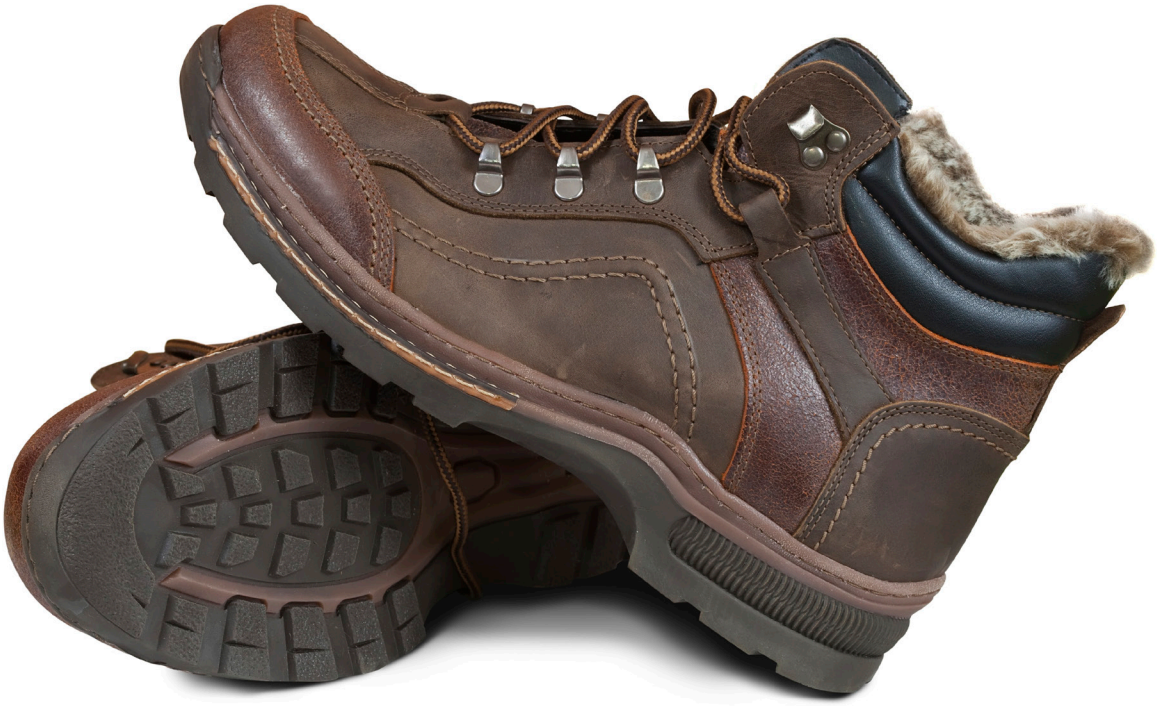

Friction & Footwear

Have you experienced a moment when your foot slips when casually walking on a sidewalk, across a parking lot, or through an entryway? How you react to this small loss of traction can mean the difference between staying upright and becoming the victim of a slip and fall accident.

The walking process utilizes both kinetic and potential energy. For this process to occur smoothly, you need friction between your foot and the walking surface, and you need that friction to propel you forward in a specific direction. As the amount of friction decreases, your stride is typically reduced. This reduction in stride is created to help maintain your balance and keep your feet under your body — reducing the chance of a slip or fall.

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What is a Coefficient of Friction?

Both footwear and walking surfaces offer frictional resistance. The coefficient of friction (COF) is a number that represents the relationship of these two surfaces — the force applied between the two surfaces vertically (pressing force) and laterally (frictional force).

The COF is important to the process of walking because:

- A higher COF means more friction and therefore more traction.
- A lower COF means less traction and a slippery surface.

So a high COF is good, right? Not always. We've all experienced a time wearing footwear with strong frictional properties (like tennis shoes) on a surface of great frictional properties (like carpet or rubber matting). Mostly likely, your shoe doesn't slip on this type of surface and your foot abruptly stops, causing you to stumble and quicken your step to regain your balance.

The goal is to have the right amount of friction between the shoe and walking surface.

- On icy, wet and oily surfaces, the coefficient of friction can be as low as 0.1μ with shoes that don't have slip-resistant soles.
- Rubber-soled shoes on a brushed concrete surface can generate a coefficient of friction over 1.0μ.
- In general, a coefficient of friction of 0.4μ to 0.5μ is considered a good traction offering.

There are no national standards or requirements for the coefficient of friction for walking surfaces, though local municipalities may carry specific requirements through building codes. The American Disabilities Act (ADA) recommends a COF of 0.6μ or greater on flat surfaces and 0.8μ on ramps.

How Do You Choose the Right Shoe for the Job?

Wearing the right shoe will go a long way in preventing a potential slip and fall.

- The outsole of the shoe is the area in contact with the walking surface. If the sole's properties and walking surface have a high enough coefficient of friction, good traction will be achieved between the two.
- Flat leather or plastic-soled shoes offer minimal slip resistance between the shoe and the walking surface; therefore, both would be poor choices in snow or ice.
- Soles carry both oily and slip-resistant properties, which are important, especially if you encounter walking surfaces that may contain oils, greases or liquids.
- Some soles have flat surfaces, while others offer a tread design that can improve the traction between the walking surface and the sole, especially if the surface may be slippery.
- The depth and spread of the treads are important, since closely-patterned treads or treads with minimal depth will not allow liquids to be dispersed from the tread pattern and may create a hydroplaning effect between the sole and the walking surface.
- It's important to periodically inspect shoe tread for wear and replace shoes when significant wear is noted.

Are There Recommendations for Shoe Tread Patterns?

While there are no specific recommendations for a specific tread pattern, the Shoe and Allied Trade Research Associate (SATRA) Technology Centre, Ltd., has produced guidelines for slip-resistant sole design:

- Should have a raised tread pattern on the heel and sole with a leading edge in many different directions (crosshatch or similar design).
- Cleat width should be between 3 and 20 mm.
- Channel width should be at least 2 mm.
- Tread pattern should extend over the whole sole and heel area.
- Sole should have a flat, flexible bottom construction — consider a low density midsole that conforms to the ground and maximizes contact area.
- A square heel breast, which acts as leading edge, is recommended over a rounded edge.

Studies have shown that greater heel height has been associated with a greater risk of fall; therefore, high heel shoes are not recommended for walking in snow and ice.

How Do Flooring Materials Impact Friction?

The type of surface one must cross, as well as its coefficient of friction, greatly influences the possibility of slips and falls. Ultimately, the type of floor surface will determine the coefficient of friction between footwear and walking surface. Also keep in mind:

- Surfaces should be kept clean and dry, as they will offer better slip-resistant properties than floor surfaces covered in liquid.
- Adding liquid (water, oil, grease, etc.) will impact the coefficient of friction and lower its number.
- Floors should be inspected routinely. Surfaces that have become worn should be replaced or resurfaced, especially if they are in a pedestrian traffic area.
- Consider designated monitors in areas where floors may become wet with snow or water from outdoors so appropriate signage can be placed and floors can be cleaned and dried in a timely fashion.
- Floors requiring specific maintenance, such as ceramic tile, terrazzo, and marble should be regularly cleaned and conditioned to keep them in the good condition. Proper care and maintenance of floor surfaces will ensure proper frictional properties and safe passage by your employees.

What Actions Can Employers Take to Reduce Slip and Fall Accidents?

Recognizing that footwear and floor surfaces play a key role in slip and fall accidents, employers should develop specific plans and expectations for those who travel within their facilities or on their grounds. This starts with a good maintenance program of both internal and external walking surfaces:

- Parking lots, sidewalks and entryways should be kept free of snow and ice.
- Floor surfaces within the building should be cleaned and conditioned per manufacturer recommendations.
- Routine inspections of floor surfaces should occur to identify those that need resurfacing or replacing.
- Expect employees to wear appropriate footwear, especially during inclement weather involving snow, ice or heavy rain.
  - Employees should wear appropriate boots or footwear that provides adequate slip resistance on snow, ice or wet surfaces until they enter the building. They can then change into footwear that provides them comfort and safety while working within the facility.
  - The reverse should occur when leaving the building.
- Employees subjected to slip/fall exposures within a facility should be expected to wear appropriate footwear. Employers should identify the footwear that should be worn when working and communicate these expectations.

By keeping these tips in mind and taking action every day, you will help prevent slip and fall accidents in your workplace.