

Risk*topics*

Floor Surfaces and Design

Introduction

In public places, slips and falls occur more frequently than any other type of accident. Along with the alarming frequency of these accidents, slips and falls can result in severe injuries especially to the head and back. The problem is even more serious when the clientele includes elderly people. According to the National Safety Council's "Accident Facts," falls account for about 12,000 deaths annually and are the second leading cause of accidental deaths.

A floor surface characteristic is the single most important factor contributing to slips and falls. By analyzing the effects of surface composition and by proper selection of floor surfaces for specific conditions, one can reduce the potential for these serious accidents.

Coefficient of Friction

This is a ratio of sliding force required to move one surface over another to the total vertical force applied to the two surfaces in contact. In simple terms, it is an indicator of "grab" or friction present between the two surfaces in contact. Higher Coefficient of Friction is desirable as it reduces the possibilities of slipping. Americans with Disabilities Act (ADA) recommends a minimum value of 0.5 for all level walking surfaces. Coefficient of Friction is going to vary con-

siderably for different types of floors, and it is affected by the type of shoe materials (leather, rubber, barefoot) and also the environmental conditions (wetness, oil, spills and other contaminants). Coefficient of Friction helps in quantifying a floor's slip resistance and should be used in floor design specifications.

Surface Composition

Depending upon the location and use, a wide variety of floor surfaces can be selected. Some of the factors that affect the selection include:

- Durability
- Appearance
- Maintenance
- Exterior/interior use
- Traffic patterns
- Heavy loads
- Effect of foreign substances

Masonry floors like cement and quarry tiles are commonly found at the entrances of building lobbies and provide adequate level of surface friction even when wet. Decorative surfaces like marbles, terrazzo, and ceramic tiles are used in a number of interior applications. Base floors of some of the high traffic

Risk Engineering

Where standard solutions are the exception



interior areas may be covered by carpeting, linoleum, rubber, and vinyl tiles. Runners, mats and grates are used at the entrances to the building to reduce water tracking into the building in bad weather conditions. Grates do cause problems for wearers of high-heeled shoes.

Some floor surfaces are inherently slippery, and the presence of foreign substances like food spills, grease, oil, or water makes it even worse. Special attention is required for susceptible areas like entrances, restrooms, loading docks, and restaurants. Water on polished marble floors in bathrooms and tiled surfaces in swimming pools presents a very serious slip problem. Use of suntan lotions and oils results in an oily film being deposited on the floors around the lounging areas, and this can create slippery conditions.

Floor Treatments

In some occupational cases, the use of slip resistant footwear provides a limited solution. There is no substitute for careful selection of floor surface that will provide adequate traction under almost all use conditions. Floor treatments, including slip resistant coatings, do help in improving the Coefficient of Friction. A number of wax base products, synthetic resins, and paint coatings are commercially available for this purpose. It is best to consult floor-covering suppliers to determine the most suitable treatment. It is also suggested that a comparative testing based on Coefficient of Friction values should be used for evaluation and purchase specifications. Snow removal and salting are special cases of surface treatment to improve the friction of exterior walking surfaces.

Maintenance

Pot holes in parking lots, broken tiles, torn carpets, and damaged rain mats are some important maintenance issues. Periodic inspection, housekeeping, and

prompt repairs of damaged floor conditions can certainly help reduce slip and fall accidents. These maintenance activities, including mopping and installation of floor treatment, should be completed promptly. It is important to assure safety while the repairs are in progress by restricting access to the work area. Upon completion of work, all the tools and debris should be removed to reduce potential tripping hazards. A scheduled inspection program can help in identifying these critical maintenance issues.

Design Considerations

In addition to the selection of suitable floor surface and prompt maintenance, there are other design considerations. Although the Coefficient of Friction on each section of floor surface is important, sudden and unexpected changes in surface characteristics and Coefficient of Friction are even more important. A sudden and unexpected encountering of a high friction surface from a low friction surface is likely to result in a stumble forward. Conversely, an unexpected encountering of a low friction surface from a high friction surface in the travel pathway may result in a backward fall. Major changes in levels are easy to notice, but subtle minor changes can be overlooked until a fall occurs. Level changes should be highlighted by appropriate striping or color contrasts. If a ramp is needed, high friction surfaces should be specified, and handrails should be provided for slopes greater than 1 to 10.

Good visibility is an important part of good design for prevention of slip and fall accidents. More than just proper illumination, it addresses visibility of changes in surface composition and levels and any obstructions within the travel path.

Summary

Slips and falls appear to be simple trivial accidents that occur frequently, but they result in thousands of deaths and cost billions of dollars in direct and indirect costs to the business. Preventing and reducing slip and fall accidents requires a systematic approach.

References

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