles to be clean and dry. Permanent aisles should be marked. Proposed standards would require 18 inch clearance around obstacles. National Fire Protection Association standards require access be kept clear to fire alarms and extinguishing equipment.

Controls

Opportunities for improvement may include:

- Increasing aisle width
- Placing mirrors, warning signs or signals
- Marking aisles
- Providing all–weather walk off mats
- Assigning supervisor responsibility for housekeeping

Lighting

General lighting of work areas and walkways may help prevent slips and falls. General lighting includes natural sunlight, general overhead lighting and task lighting. Adequate lighting can help employees and the general public detect hazards and avert them.

Evaluation

Identify the areas where poor illumination or no illumination, as well as direct glare, reflected glare, dark shadows, and visual fatigue can contribute to accidents. These areas may include:

- Building entrances
- Parking lots
- Loading platforms and service entrances
- Work areas around machinery and office equipment
- Areas where floor level changes
- Stairs

Controls

Opportunities for improvement include:

- Provide task lighting
- Reduce glare
- Missing or burned out light bulbs are indications of poor maintenance

Provide switches for stair lighting at each access to stairs so that lights can be turned on to reduce the risk of an employee climbing or descending a dark stair.