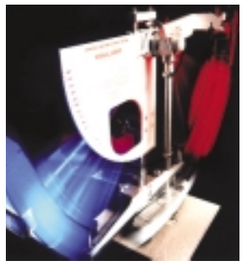

Pendulum

Surface microroughness meter

THE ASSESSMENT OF SLIPPERINESS: THE HSE APPROACH

The law requires that floors must not be slippery, so as to expose any person to a risk to their safety at the workplace (Health, Safety and Welfare Regulations 1992). The characteristics of floor surface materials required to provide satisfactory slip resistance have traditionally been considered difficult to assess. However, research carried out by HSE at HSL, in conjunction with the UK Slip Resistance Group (UKSRG) and the British Standards Institution, has shown that this is not the case. The slipperiness of flooring materials can be accurately assessed by using commercially available, portable scientific test instruments

- 'Pendulum' coefficient of friction (CoF) test (HSE's preferred method of assessing the slipperiness of a surface).
- Surface microroughness meter. Their methodology using this meter is ideally suited to laboratory-based assessment, and use on installed floors.

PENDULUM TESTS

The pendulum coefficient of friction test (also known as the 'portable skid resistance tester', the 'British pendulum', and the 'TRRL pendulum') is described in the British Standard, BS 7976 and is the HSE/HSL's preferred test method for the assessment of floor surface coefficient of friction This instrument although often used in its current form to assess the skid resistance of roads, was originally designed to simulate the action of a slipping foot. The method is based on a swinging dummy heel (fitted with a standardised rubber soling sample), which sweeps over a set area of flooring in a controlled manner. The slipperiness of the flooring has a direct and measurable effect on the pendulum value.(known as the 'slip resistance value', 'pendulum test value' or 'British pendulum number'). HSL research has confirmed the pendulum to be a reliable and accurate test, leading to its adoption as the standard HSE test method for assessing the floor slipperiness in dry and contaminated conditions. The instrument requires a competent operator to use and interpret the results. HSE currently concludes that this to be the only portable instrument that accurately simulates the action of a foot slipping on a wet floor.

SURFACE MICROROUGHNESS

An indication of slipperiness may be obtained by measuring the surface roughness of flooring materials. Many types of roughness tests exist, but research has shown that measurement of the 'Rz' parameter (formerly known as 'RzDIN' and 'Rtm') allows slipperiness to be predicted for a range of common materials. Rz is a measure of total surface roughness, calculated as the mean of several peak-to-valley measurements. This measurement is simple, quick and a good indicator of floor slip resistance.

OTHER CONSIDERATIONS

Consider other relevant information relating to the slipperiness of the floor to give a more complete picture of pedestrian slip potential. Such information could include the causes and means of preventing floor surface contamination, the regimes used to clean the floor surface (both in terms of their effectiveness and frequency), the types of footwear worn in the area (specifically, soles, tread pattern and the condition of the footwear) and associated environmental and human factors. This slip potential model approach has been shown to be a very powerful tool for the accurate assessment of slipperiness, and can be used as a starting point for a risk assessment-based approach.

RAMP TESTS

Many European flooring manufacturers use ramp-type tests to classify the slipperiness of their products before sale. Such tests are generally carried out using German National Standard test methods (DIN 51097:19924 and DIN 51130: 1992. HSE/HSL have developed their own protocol for a related "Ramp Test".

SLIPS ASSESSMENT TOOL (SAT)

HSE and HSL have recently developed a PC based package that allows 'non-experts' to assess the slip risk potential of level pedestrian walkway surfaces. The SAT prompts the user to collect surface microroughness data from the test area using a hand-held meter. Further information is then fed into the system, such as the floor surface type, the cleaning regime used, the condition of the floor (both in terms of its cleanliness and history), type of footwear worn and human factors relating to pedestrian use. On completion, a 'slip-risk classification' is supplied to the user, this gives an indication as to the potential for a slip. SAT is designed to assist in the decision making process when considering the risk of slipping in a defined area. However, it should not be relied upon when considering only the performance of the flooring. In this instance the pendulum should be used. In autumn 2004 HSE/HSL made the SAT widely available through the Internet, following an extensive field-testing programme by HSE and local authority inspectors.

More information about slips and trips can be found at

- www.hse.gov.uk/slips.htm
- www.hsl.gov.uk/capabilities/pedestrian.htm.

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Slips and Trips

Introduction

Slips and trips are the most common cause of major injuries at work. They occur in almost all workplaces, 95% of major slips result in broken bones and they can also be the initial cause for a range of other accident types such as falls from height.

Facts & Figure:

Slips and trips are the causes on average for:

- 33% of all reported major injuries
- 20% of over-3-day injuries to employees 2 fatalities per year
- 50% of all reported accidents to members of the public
- a cost to employers of £512 million per year
- a cost to health services of £133 million per year

What factors to consider in preparing a Risk assessment?

HSE recommends a five-step approach to risk assessment, and slip and trip risks should be among the major risks examined.

Step 1- Look for slip and trip hazards around the work place, such as uneven floors, trailing cables, areas that are sometimes slippery due to spillages. Including outdoor areas.

Step 2- Decide who might be harmed and how?
Who comes into the workplace? Are they at risk? Do you have any control over them? Remember that older people and people with disabilities may be at particular risk.

Step 3- Consider the risks.
Are the precautions already taken adequate to deal with the risks? If not, take appropriate action.

Step 4- Record your findings
if you have five or more employees.

Step 5- Regularly review the assessment
If any significant changes take place, make sure existing precautions and management arrangements are still adequate to deal with the risks.

What precautions should be taken to avoid slips and trips

If I want to prevent slip accidents at my premises what things should I look at first?
These steps represent a hierarchy of controls and those items at the top of the list should be tried first.

- Stop the floor getting wet or contaminated in the first place
- Keep water or contaminants away from walkways
- Immediately clean up any spillage or contamination on the floor and place a hazard warning signs around the effected area until it is dry
- Ensure that the existing floor surface has enough grip
- Ensure that staff are wearing suitable footwear for their working condition
- Replace the floor surface with one that has better grip
- Make sure that steps and slopes are provided with hand holds
- Make sure that poor lighting or glare does not prevent people seeing where they are walking
- Arranged work areas differently to reduce movement across floor spaces
- Consider vulnerable people such as the young, elderly and those with impairment
- Provide staff with good supervision and training to promote their awareness of good practice

In this issue

Editorial

Welcome to the fourteenth spring edition of Healthy Work Matters. In this issue, we are focusing on Slips and Trips in the workplace.
This newsletter contains:

- Facts & figures about slips and trips injuries
- Articles about risk assessment and how to assess floor surface roughness
- Real life case studies of slips and trips incidents

We would like to draw your attention to a slips and trips roadshow on the 20th March 2006 at the Health & Safety Laboratory, Harpur Hill, Buxton, Derbyshire. The main contributors of the roadshow will be Dr Steve Thorpe from HSL and Mr Mark Thomas from HSE.

We would like to encourage you to send in your comments and views on the Newsletter and other occupational health issues you would like us to cover. Please visit our website, which contains information and back issues of the newsletter.

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continued from front cover

What causes a floor to be slippery ?

- The interaction of feet, (shoes or bare foot) with flooring materials governs the slip periness of the floor
- Whether the floor is wet or dry
- Whether the floor is free from oil/fat or other slippery substances
- Whether the flooring material received manufacturers recommended treatment during installation
- Whether the floor surface is cleaned according to manufacturers instruction after installation
- When spillages are left on the floor
- Whether footwear is appropriate for the floor surface
- To a certain extent poor lighting (e.g. on stairs/steps/ramps)
- Whether it is covered with dusty contaminants from spillage of saw dust, sands and flour dust etc

Other factors:

- Matting should be securely fixed so that there is no chance of tripping hazards
- The building entrance should be positioned away from the prevailing weather with a canopy over the entrance
- The use of an adequate ventilation system to help reduce the effect of prevailing weather
- The slip resistance of a floor may change during its life and should be monitored
- The volume of pedestrian traffic at peak time should be a guide to the choice of flooring materials
- Speed of movements, change of directions, and changes to the level of use all put extra demand on the flooring materials
- Special requirements are needed for the elderly and for disabled people

A risk assessment based approach is the best practice to avoid slips and trips, because every situation is different

How to choose a floor surface?

Floors need to have enough grip for pedestrians to walk safely. Grip is measured as the coefficient of friction and suppliers of floor coverings should provide information about the coefficient of friction of their products.

For safe walking on a level surface, the coefficient of friction should be 0.36 or higher. These following points are also important:

- If floor contamination is likely then the coefficient of friction measurement should relate to the condition of the contaminated floor
- Coefficient of friction tests should be based on reliable methods such as the use of pendulum equipment. Several tests currently in use (particularly sled-type tests) can give misleading results
- Coefficient of friction figures should relate to the floor as it is installed not the figure quoted ex-factory. Many floor surfaces on installation can dramatically change their frictional properties
- Surface roughness measurements provide useful complimentary data. This can especially useful in monitoring changes in surface over time

Conclusion

- Identify the key hazards and risks in your workplace
- Simple solutions are the best and most cost effective options
- Take a proactive approach to the problem of slips and trips.
- Good housekeeping and good management are the key factors to reduce slips and trips accidents

Case Study-1

16 Year Old Employee Flash Fries Arm in 360°F Oil Following a Slip

This accident showed that a failure to maintain plant to prevent contamination and not to provide effective training and supervision contributed to a slipping accident. Research showed that the accident was caused by a combination of factors.

A 16 year old girl was employed at a fast food outlet to cook fried food.
She slipped on water leaking from an ice-making machine and instinctively put out her hand to break her fall. Unfortunately her hand went into the deep fat fryer containing oil at a temperature of 360°F and she sustained severe burns to her left hand and forearm.

The outlet was short staffed on the day of accident and the Team Leader was working on the tills instead of monitoring workplace safety.

Although the company policy was to mop up spillages it was common practice to leave spillages at busy times and cover them with a sheet of cardboard, which itself can create a tripping hazard.

At busy times it was usual to give greater priority to serving customers than to cleaning spillages.

The ice-making machine had been leaking for several days and various attempts had been made by different contractors to cure the leak. No-one had sole responsibility to coordinate the repair of faulty equipment and a lack of communication between different shift managers left the equipment leaking over a long period of time.

Following the accident, the company did a complete review of its management of wet/contaminated floors.

- Systems were put in place to ensure maintenance of faulty equipment
- Managers were identified as having responsibility to ensure slips procedures were implemented and followed
- Employees were empowered to deal with slips as a priority and were given backing by the company

- Slip control was given a priority over serving customers
- Extra training on slips procedures was given to all the staff

The local authority successfully prosecuted the company and the magistrates imposed a fine of £15,000.

The investigating Environmental Health Officer believed that the accident was completely avoidable as the company had failed to maintain a safe system of work or to carry out a suitable and sufficient assessment of the risks associated with slipping within the kitchen.

Case Study-2

Holed walkway went unrepaired for months before injuring a health service worker

A hole in a walkway went unrepaired for months and resulted in an injury to a health service worker. The hole had been dug in a concrete walkway at a hospital in order to repair a leak. The walkway was a busy access route to the hospital kitchen and restaurant.

Five months later the hole in the walkway had still not been repaired, nor was it properly protected despite repeated requests to management from staff in the catering department.

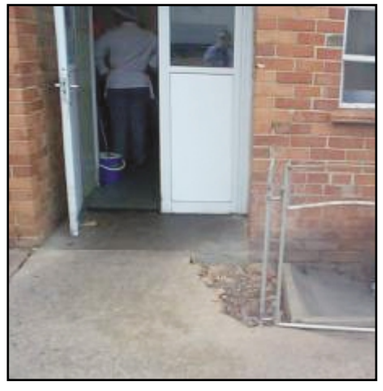
A catering assistant pushing a trolley tripped and fell into the shallow hole sustaining an injury that kept her off work for several months.

Only after the catering assistant was injured, the necessary repairs carried out to restore the surface of the walkway

A Health and Safety Executive Inspector investigated the accident and concluded that the hole was an obvious and significant hazard on a busy thoroughfare. The risk was known to the employers (the NHS trust) having been brought to their attention on a number of occasions before the incident.

There was evidence of several 'near miss' or minor injury incidents involving this hole prior to the catering assistants accident and there were indications that repair work on the walkway was deliberately delayed so that several jobs could be carried out together

The Inspector served Improvement Notices on the Trust requiring them to carry out risk assessments of all their pedestrian traffic routes and floors. - This should already have been carried out as routine good management practice. The Inspector prosecuted the trust for breach of the Health and Safety at Work etc Act 1974 and at the hearing the Trust plead guilty to the offense.



The court imposed a penalty of a fine plus costs totalling more than £7000.

References and Further Reading

1.Preventing slips in the food and drink industries: Technical update on floor specifications Food Information Sheet FIS22 HSE Books 1999

2. The measurement of floor surface slip resistance: Guidelines recommended by the UK Slip Resistance Group United Kingdom Slip Resistance Group 2000 ISBN 1 85957 2278