

Over the Edge

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PREVENTING INJURIES FROM SLIPS, TRIPS & FALLS

Each year, over one million people suffer a slip, trip or falling injury, and over 17,000 Americans die as a result. The average direct cost for one disabling injury now approaches \$28,000. Conservative estimates of indirect costs are significantly higher at \$50,000. Add to these the personal and family costs and trauma, and it is evident that slips, trips and falls should be avoided.



OSHA has reported that the back was the most frequently injured part of the body in falls: Nearly half of all slip-fall injuries occur from same-level falls. Most injuries are sprains and strains:

Types of Falls. Falls are of two basic types: elevated falls and same-level falls. Same-level falls are most frequent, but elevated falls are more severe.

- Same-Level Falls: high frequency--low severity
- Elevated Falls: lower frequency--high severity

Same-level falls are generally slips or trips. Injury results when the individual hits a walking or working surface or strikes some other object during the fall. Over 60 percent of elevated falls are from less than 10 feet.

Slips are primarily caused by a slippery surface and compounded by wearing the wrong footwear. In normal walking, two types of slips occur. The first of these occurs as the heel of the forward foot contacts the walking surface. Then, the front foot slips forward, and the person falls backward.

The second type of fall occurs when the rear foot slips backward. The force to move forward is on the sole of the rear foot. As the rear heel is lifted and the force moves forward to the front of the sole, the foot slips back and the person falls.

Coefficient of Friction. The force that allows you to walk without slipping is commonly referred to as "traction." Common experience shows that dry concrete sidewalks have good traction, while icy surfaces or freshly waxed floors can have low traction. Technically, traction is measured as the "coefficient of friction." A higher coefficient of friction means more friction, and therefore more traction. The coefficient of friction depends on two things: the quality of both the walking surface and the soles of your shoes.

To prevent slips and falls, a high coefficient of friction (COF) between the shoe and walking surface is needed. On icy, wet, and oily surfaces, the COF can be as low as 0.10 with shoes that are not slip resistant. A COF of 0.40 to 0.50 or more is needed for excellent traction. To put these figures in perspective, a brushed concrete surface and a rubber heel will often show a COF greater than 1.0. Leather soles on a wet smooth surface, such as ceramic tile or ice, may have a COF as low as 0.10.



Providing dry walking and working surfaces and slip-resistant footwear is the answer to slips and their resultant falls and injuries. Obviously, high heels, with minimal heel-to-surface contact, taps on heels, and shoes with leather or other hard, smooth-surfaced soles lead to slips, falls, and injuries. Shoes with rubber-created, soft soles and heels provide a high COF and are recommended.

Trip and Fall Trips occur when the front foot strikes an object and is suddenly stopped. The upper body is then thrown forward, and a fall occurs.



As little as a 3/8" rise in a walkway can cause a person to "stub" his toe resulting in a trip and fall. The same thing can happen going up a flight of stairs: only a slight difference in the height of subsequent steps and a person can trip and fall.

Step and Fall. Another type of working and walking surface fall is the "step and fall." This occurs when the front foot lands on a surface lower than expected, such as when unexpectedly stepping off a curb in the dark. In this type of fall, the person normally falls forward. A second type of step and fall occurs when one steps forward or down, and either the inside or outside of the foot lands on an object higher than the other side. The ankle turns, and one tends to fall forward and sideways.

Prevention of Step and Fall Injuries

- Proper housekeeping in work and walking areas can contribute to safety and the prevention of falls. Not only is it important to maintain a safe working environment and walking surface, these areas must also be kept free of obstacles which can cause slips and trips. Working and walking areas should never be obstructed by objects of any kind.
- Adequate lighting to ensure proper vision is also important in the prevention of slips and falls. Moving from light to dark areas, or vice versa, can cause temporary vision problems that might be just enough to cause a person to slip on an oil spill or trip over a misplaced object.
 - Carrying an oversized object can also obstruct one's vision and result in a slip or a trip. This is a particularly serious problem on stairs.

Behaviors that Lead to Falls. In addition to wearing the wrong footwear, there are specific behaviors which can lead to slips, trips, and falls.

- Walking too fast or running can cause major problems. In normal walking, the most force is exerted when the heel strikes the ground, but in fast walking or running, one lands harder on the heel of the front foot and pushes harder off the sole of the rear foot; thus, a greater COF is required to prevent slips and falls. Rapid changes in direction create a similar problem.



- Other problems that can lead to slips, trips and falls are: distractions; not watching where one is going; carrying materials which obstruct view; wearing sunglasses in low-light areas; and failure to use handrails. These and other behaviors, caused by lack of knowledge, impatience, or bad habits, can lead to falls, injuries, or even death.

Elevated Falls. Generally, elevated falls are less frequent but more severe than same-level falls in the workplace.

Falls from Ladders. Ladders may be fixed or portable. They may be straight- extension- or step-ladders and may be manufactured from wood, metal, plastic, or fiberglass. They can be light-, medium-, heavy-, or extra-heavy-duty. Ladders can be two feet high (step-stools), 18 feet for extra-heavy-duty step-ladders, and 40 feet or longer for extension-type ladders.

- A ladder should be long enough so that when it rests against the upper support the user can work with the waist no higher than the top rung of the ladder. This means that the top three rungs of a straight ladder, or the top two steps of a step-ladder, should never be used for the feet.
- The lower ends of the side-rails should be equipped with slip-resistant pads, particularly if the ladder is to be used on hard surfaces. The same is true for the upper ends of the side-rails if they are to rest against a surface.
- Ladders should be set at, or as near, a 4:1 angle as possible. That is, for each three or four feet of rise from the base to the upper resting edge of the ladder, the base should be one foot out from a vertical line from the upper resting edge of the ladder to the working surface. As an example, if a ladder is leaning against a ledge that 20 feet off the ground, the base of the ladder should be five feet back from the wall. The base of the ladder must be firmly set so that there is no possibility of slippage or settling into soft ground. The resting edge of the ladder should have both side-rails in contact with the object (building or tree) it is against. Tying the top of the ladder to the supporting structure can also keep the ladder from slipping or sliding.
- Ladders should be inspected before use: check for cracks, loose rungs, splinters, and sharp edges. Never paint ladders, as the paint can hide potentially dangerous conditions.
- The rungs and side-rails of ladders must be kept free of oil, grease, and mud; they should be kept dry.
- Always face the ladder when climbing or descending.
- When working on a ladder, the person's belt buckle should never extend beyond the side-rails. Reaching further can cause the ladder to slide in the opposite direction. Tying the ladder to the structure supporting it can prevent this and is a recommended practice.
- Workers should have both hands free to hold the ladder's side-rails, not the rungs, when climbing or descending. Small tools may be carried in a tool belt, not in the hands; but a better choice is to raise tools and supplies with a rope.

- Make-shift ladders, chairs, boxes, and barrels should never be used as substitutes for a ladder -- the risk is far too great.

Falls from Vehicles and Equipment. Far too many injuries occur in the simple process of getting in and out of vehicles, including school buses. Keep the steps clean and dry.

- Whenever mounting or climbing on a vehicle or school bus, have a good hand-hold before stepping up. Pulling yourself up reduces the force between your shoe and the step and reduces the danger of a slip. As with a ladder, the foot should be placed on the step or rung just in front of your heel, under the arch.
- Always face the vehicle or equipment when mounting and dismounting. When stepping down backward, one steps down on the ball of the foot; when stepping down forward, one lands on the heel, thus increasing the chances of falling, twisting an ankle or knee or suffering some other injury.
- Practice the "Three-Point System." This system can significantly reduce the chances of injuring yourself through a slip or fall while climbing ladders or while entering or exiting a vehicle. The Three-Point System means that three of your four limbs are in contact with the ladder or vehicle at all times, either one hand and two feet, or two hands and one foot -- only one limb is in motion at any one time.
- One more tip that will save you from many sprains or worse: When getting off the bed of a truck or wagon or any similar level: Step down, never "jump" or "fall" down forward.



Learn How to Fall. Naturally, the goal is not to slip, trip and fall; however, the possibility of a fall still exists. There are correct ways to fall, however, the recommended procedures are:

- Tuck your chin in, turn your head, and throw an arm up. It is better to land on your arm than on your head.
- While falling, twist or roll your body to the side. It is better to land on your buttocks/side than on your back.
- Keep your wrists, elbows and knees bent. Do not try to break the fall with your hands or elbows. When falling, the objective is to have as many square inches of your body contact the surface as possible, thus, spreading out the impact of the fall.

Prevent Injuries – Practice Good Techniques

- Keep walkways and stairs clear of scrap and debris; coil extension cords, lines and hoses when not in use.
- Wipe up spills immediately; wear appropriate waterproof, non-slip footwear.
- Ensure all wet surfaces are covered with non-slip materials; cover floor openings.
- When working in icy conditions, wear lug soles; clear parking lots, stairs and walkways.



Slips, trips and falls - whether on or off the job - are expensive, disruptive, painful, and may be tragic. There are a number of things that we can reasonably do to reduce the chances of slips, trips and the losses associated with the resulting falls. Get informed and make a difference.