

Risk Topics

Slip resistant floor treatment for existing floors

Increasing the slip-resistance of flooring will help minimize the potential for a slip and fall incident. There are several methods to enhance slip resistance of flooring, however the effectiveness will depend on several factors.

Introduction

Many factors can contribute to a slip and fall, but floor surface is the single most important. If an existing floor surface is relatively slippery, then the ideal remedy is to replace it with one that has adequate slip resistant properties. However, this may not always be possible for a variety of reasons, and other remedies may have to be considered. A multitude of slip resistant floor coatings and treatments are commercially available that can help in reducing slip and fall exposures with existing, inherently slippery floor surfaces.

Discussion

Slip resistant floor treatment can be a remedial treatment applied to an existing floor surface to reduce slip and fall exposure. They are designed to improve the coefficient of friction (COF). Depending on the type of floor surface, a large selection of floor treatment products is available for hard or resilient surfaces. To ensure desired results, consider different characteristics and benefits in selecting a floor treatment. Because they only treat the surface, they are subject to wear and require periodic dressing (maintenance) and eventual reapplication to maintain the desired level of slip resistance.

Considerations should be taken when selecting a floor treatment, including:

- The type of flooring to be treated (e.g. ceramic tile, polished marble, vinyl, concrete, etc.)
- The amount of area to be treated (localized area or large walkways, etc.)
- Type of operation and precautions needed such as food processing, etc.
- Appearance expected to be maintained such as polished marble in an office lobby or a shine placed on hospital hallways & lobbies to give a super clean appearance
- Maintenance cost and durability

Research is necessary for selection of an appropriate floor treatment suitable for a specific application. Besides the initial and maintenance costs and durability, factors such as substrate conditions, pedestrian and forklift traffic, environmental conditions, compatibility and resistance to spills of chemicals, oils, foods and soapy water are some additional details to consider. Some surfaces, such as polished marble and granite, may be damaged easily if adequate care is not taken in selection of a floor treatment suitable for these surfaces. It may also be important to consider regulatory implications. For example, the Americans with Disabilities Act (ADA) requires floor surfaces to be stable, firm, and slip resistant. In addition, any cleaning treatment chemicals and coatings used in food processing plants must be approved by the U.S. Department of Agriculture. Some electronic assembly areas require anti-static specifications.

Options to be considered

Coatings

Coatings can be used for inside as well as outside walking surfaces and include urethane polymers, epoxy, acrylic, and vinyl ester resins. These coatings adhere to the existing substrate or floor surface and provide a higher COF than the existing surface. These coatings can be applied by brush or by spray gun. The light-duty types are suitable for wood surfaces, while the heavy-duty types provide a non-slippery coating over wood, metal, or concrete. They may also contain rubber or plastic particles (micro-beads) to give a textured surface, which is recommended for factories, offices, corridors, and service rooms.

Polymer-based coatings have plastic micro-beads embedded in them. Upon drying, these coatings give a slight texture to the surface from the embedded micro-beads and improve traction of the walking/working surface. Water based floor coatings contain no volatile organic solvents. These are non-flammable and are environmentally safer. Usually an aggregate, such as aluminum oxide is included in the base material. Heavy aggregates give these coatings a high-profile finish that is ideal for walking surfaces subject to oil and grease spills/accumulations. These coatings may be applied by brush, roller, spray, or trowel and will generally retain nonskid properties in wet or oily conditions. They are also good for do-it-yourself application. Since the water-based coatings contain no organic solvents, they may be used when limited ventilation or explosion hazard exists.

Slip resistant abrasive coatings (such as adding sand in paints) are applied over wood, metal, or concrete. The abrasive floor coatings give better traction under foot even when wet. The abrasive grains may be mixed with an adhesive such as epoxy resin and sprinkled on top of a thin adhesive coating. They also work well outdoors as well as indoors on dry, wet, or oily floors, stairs, ramps, and platforms. The abrasive grains wear off over time, and regular maintenance is required to retain adequate traction. Incorrect selection and application of paints for curbs, ramps and steps on a stair can actually result in slippery surfaces, increasing the risk of slips and falls.

Spray coatings often will consist of an epoxy aerosol spray that creates a slip resistant coating to reduce slickness on surfaces. These sprays provide a textured surface quickly and are great for localized applications (small areas). The product can be applied inside or outside on metal, concrete, ceramic, vinyl and wood surfaces. Some solutions will maintain the original surface appearance however a texture will be present.

Floor coatings are available in various colors. Besides the typically-used orange and traffic yellows for ramps, curb markings, and walkways, some coatings are also available in luminescent formulas that glow in the dark and enhance visibility of steps or other walking surfaces. Also available are products such as sand and slip resistant granules that are scattered to increase traction, primarily for emergency use when oil, snow or other conditions make floors slippery.

Etching

Chemical etching of floor surfaces is a treatment process that uses mild acids to make microscopic grooves or tread patterns. The solution is applied, and a water rinse is used to stop the etching process. The degree of slip resistance depends on the strength of the acid solution applied to the surface and the length of time it is applied. Due to the nature of this application, it is recommended the treatment be applied by a trained professional.

Acid-based slip resistant treatments can be made on a variety of floor surfaces including ceramic/porcelain tile, travertine, quarry, marble, granite and terrazzo tile. The treatment is popular on smooth, hard walkway surfaces where a coating is not practical. The stronger the solution, the higher the slip resistance; however, it will yield a less glossy appearance.

Surface Grooving and Scoring

A common method to add slip resistance to outdoor walking surfaces is through grooving and/or scoring. Shallow grooves are physically made in the material such as concrete, asphalt, slate and other hard mineral flooring. The application is typically performed by a professional who will use a tool (e.g. diamond tools, shot-blasting, floor grinders) and physically create grooves to increase floor traction. The depths, widths and appearance of the grooving is controlled through the tool settings. This is a common process around swimming pools and aquatic environments, as well as areas subjected to continual water (or other foreign materials) on the walkway. The application may also be used indoors, particularly in environments with a high potential for contaminants (e.g. commercial kitchen floors, etc.).

Surface grooving and scoring is a permanent process. By cutting into the surface, the process can accelerate leaching of contaminants, such as grease and oil, into the surface. Heavy deposit of these contaminants will minimize the slip-resistant effects; thus, cleaning should be a continuous process.

Particle Embedding

Similar to coating a floor surface, particle embedding is where particles are placed (embedded) into a base material to increase slip resistance. The particles placed within the floor often include quartz, aluminum oxide, recycled natural aggregates and silicon carbide. To obtain the greatest slip resistance, the particles should be an angular configuration, thus increasing floor surface roughness. The correct mixture of particle type and the number of particles will create a high degree of slip resistance, while still allowing floor cleaning capabilities.

For the most part, larger particles spaced close together provide the best slip resistance. There must be adequate spacing between particles to allow for proper cleaning. Smaller particles will provide less slip resistance, however may be more appropriate for certain interior applications.

Epoxy flooring is often placed in commercial food service and restaurant operations due to durability, semi-ease of cleaning and slip resistance value. Other applications range from commercial applications (e.g. car dealerships, stadiums, churches, etc.) to outdoor areas such as pool decks.

Guidance for consideration

Selecting the proper floor treatment to help increase slip resistance requires a review of various factors. These may include:

- Type of existing flooring and slip resistance characteristics (e.g. COF, slip resistance index)
- Typical use of the floor or type/number of pedestrians using it and footwear expected
- Type and amount of contaminants (e.g. water, grease, sand, etc.)
- Ease of cleaning requirements
- Floor polishes and waxes applied
- Appearance or aesthetic appeal of flooring
- Total area needed to be treated

There are a wide variety of flooring types including resilient (e.g. vinyl, rubber, asphalt, etc.) to non-resilient (e.g. ceramic, quarry, concrete, terrazzo, marble, granite, etc.). Floor manufacturers will add finishes to flooring such as glazed tile that reduces slip resistance. Concrete can be installed in a rough form or honed to a smooth shine, thus decreasing slip resistance. Prior to selecting a floor treatment application, the existing

flooring type and surface finish must be evaluated.

Along with the type of flooring, the location or usage must be considered. A polished marble flooring in a high-rise office lobby may not be the best location to apply a slip-resistant coating. This type of location may be better suited for an etching process that will maintain the esthetics of the flooring. The appearance of a floor may not be critical if the location is in out-of-the-way areas such as kitchen flooring, exterior walkways, industrial settings, etc. Additionally, the durability of the treatment should be considered, particularly for heavily-traveled areas.

A significant contributing factor of slips and falls on walkways is the foreign substance potential. If the pedestrian walkway has little to no opportunity of water or other contaminant forming, the degree of slip resistance may not be critical. Likewise, commercial kitchen flooring, hospital surgical rooms, or other locations with a high potential for foreign substances, require a surface with a roughness or asperities (sharpness) that can extend beyond the contaminant, thus allowing for contact with footwear.

Existing Floor Treatment Types with Advantages and Disadvantages

Treatment Type	Advantages	Disadvantages
Coatings	<ul style="list-style-type: none"> • Easy to apply • Can offer good slip resistance (asperities) • Reversible or removable if necessary • Can provide spot or localized treatment 	<ul style="list-style-type: none"> • May lack durability • Minimize aesthetic appeal
Etching	<ul style="list-style-type: none"> • Maintains aesthetic appeal if applied properly • Provides greater longevity than other treatments • Effective on smooth/hard walkway surfaces 	<ul style="list-style-type: none"> • Less effective results for slip resistance than coatings • Requires installation by a professional • May decrease service life of flooring
Grooving & Scoring	<ul style="list-style-type: none"> • Can offer good slip resistance • Good choice for hard, exterior surfaces 	<ul style="list-style-type: none"> • Difficult to clean grooves • Requires installation by a professional
Particle Embedding	<ul style="list-style-type: none"> • Can offer good slip resistance (asperities) • Can provide attractive appearance in multiple areas 	<ul style="list-style-type: none"> • May lack durability • Requires installation by a professional

Key Advice

It is imperative to know the existing slip resistance of a floor surface prior to treatment. The slip resistance of a floor surface can be measured with a tribometer before and after a treatment. Treat a small sample area and determine if the measured change in slip resistance is adequate. The post treatment results should exceed the acceptable level of safety as suggested by the tribometer's guidelines both on a dry and wet surface.

Research and consult with experts on the best floor treatment alternatives for your walkways. Salespeople should be able to describe the expected results of their treatment process and how these results are obtained (e.g. measured with a tribometer, type of tribometer, etc.).

Conclusion

Ideally, the slip resistance of a floor surface should be considered during the development/architectural phase. However, it is often the result of several slip and fall incidents before one decides a slip resistant treatment is needed. Remember, what gives flooring its slip resistance is the grit (roughness or asperities) which provides traction that grips the footwear. Selecting the right floor treatment may require a balance of aesthetics, cleanability, durability and safety.

References

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