

SUSTAINABLE SLIP RESISTANCE, AND PROACTIVE SLIP PREVENTION

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Most slipping accidents can be prevented but it will require change and a more proactive approach to slip prevention. Slipping accidents remain one of the biggest causes of serious injuries and also one of the few areas of health and safety where there is little evidence of progress. Too many slip and fall incidents are ignored and too many businesses have a poor record for slip and fall injuries. The elderly, the infirm or those with balance issues or dementia are most at risk. The flooring industry, architects and designers, the cleaning industry, and building owners can all do more to reduce risk. There is an opportunity for greater research on fall prevention supported by data from the slip risks of real floors. Proactive steps as outlined here will significantly reduce slipping accidents and will prevent needless injuries.

Introduction

Traditional approaches to slip prevention have been failing. Slips are one of the biggest causes of serious injuries, one of the biggest costs to the insurance industry, and slip related issues add significant costs to many businesses. There is a growing appetite for improved floor safety and slip prevention. We can and should do more. Understanding how slip resistance varies over the life of a floor is a vital first step. This paper considers how co-operation and sharing of slip resistance data will facilitate proactive steps to monitor and manage the risks and to reduce accidents.

Slip risk changes over time

It is a well established fact that the slip resistance of a floor will vary. A wet or contaminated floor will offer far less slip resistance than a clean dry floor. Contamination, cleaning, maintenance and wear can all contribute to changes in the level of available slip resistance at any given time. All types of flooring material can change. A resin floor which relies on surface aggregate may lose grip as the floor wears, tiled floors can lose 20% of their slip resistance within a few weeks of normal use, and the slip resistance of wooden floor will depend on the finishing and coating or the surface. Even concrete surfaces can be affected by diamond polishing.

Monitoring risk with the right measures

The SlipAlert test and the Pendulum test have been shown to have high correlation ($r > 0$)

based upon combined test data from several respected international laboratories and tests made on various types of flooring. For the purposes of this paper we will express slip risk in SlipAlert Test Values (STV) which can easily be converted to Pendulum Test Values (PTV). The higher the SlipAlert Test Value, the higher the risk of a pedestrian slip.

Table 1. Slip Risk Estimates and PTV/STV values

Estimated Slip Risk	Risk Category	PTV	STV
<1:1 million	Low Risk	40+	Below 130
1:100,000	Medium Risk	<35	>136
1:20	Medium Risk	24	>166
>1:2	High Risk	<20	>180

For simplicity, we could consider 130STV as zero risk and every point above 130 as an increase of 1% that someone will find the floor to be slippery. This is borne out by past studies with force plates where below 20PTV is associated with a 1:2 risk i.e. 50% chance that someone will find the floor to be slippery.

Sustainable slip resistance

Traditionally, the flooring industry has supplied slip resistance ratings in different formats: PTV, STV, Co-efficient of Friction (CoF), or R Numbers (based on the German ramp test). However, the values are often “ex-factory” values that may or may not reflect the safety of the floor during its life. Two floors may begin life with identical R numbers but one may wear and become slippery, while the other may provide even greater slip resistance over its life. Two floors may be sold as having an acceptable CoF, but in practice one may be slippery when wet because the measures used may not have accounted for wet slip risk. We need to develop a better understanding of the sustainability of the slip resistance and we need slip resistance measures that can be monitored in all of the conditions in which the floor will be used or walked upon throughout its life.

Gathering slip resistance data over the life of a floor

Two measures that have been shown to take account of water and other contaminants are the SlipAlert and the Pendulum. The Pendulum is particularly useful in a lab for testing floor samples, and the SlipAlert is particularly useful in the field. On real floors SlipAlert is often used for monitoring how risk changes in hospitals, shopping malls, supermarkets, car parks, sports halls, warehouses, and factories. Individually these measures of the changes to slip resistance can result in changes to cleaning, and a reduction in accidents. Sharing of slip test data between interested parties within the flooring industry, building owners, insurance companies and cleaning and FM companies would yield a lot of valuable data and would facilitate a substantial reduction in slipping accidents.

Benefits for all

Flooring manufacturers would benefit if they begin to consider the slip resistance over the life of a floor. Commercial flooring companies will protect themselves and their customers if they tested every new floor when laid and also advised clients to re-test after one month and then annually. Building owners should test new flooring, audit floors when purchasing properties with legacy flooring, and should test before and after flooring renovation, maintenance or repairs. Cleaning and facility management companies would benefit from testing floors before and after cleaning. The relative risks of different floor in different conditions can help to inform planning, management, frequency, and methods of cleaning,

Cost benefit analysis and the case for monitoring slip risk

Businesses with large areas of flooring such as hospitals, shopping malls, supermarkets, universities, hotels or leisure facilities will experience considerable costs associated with flooring, floor maintenance, refurbishment, floor cleaning and also costs associated with claims made as a result of slipping incidents. These types of facilities can save £1,000'per year on claims alone and the cost of proactive testing could be as little as a few pence per square metre of flooring. A proactive approach to slip prevention and sharing of slip test data would yield even greater benefits and would be a major step towards safer sustainable flooring.

Safer, sustainable flooring

Sharing of slip resistance data measured over the life of a floor would lead to enormous benefits, and safer sustainable flooring solutions. Better data on the most effective methods of cleaning could extend the life of many floors. Data on the changing slip risk of floors subjected to different levels of wear, different uses, and different cleaning methods will inform decision making and help flooring suppliers and buyers to work together to select flooring fit for purpose. Architects, designers and CDMC's can work together to consider slip risk as one of the factors in selecting suitable new flooring. Building owners and cleaning staff can work together and will be able to factor in slip risk to improve methods and frequency of cleaning. Greener cleaning methods can be safely introduced where appropriate. Rather than the existing ad hoc changes to cleaning that often result in slipping accidents, in future, cleaning and maintenance changes can, tested. This will significantly reduce slip risks, save all parties time and money and it will reduce injuries caused by "mistakes" with cleaning.

Quality, environmental benefits and fewer slip injuries

Some floors are unsuitable for intended use, they can be difficult to clean or it can be difficult to maintain sufficient slip resistance. This can lead to excessive or inappropriate use of cleaning products that can exacerbate the problems with slip risk. Proactive slip prevention will bring benefits for quality suppliers of flooring, floor cleaning and flooring maintenance. Shared data and a better understanding of changing

slip risks will improve sustainability of flooring, will provide environmental benefits, could reduce costs and will reduce slipping injuries.

Conclusions

Monitoring slip risk has already proven itself as a useful way to understand and manage slip risks and to prevent accidents and injuries at sites that had previously experienced slipping issues. There can be no doubt that a collective approach to monitoring slip risk over the life of a floor will lead to a better understanding of slip risks and will bring about radical improvements that benefit the flooring industry, cleaning, facilities management, flooring maintenance and that will deliver a significant reduction in slipping accidents and slipping related injuries. This level of co-operation and sharing of slip test data over time is now possible, it is cost-effective and has long term benefits for all.

References

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GLC (1971). Bulletin 43 (2nd Series) Item 5 Slip Resistance of Floors, Stairs and Pavings

Sigler, P.A. (1943). *Relative Slipperiness of Floor and Deck Surfaces*

A full list of reference materials, electronic copies of this paper, graphs of test data and links to reference websites will be available from www.slipalert.com/conference