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Avoiding a slip-up when
choosing safety flooring

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Avoiding a slip-up when choosing safety flooring

John Mellor, Market Manager for safety flooring at UK manufacturer, Polyflor, examines the important role of safety flooring in healthcare premises, and highlights some of the key things to look for when specifying such flooring.

Effective healthcare design is about the creation of safe and clean surroundings for patients, staff, and visitors alike. The operational requirements of a hospital environment can be inherently complex, and floor finishes are required to meet high functional, aesthetic, and durability standards, with different areas of healthcare buildings requiring different levels of flooring performance and slip resistance characteristics.

Offering a high level of sustainable slip resistance, safety flooring is typically specified in public and staff areas where there is a risk of spillage or wetness, and is used to protect against an unsafe slip hazard. Making a good choice of slip-resistant flooring can be a challenge for specifiers, partly because, with some products now entering the market, slip-resistant characteristics are promoted that are based solely on transient, ex-factory R ratings derived from 'the ramp test', which are not sustainable. It is therefore useful to remind those specifying flooring in the healthcare sector of the need to undertake an early risk assessment to determine whether safety flooring will be required, and to then provide information on relevant industry standards and the guidelines offered by the UK Slip Group (UKSRG) and the Health and Safety Executive (HSE) to which your chosen flooring manufacturer should adhere. These determine what products can legitimately be called a 'safety floor', and indeed will provide sustainable slip resistance in wet conditions.

What is slip resistance?

Quite simply, enhanced slip resistance is achieved by increasing the friction between the foot and the floor, to give underfoot protection in areas where spillages can occur. This friction increase is obtained through the combination of safety aggregates and particles within the



Polysafe Wood fx American Oak at Bronglais Hospital in Aberystwyth.

floor such as quartz, aluminium oxide, recycled natural aggregates, and silicon carbide. When a contaminant such as water enters the floor area, this creates a 'squeeze film' between foot and floor. A particle-based safety flooring will provide enough roughness to break through this squeeze film and ensure foot-to-floor contact. However, a flooring without particles and just an emboss will be a relatively smooth surface, and in 'water wet' conditions will provide a high risk of the user slipping on the floor due to the squeeze film not being broken.

Use of aggregates

In genuine safety floorcoverings, these aggregates are not simply sprinkled onto the top as a coating that will wear off over a short time of use. Instead, aggregates are incorporated through the full thickness of the product's wear layer to ensure sustainable wet slip performance for the guaranteed life of the product. The

aggregates combine with the floor's surface emboss to provide a rougher, harder friction surface to 'bite' into the under surface of footwear when walked upon, and create the necessary traction, durability, and continuous underfoot safety.

In healthcare environments, slip-resistant safety flooring may be specified for various areas, including corridors, wards, treatment rooms, bathrooms, *en suites*, waiting rooms, and circulation areas. Slip resistance is also required for continually wet areas such as wet rooms and shower rooms, where safety flooring with a subtle raised emboss can be used in conjunction with aggregates to increase the floor's ability to provide a safe surface and added grip for the barefoot or shod user when the floor is covered with water.

Specifying safety flooring

Slip resistance can be a confusing area for specifier and client alike. On one hand there is a requirement to specify safety

flooring that is safe and fit for use, against a background of increasing awareness, and litigation in the case of slips and trips. On the other hand, there is a plethora of test methods to assess the slipperiness of floors, various manufacturer claims, and competing products to complicate choice.

Polyflor always gives the same two key pieces of advice to someone specifying slip-resistant flooring:

- 1) Use a reputable manufacturer that can demonstrate previous experience in the areas you are working on.
- 2) Ask for advice – use the manufacturer's customer service team and the company's expertise to help you specify the right product. The manufacturer is there to help you.

Not a sole solution

Remember that when carrying out initial risk assessments to determine the factors that could cause slip incidents within a healthcare environment, the specification of appropriate flooring should not be seen as the sole, one-dimensional solution to minimising these risks. The Health and Safety Executive (HSE) points to other factors which have an impact on slip risks, including the type of footwear used, drainage and expected floor contaminants, likely cleaning regimes, and the different types of use the floor is subjected to by pedestrians, including individual gaits and human behaviour when walking (see Figure 1: 'HSE Slip potential diagram').

What makes a safety floor?

A good safety floor product should retain its performance characteristics and decoration, demonstrating outstanding durability and abrasion resistance. In terms of safety floor credentials, all products specified to provide slip

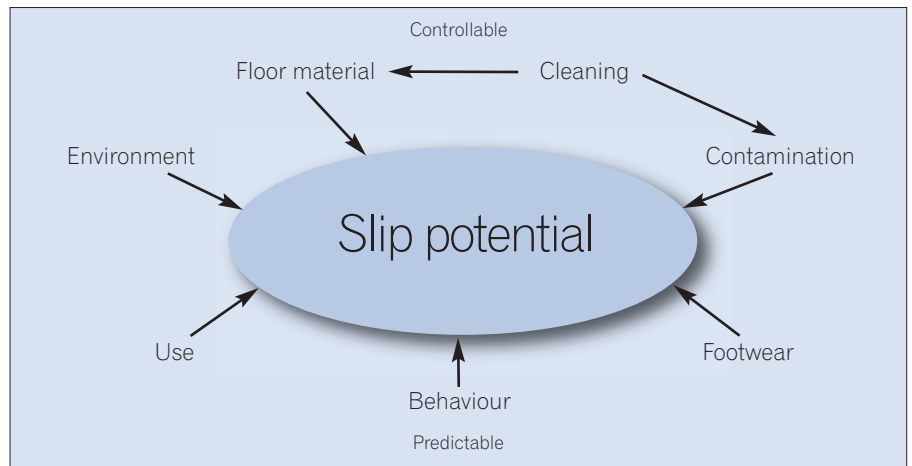


Fig. 1: HSE Slip potential diagram.

resistance in wet conditions should meet EN 13845, the European standard for particle-based safety flooring. Product claims that show conformance to other flooring standards, such as EN ISO 10581/10582, EN 649, EN 548, EN 12199, and EN 1817, mean the flooring is not classified as a true slip-resistant surface, and therefore is not a safety floor.

To meet the criteria for the EN 13845 standard, safety flooring must pass the 50,000 cycles abrasion test (EN 660-2) to demonstrate the longevity of the aggregates and their performance, ensuring the long-term, sustainable slip-resistance of the product. This stringent test procedure involves constant cycles of abrasion under pressure, with continuous application of grit to replicate accelerated wear over time. (see Figure 2)

Sustainable performance is key when measuring the slip resistance of safety flooring. Safety floor ranges can also be independently assessed and certified by the British Board of Agrément (BBA), indicating that the products are fit for their intended use for at least 10 years

provided that they are installed to the manufacturer's instructions. Generally, if safety flooring is used in appropriate areas and maintained correctly, the slip resistance will tend to improve with age. Over time, the more abrasive aggregates will be left behind, and will still be carrying out the job of imparting the necessary slip resistance in years to come.

'Pseudo' products

Products currently being sold as 'safety floors' in some instances only have very thin coatings of aggregate applied, or include a slightly rougher surface emboss and no embedded particles. These products pass ex-factory ramp tests, but only offer short-term slip resistance that reduces after installation, maintenance, and wear. In terms of sustainable slip performance, these products offer no credible substitute to a safety vinyl containing aggregates all the way through the performance layer.

This leaves a specifier or contractor who puts these 'pseudo' safety floor products forward on a project in a potentially difficult position in terms of their duty of care to their clients, and ultimately to their clients' 'customers'. Where do the specifier and installer stand if there is a slip issue a few years down the line, and the product fails to perform to the correct levels when tested with the HSE-recommended Pendulum machine? The wrong product can easily be installed when a specifier has received misleading information, and is now confused about the true definition of a sustainable, slip-resistant safety floor.

Testing safety floors

Safety floors can be subjected to a variety of international test methods for measuring slip resistance, the results of which should be made readily available by the manufacturer. To further complicate matters, some test methods are more valuable and trustworthy indicators of slip resistance than others.

Polyflor's 'top tips' for selecting a slip-resistant safety floorcovering

Before a floorcovering is specified, an initial risk assessment of the floor area is recommended to ensure that all the potential risks are taken into account, and to determine the type of flooring required.

The following questions need to be considered:

■ Likely contaminants in the area

Will the flooring receive regular oil, grease, or other forms of contamination, necessitating a more specialist safety floor?

■ Maintenance

How is the floor going to be cleaned, and how often?

■ Footwear

Is this controlled, or is the area open to the public?

■ Nature of traffic and behaviour of users

What will be the likely level of footfall and user movement on the floor? Will users be continually pushing and pulling trolleys; will children be running etc?

■ Life expectancy

Does the level of footfall and punishment the floor will take over the years require a product with a 10-year guarantee?

■ Aesthetics

Is it important for the safety floor to be very visible to the public, with a requirement to be decorative, yet also slip-resistant?



Fig. 2: Abrasion testing in progress.

The Pendulum test

The Pendulum test method (see Figure 3) is recommended and preferred by the HSE to assess the dynamic coefficient of friction of a floorcovering, achieved by swinging a dummy heel over the floor surface to simulate a foot slipping on a wet floor. A standardised rubber sole sample is used on the foot of the pendulum to represent a standard shoe sole of average slip resistance. Widely used, the greatest strength of this test is that the machine is highly portable, and can easily be used *in situ*, so the slip resistance of the floor can be assessed over its whole life.

HSE guidelines call for a floor to give a pendulum test value of 36 and above in the wet to be classified as low slip potential, with results quoted using a Four S (Slider 96) rubber slider. This equates to a slip risk level of one in a million if the flooring is installed correctly. While floor surfaces can be tested in the wet or dry, always look out for the wet result, as this is the condition in which slipping is likely to occur. If specifying for wet areas where safety flooring is required, products with very high Pendulum results in the dry quoted in isolation should be avoided.

For floorcoverings in continually wet areas such as walk-in showers, a softer TRL (Slider 55) rubber slider is used on the pendulum foot to simulate the act of a bare foot or a user with soft-soled footwear slipping on a floor. The same requirement of meeting 36 or above is needed to give a low slip risk potential classification.

Surface microroughness test

The surface roughness test is another on-site test method which can be used in conjunction with the Pendulum test, and is particularly useful for measuring changes in the surface condition of the floor. The test involves measuring the total

surface microroughness of the flooring with a surface roughness meter. A mean value of several peak to valley measurements is electronically calculated on the surface by tracing a needle over the floor at various points. All safety floor products should achieve a result exceeding $R_z 20\mu\text{m}$ (20 microns), which meets HSE guidance, and means products are classed as offering low slip potential in water-wet pedestrian areas.

The surface roughness of the flooring must be sufficient in order to penetrate the squeeze films created when there is a presence of wet contaminants between shoe sole and the floor that prevents solid

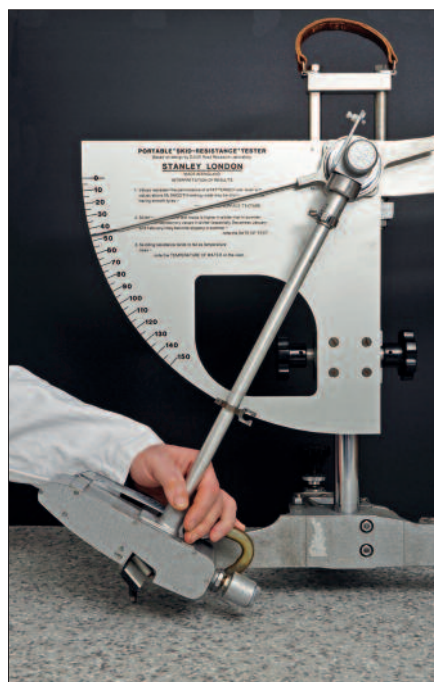


Fig. 3: The Pendulum test method is recommended and preferred by the HSE to assess the dynamic coefficient of friction of a floorcovering, achieved by swinging a dummy heel over the floor surface to simulate a foot slipping on a wet floor.

to solid contact. The surface roughness that the floor requires is governed by the viscosity level of liquid contaminants in the application area. The more viscous the contaminant, the higher level of surface roughness is required for the flooring to penetrate this squeeze film and achieve continued friction between foot and floor. In commercial kitchen areas within a healthcare environment, where high viscosity contaminants such as cooking oil or margarine are present, the floor needs to have a minimum surface roughness level of 70 microns.

The Ramp test (DIN 51130 & DIN 51097)

It is generally known and accepted in the market by flooring professionals that if true slip-resistant safety flooring is required, then solely basing a specification on R values from a Ramp test can be misleading for end-clients and users. This test (see Figure 4) involves a person with work boots walking over a flooring sample on an inclined ramp in the presence of an oil contaminant. The resulting level of degrees the ramp can be inclined before the operator slips is categorised into appropriate 'R' Values – running from R9 up to R13. This test has been commonly used in Europe, especially in the ceramic flooring sector.

It is believed that the Ramp test can be used to mislead. Firstly, a common misconception is that the R scale runs from R1 to R13, with R1 being the most slippery. In fact, an R9-rated product is classified as the floor with the most slipperiness. This allows an opportunity for manufacturers to offer products as specialist, slip-resistant surfaces, purely based on ex-factory ratings. Traditionally, safety flooring achieves an R10 rating, but a specification should not be made solely on this information.

No reliable measure

Furthermore, the Ramp test is carried out ex-factory, and is not practical to replicate on site, and thus gives no reliable measure of performance and wear over the life of the floor, as is possible with the Pendulum and surface roughness tests. A product with no particles within its wear layer, which is reliant on a rough emboss to achieve initial slip resistance, will provide only a transient solution. Once the emboss wears, no particles will be underneath to generate the required friction between foot and floor. Products with a rough emboss but no embedded particles may be sold as safety flooring with an ex-factory R10 or R11 rating, but, once the emboss wears, this will leave a smooth floor that is not slip-resistant in wet conditions. Therefore, ranges sold solely on their associated R values cannot be considered safety floors that meet the HSE's low slip potential classification.

Difference in contaminants used

The UK Slip Resistance Group (UKSRG) also finds that the Ramp test does not correlate at all with the Pendulum test, because of the difference in type of contaminants used, and the more industrial type of footwear used by the operator in the Ramp test. A ramp test can also be undertaken where the operator is barefoot, with soap solution as the contaminant. Floors are categorised into three classifications – A, B, and C, depending on the angle where the operator slips. As with the shod ramp test, specifying a safety floor for barefoot areas using only Ramp test results should be avoided.

The HSE recommends the use of the Pendulum test in conjunction with the surface microroughness meter for 'real life' *in situ* results. Other methods of measuring slip resistance, such as the Ramp test, are only complementary, and should not be used as sole indicators for specification.

Getting the right look that also performs

Having developed substantially to meet market demands and trends, safety vinyl is now being used across front and back-of-house areas within hospitals, health centres, and specialist care environments, where flooring needs to be highly aesthetic to encourage wellbeing and comfort.

Many years ago, a specifier of safety flooring was faced with a simple choice; a product was available in any colour as



Polysafe Mosaic in Grey Fusion, installed at the FirstCare Practice in Hounslow.

long as it was grey, with function, rather than form being all important. Fast forward 20 years or so, and the vinyl safety flooring we now see today is a much more sophisticated and a significantly different animal. Safety flooring is now a combination of both style and substance, with warmer, brighter, and more contemporary designs available, including wood and stone effects, which are far removed from the institutional, clinical look of old. These safety floor options that replicate nature are increasingly popular in specialist care environments catering for people living with dementia.

Impact on the living environment

Flooring designed to create this homely feel can be used in conjunction with appropriate lighting, acoustics, and effective wayfinding signage, to contribute to a more peaceful environment and reduced anxiety levels for people living with dementia. Thanks to the technological advances from flooring manufacturers such as Polyflor, safety flooring is now a major consideration for developers and specifiers who want to create a 'wow factor', but equally to underpin this with underfoot safety that is sustainable for the guaranteed life of the product.

Today's safety flooring comes in various guises, ranging from subtle, nuanced decorations to vibrant, inventive colours with virtually invisible particles within the vinyl to aid clarity and maintain the overall design. Traditional safety floors, on the other hand, often include dark aggregate to provide friction which is very visible. Some customers still prefer the dark aggregate to be seen in their chosen safety floor as a clear indicator that the floor has low slip potential, and these traditional safety floors are generally installed within back-of-house areas.

Advancing aesthetics

The advances in safety flooring design, and the incorporation of virtually invisible aggregates, mean that the aesthetic appearance is now very similar to smooth vinyl floorcoverings which only offer slip resistance in dry conditions. It is therefore important that a product's slip performance is analysed carefully at the specification stage to ensure the product meets the relevant standard, abrasion, and Pendulum wet test requirements, and that the right type of product is used in the correct areas to give underfoot protection in wet areas.

It is important to remember that a clean floor is a safe floor, and to follow the floor care guidance offered by your chosen flooring manufacturer. The development of protective maintenance enhancements such as Polyflor's Polysafe PUR polyurethane reinforcement means

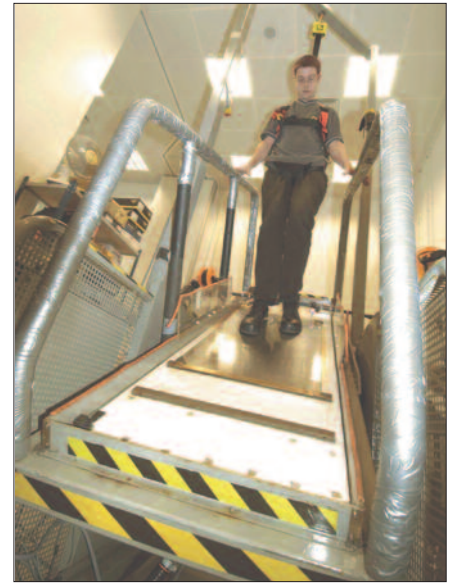


Fig. 4: The Ramp test involves a person with work boots walking over a flooring sample on an inclined ramp in the presence of an oil contaminant.

improved maintenance benefits, optimum appearance retention, and lifecycle maintenance cost savings of up to 60%. Any of Polyflor's Polysafe ranges that feature PUR are enhanced with this super strength, polyurethane reinforcement, which is cross-linked and UV cured to improve its cleanability, stain resistance and colour retention.

Sealed solution

Alongside maintenance, ensuring that vinyl safety flooring is sealed to prevent dirt and water ingress is also key, particularly in hygiene-critical locations. Safety flooring in sheet format can be easily heat welded to create a non-porous and watertight finish. Safety flooring products from Polyflor are designed to be flexible, enabling the product to be covered up the wall to create an enclosed floor-to-wall solution, particularly if also using the company's wallcovering options, such as Polyclad Pro.

In conclusion

Everyone in the supply chain has the duty of care to ensure that where safety flooring is required, the selected products should be both fit for purpose and correctly specified according to HSE guidelines, the appropriate particle-based safety flooring standard, and abrasion tests. It is fair to say that when sustainable slip resistance in wet conditions is key, it is sensible to consider sticking to manufacturers that you know and trust. It is important that your flooring partner has the knowledge and understanding of sustainable slip resistance and safety flooring development to deliver a product that performs for its guaranteed life, and does the job it is designed for over the long term.

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