

Preventing Slips and Falls - Floor Cleaning and Maintenance



Tribology, the study of the interaction between sliding surfaces, is derived from the Greek “tribos,” meaning rubbing. The field of tribology includes the analysis of friction, lubrication, and wear, and the application of these principles to mechanical design, manufacturing processes, and machine operation.

In slips and falls, tribology helps describe causes and support preventative strategies associated with *friction* between the shoe sole and the floor surface; *lubrication* at the interface or contaminate on the floor surface, such as water, grease, oil, or particulate soil; and *wear* of floor surface and shoe sole material over time.

Dirty floors are a common cause of slips and falls and a good illustration of tribology. This reference note will describe effects of contaminants on floor slipperiness, types of cleaners for breaking up and removing contaminants, and written floor cleaning protocols as part of an overall housekeeping program.

Effects of Contaminants

Contaminants may accumulate on floor surfaces due to inadequate cleaning processes, resulting in the reduction of surface roughness as soil, grease, or other contaminants fill in the pores or valleys in the floor surface. The accumulation of contaminants alters these surface features and, consequently, reduces the uncontaminated floor’s original friction characteristics. It is, therefore, very important to keep floors clean in order to maintain these desirable features of the walking surface.

Keeping floors clean maintains desirable walking surface features and, therefore, improves slip-resistance. A floor cleaning protocol must consider the floor type, the contaminants involved, and a cleaning solvent most suitable for both.

Types of Cleaners

Major categories of cleaners include alkaline, acidic, and neutral pH. Most chemicals used to clean floors are intended to act upon contaminants chemically and emulsify or break down the contaminant so it can be removed easily by rinsing. Surfactants and water conditioning additives are common.

Alkaline Cleaners

Alkaline cleaners react with fats and oils, converting them into soap (saponification), and must be thoroughly rinsed with clean, hot water to prevent polymerization. Alkaline cleaners are used to remove grease and can remove sealers, finishes, and waxes.

Alkaline cleaners are often used on restaurant kitchen and dining area tile floors. In restaurant kitchens, animal and vegetable fats (fatty acids and triglycerides) used in cooking oils hydrolyze and fall to the floor as a “grease” contamination. Grease, in the presence of wa-



ter, can produce a very slippery floor. Over time, triglyceride molecules can unite to form a long chain polymer (called polymerization) and form a hard grease film on floors, resistant to most detergents.

Cleaning a restaurant kitchen floor with a mop and pail with hot water and detergent only partially cleans the floor. A restaurant kitchen floor is only clean when the polymerized grease film is also removed which means a suitable amount of detergent applied to the floor in 160-degree water with a dwell time period followed by a vigorous deck brushing. Greasy residue must be picked up using a squeegee or wet vacuum or rinsed away using hot clean water. A hose rinse is best assuming good drainage is available.

Acidic Cleaners

Acidic cleaners use a process known as oxide reduction to remove rust, scale, and oxides from floors. Commonly used for cleaning porcelain, ceramic tiles, and grout, but, if too strong, can etch the floor surface.

Neutral Cleaners

Neutral cleaners are typically used on floors with glossy finishes or those that can be dulled by the abrasive qualities of acidic or alkaline cleaners. Examples include retail stores and malls, offices, airports, or any establishment with resilient flooring, terrazzo, marble, and granite floors.

Microbial Cleaners

Microbial cleaners are also becoming popular. These cleaners use a non-pathogenic form of Bacillus bacteria that can consume and digest oil, fat, grease and petroleum hydrocarbons. Microbial cleaners are multi-purpose cleaners and have been used to clear drains and clean concrete floors, tiles, and grout areas.

The wrong soap or detergent, or incorrect application can add to the slipperiness of floors. Some commercial cleaners may also leave a residue on the floor. Floors should be rinsed only with clear water to avoid leaving residue on

floors after drying. The following agencies can be contacted for more information:

The Soap and Detergent Association

1500 K Street, NW
Suite 300
Washington, DC 20005
Tel: 202-347-2900
Fax: 202-347-4110
www.sdahq.org

International Sanitary Supply Association

7373 North Lincoln Ave.
Lincolnwood, IL 60646
Phone: (800) 225-4772
Phone: (847) 982-0800
Fax: (847) 982-1012
www.issa.com

Housekeeping Programs

A good housekeeping program should include written instructions regarding floor maintenance. Basic elements of an effective program should include the following:

- Identification of the specific contaminants and selection of a cleaner/chemical that effectively breaks each down.
- Establishment of a floor cleaning protocol for the removal of contaminants.
- Provision of appropriate tools to clean the floor (e.g., mops, buckets, deck brushes, and squeegees). Designation of dedicated tools for specific areas is necessary in order to avoid cross-contamination (e.g., mops used in areas with grease should not be used in non-greasy areas).
- Implementation of a floor-cleaning schedule that is consistently followed, including the identification of responsible employees and the time of day during which cleaning should take place.
- Establishment of a training program for persons responsible for inspection, maintenance, and cleaning. This includes definition of cleaning requirements, cleaning procedures,

safe handling and disposal of chemicals and solutions, emergency conditions and operations, and record keeping or reporting related to housekeeping and maintenance.

- Routine inspection of all floor surfaces for wear, damage, debris, and contaminants. Clear communication of any needed repairs to the facilities or maintenance department is critical.
- Occasional testing of floor surfaces to monitor slip resistance levels and determine effectiveness of the floor cleaning protocol.

Other Considerations

In addition, the housekeeping safety program should address the following procedural questions:

- How are potential hazards identified and reported to appropriate supervision?
- Are “sweep logs” maintained?
- Are routine inspections performed, including unannounced inspections? Are results recorded?
- Are first-line supervisors held accountable for hazards in their departments?
- Are warnings or signage provided whenever a slip and fall hazard has been identified and is it left in place until appropriate action taken? Warning signs should use symbols that follow ANSI Z535.3 1991 Criteria for Safety Symbols.
- Are enough trash containers provided and are they located close to points of generation of waste?

In summary, identification of slip and fall causes can become complex, but fall prevention begins with the selection and maintenance of flooring. Development and adherence to formal floor cleaning protocols and housekeeping programs are an important element of removing contaminants and improving the slip-resistance of floors.

References

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Courtney, T.K., Grönqvist, R., Redfern, M.S., Taylor and Francis, 2003.

English, W., *Pedestrian Slip Resistance; How to Measure It and How to Improve It*, 2nd Edition, William English, Inc., 2003.

Di Pilla, S., *Slip and Fall Prevention: A Practical Handbook*, Lewis Publishers, CRC Press, 2003.

Chang, W. R. (2004) Preferred surface microscopic geometric features on floors as potential interventions for slip and fall accidents, *Journal of Safety Research*, 35 (1), 71-79.

Filiaggi, A. J., Courtney, T.K., Restaurant hazards’ practice-based approaches to disabling occupational injuries, *Professional Safety*, May 2003, pp. 11-23.

General Floor Cleaning Procedures

Floor cleaning procedures may vary by the type of product; therefore, check the manufacturer’s guidelines or protocol for the product used. Recommendations for removing grease include:

1. Use the proper amount of cleaning product with hot, softened tap water;
2. Apply cleaning product evenly on floor surface with a clean mop;
3. Temporarily block any floor drains to permit chemical sufficient time to penetrate built-up contaminants;
4. Allow sufficient time for the cleaning product to loosen contaminants on the floor – usually 5 to 10 minutes;
5. Scrub the floor briskly using a deck brush;
6. Open floor drains, wet vacuum or squeegee before rinsing;
7. Rinse floor with clear hot, softened tap water to avoid leaving a residue on floors after drying.

Notes

The illustrations, instructions and principles contained in the material are general in scope and, to the best of our knowledge, current at the time of publication. No attempt has been made to interpret any referenced codes, standards or regulations. Please refer to the appropriate code-, standard-, or regulation-making authority for interpretation or clarification. Provided that you always reproduce our copyright notice and any other notice of rights, disclaimers, and limitations, and provided that no copy in whole or in part is transferred, sold, lent, or leased to any third party, you may make and distribute copies of this publication for your internal use.