

Preventing Slips and Falls—Selecting the Right Matting System

Tribology is the study of the interaction of sliding surfaces. In slips and falls, tribology is 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 or oil, particulate soil etc.; and *wear* of floor surface and shoe sole material over time. All three are important when assessing potential for slips and falls and all three are important when selecting interventions to prevent slips and falls.



Mats are more than a place to wipe your shoes when entering a building or to stand on when performing manual work tasks. Mats, when selected and installed correctly, can reduce likelihood of slips and falls and reduce lower extremity and back discomfort. This reference note will offer some simple guidelines on selecting and installing the right matting system for the right purpose.

When Do I Need a Mat?

Mats might be warranted when a pedestrian walking- or working-surface does not meet slip resistance requirements, such as when moisture, grease, oil, dirt or other contaminants are present. Examples of mat placement areas include building entrances, grocery produce areas, areas around salad bars, water fountains, sinks, restaurant kitchens, machinery process areas, around food

counters, and anyplace where spills, water, dirt, grease, etc., is part of the environment. Some mats also have anti-fatigue properties that might be useful for areas where employees stand in one place for long period of time.

There are two types of matting systems; entrance mats or “front of the house” mats, and multi-purpose mats or “back of the house” mats. Whether “front of the house” or “back of the house”, a strategy needs to be employed to select the right mat for the right environment. Little thought is too often given to matting systems. It is easy to subcontract to a vendor selection, cleaning, and replacement of loose-lay mats (see below) used at entrances and back of the house. Mats that are dirty, worn, and old offer little slip prevention benefits.

Entrance Mats

Entrance matting improves overall floor maintenance by scraping and absorbing soil particles and moisture from footwear to keep the floor in a clean dry condition. Can an entrance mat system improve the “tribology” of a floor? Yes, because mats remove moisture and particulate soil from the shoe sole and heel, thereby reducing likelihood of slips and protecting the floor finish from unnecessary wear.

There are four types of entrance mats:

1. **Well and grate system:** requires a structural commitment. This system funnels and drains moisture down and away from floors, and is a permanent fixture at entrances.
2. **Glue-down:** installed at any time. Floor surface can be damaged by the adhesive. Some types require a metal strip and rubber reducer that is screwed into the floor as the finish edge. Replacement is time consuming.
3. **Recessed:** permanent mats inserted into a well or recessed surface and becomes the finished floor. The finished height of the mat should be at least flush with the lip of the well and not represent a trip hazard.
4. **Loose-lay:** loose-lay matting should stay in place without use of adhesives, frames, screws, or duct tape. Be aware of the type of backing. Guard against damage to underlying floor surface by harboring mold and mildew. Air should circulate through the mat.

Recessed and loose-lay entrance mats are the most common. Surface selection depends on expected foot traffic and whether the mat is used in winter or wet climates. The primary purpose of the mat is to remove moisture and soil from the

shoe. If an inferior mat is selected, it will wear quickly and not absorb the moisture it should. The more durable mats cost more but they usually last longer and will do the job better.

Depth of the mat is also important. The number of steps required to effectively scrape and wipe feet depends on climate. As climate improves, the demands on floor matting becomes less intense. In snow strategies, a minimum of 10-12 walking steps is a good guide to the depth of floor mat needed. Rain strategies can gauge about 8-10 steps and dry strategies require about 6-8 steps.

Mat size depends on expected foot traffic, moisture and debris. For example, a store that has 1,000 customers a day in a snow strategy needs a larger mat than the same store in a dry strategy. Either way, a rule of safe practice is that footprints or water prints should not be seen beyond the last mat of an entrance.

Multi-Purpose Mats

Back of the house mats are multi-purpose mats that can absorb liquids, elevate workers above standing water, provide a slip resistant working or standing surface, and/or provide anti-fatigue properties.

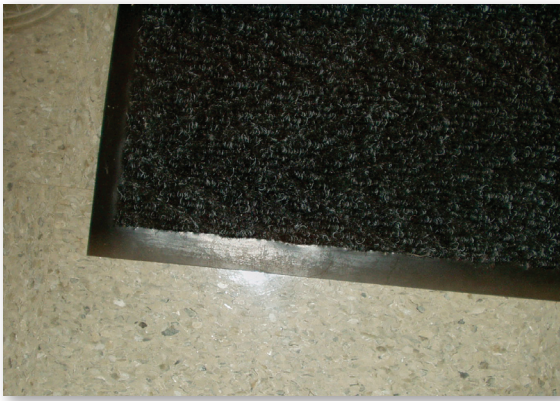
Absorbing or retaining spills is common for mats used in grocery produce areas, around water fountains and sinks etc. When selecting mats for this purpose consider liquid absorption characteristics, containment of spills and debris, and mat durability, such as grocery cart traffic and foot traffic.



Loose-lay Mat



Recessed Mat



Loose-lay Mat with Beveled Edge

Mats with slip-resistant surfaces are useful in standing work areas where grease and oil are common, as in restaurant kitchens, certain manufacturing areas, and food process areas. These mats have durable slip-resistant surfaces and are easy to clean.

Anti-Fatigue Mats

Anti-fatigue mats are common at work areas where prolonged standing work is performed, such as retail cashiers, machine operators, packing workers, and others. Standing for long periods of time has been implicated in a number of health issues including lower extremity discomfort, pain, and fatigue and low back discomfort. Research has shown discomfort may be due to venous pooling rather than muscle fatigue. Subject ratings of perceived fatigue from various flooring and mat materials are shown to be more helpful than quantitative measures when evaluating physical benefit of anti-fatigue mats among alternatives.

Research has also shown that a material which is too soft can be associated with increased lower extremity fatigue and discomfort; while harder or stiffer surfaces were most often associated with low back discomfort. No study has yet recommended a specific material for anti-fatigue matting. When selecting anti-fatigue matting, experiment with different types and be sure to involve the worker in the final selection.

In summary, use the following guidelines when selecting mats:

- Select a mat design and surface material based on expected environment and traffic load.
- Select mats whose edges will not curl by design. These mats often have a beveled edge or a flat edge to reduce tripping exposure.
- Select mats with non-slip backing that resists movement.
- Select mats that guard against damage to underlying floor surface caused by mold or mildew.
- Routinely inspect mats for damage and excess wear, and replace as necessary.
- Store mats or runners to prevent edges from curling.
- Do not place mats or runners against objects that don't allow the mat to lie flat (e.g. machinery and process areas, doors, and furniture).
- When selecting anti-fatigue mats involve workers and offer options.

References:

ANSI/ASSE A1264.2-2001 *Standard for the Provision of Slip Resistance on Walking Surfaces.*

Wolf, D., Keep It Clean By Being Up Front, *Professional Retail Store Maintenance*, September 1998.

Kim, J.Y., Stuart-Buttle, C., and Marras, W.S., The Effects of Mats on Back and Leg Fatigue, *Applied Ergonomics*, 25, (1) pp. 29-34 (1994).

Redfern, M.S., Influence of Flooring on Standing Fatigue, *Human Factors*, 37(3), pp. 570-581 (1995).

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.