

# Assessment of slips safety information/ literature provided by flooring and footwear suppliers

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# Assessment of slips safety information/ literature provided by flooring and footwear suppliers

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Nearly 11,000 workers suffered serious injury as a result of a slip or trip in 2007. A key element of HSE's work to reduce slips and trips is to raise awareness of how slip risks can be controlled through the use of suitable flooring and footwear.

Footwear suppliers use a variety of terms to describe their products, eg 'slip-resistant', 'anti-slip', 'improving grip performance' etc, and these can often mislead customers. Slip-resistant industrial footwear will normally have been tested according to European standards, but many manufacturers and suppliers do not give helpful additional information, such as the degree of slip resistance and the types of work environment for which their products are most suited.

For flooring, it is currently very difficult to make comparisons between products due to the number of tests used and specifications quoted. Where test data is provided, often very little explanation is given and the lay person could be easily confused or misled.

HSE maintains that employers must be provided with clear and helpful information that will enable them to source footwear and flooring products which are suitable for their work environment.

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# EXECUTIVE SUMMARY

## Objectives

The aim of this project was to collect and assess the slips safety information/literature provided by flooring and footwear suppliers, to enable HSE to ascertain whether or not flooring and footwear suppliers are fulfilling their statutory duties, and to provide HSE with the opportunity to assess the impact of subsequent interventions in the field.

A baseline assessment of the workplace flooring and footwear products available in the market place in late 2008 was undertaken to:

- Determine the proportion of suppliers and manufacturers who supply slip resistance data for their products.
- Determine the range of test methods that are being used to generate slip resistance data and assess the validity of the test data provided.
- Compare slip resistance data held and/or generated by HSL with data provided by manufacturers and suppliers to give an indication of the quality of the slip resistance data being supplied.

## Main Findings

A review of promotional and technical literature provided by footwear and flooring manufacturers showed that improvements to the information could be made to help procurers select a product that will work well in their work environment.

A significant proportion of flooring products (55%) did not make any reference to slip resistance or provide any test data. However, the majority (88%) of those that claimed to be slip resistant did have test data to support these claims. A significant proportion (16%) of flooring data provided by suppliers did not consist of numerical test data but rather the German DIN 'R' and 'A/B/C' classifications; these have very broad acceptance criteria and so may not give a precise indication of slip resistance. Furthermore, 13% of data provided by flooring manufacturers was generated using other tests which, in the opinion of HSE, can provide misleading results in contaminated conditions.

No indication of slip resistance was given for 47% of footwear products. Another 36% claimed to be slip resistant but did not provide any test data to substantiate the claims. Others claimed compliance with standard specifications rather than giving numerical data, which does not give a clear indication of the product's slip resistance. Furthermore, some of the standards that were quoted were no longer current and had been superseded some years earlier.

It was noted that very few footwear or flooring suppliers offered advice on the suitability (or otherwise) of their products for various environments. Where advice was given, it was generally to recommend a product for a particular environment, seemingly without any evidence to do so, without stating the environments where the product was not suitable. Where limitations of use were stipulated, they tended to be based on product durability rather than slip resistance, e.g. some floor manufacturers claimed products were not suitable for wet or outdoor environments on the basis that water would spoil the product rather than because it would become slippery when wet.

Unfortunately, due to the varied range of test methods used and, in many cases, the obscure data provided, e.g. the German DIN 'R' classifications, it was very difficult to draw direct comparisons with HSL test results. However, it was noted that some footwear products, whose suppliers claimed that they were slip resistant without providing substantiation data, achieved poor results when tested using HSL's ramp test.

# 1 INTRODUCTION

Nearly 11,000 workers suffered serious injury (RIDDOR reportable major injuries) as a result of a slip or trip in 2007 and reducing this injury toll is a priority for the HSE. The Slips and Trips programme is seeking to achieve a significant reduction in major accidents caused by slips and trips. A key element of the Slips and Trips programme of work is to raise awareness of slips and trips issues; this includes how slip risks can be controlled through the use of suitable flooring and footwear.

Footwear can play an important part in preventing slips and trips but selecting the most suitable slip resistant footwear for a particular environment and/or work activity can be very difficult. Footwear suppliers use a variety of terms to describe their products, e.g. 'slip resistant', 'anti-slip', 'improving grip performance' etc. which can often mislead customers. Slip resistant industrial footwear will normally have been tested for slip resistance according to BS EN 13287:2004 (amended in 2007). However, work carried out by HSL in 2006 to evaluate current test methods used to measure slip resistance, has shown that this test has a lenient pass threshold, raising concerns that this could give a false impression of the suitability of a product. Many manufacturers and suppliers do not give additional information, such as the types of work environment for which their products are most suited (or not suited) although they do have a legal duty to provide accurate descriptions of their products to enable purchasers to understand the relevant safety features, e.g. slip resistance data. If the number of slip and trip accidents in workplace areas is to be reduced, then employers seeking to procure new flooring and footwear must be supplied with clear and helpful information that will enable them to source products which are suitable for their work environment.

Marketing and technical information for a wide range of flooring and footwear was collected to assess the quality of information provided by suppliers. Information sources included: manufacturers' websites, suppliers' websites, catalogues, brochures, and trade shows. Suppliers were also contacted to request information regarding the slip resistance of their products.

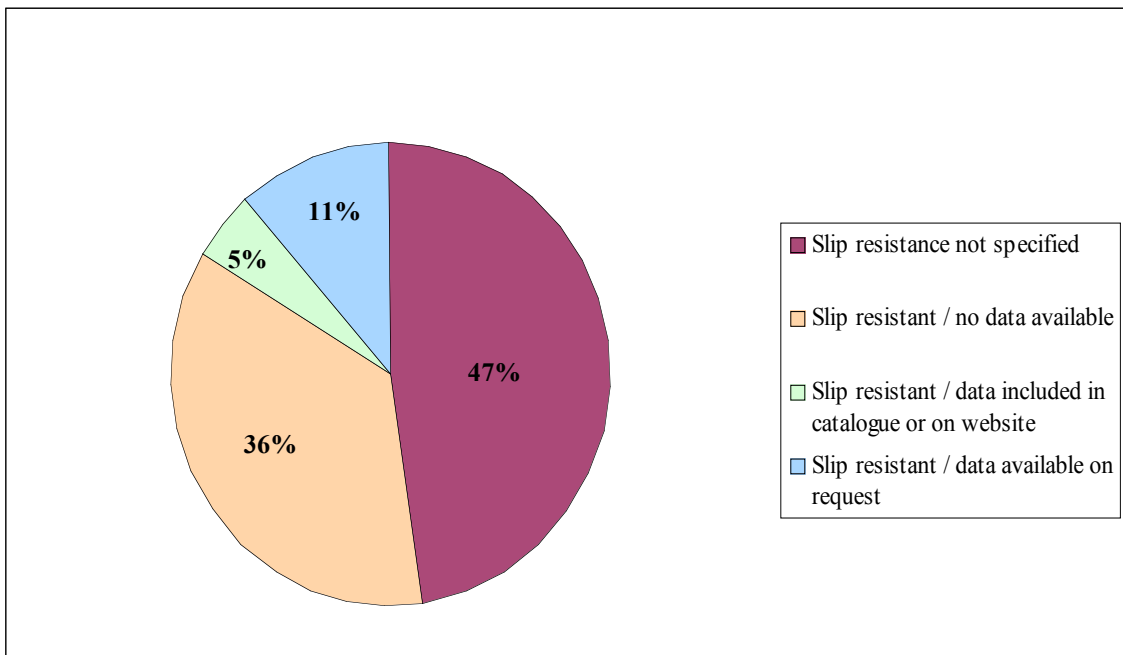
The information and materials collected were examined to:

- Determine the proportion of suppliers and manufacturers who supply slip resistance data for their products.
- Determine the range of test methods that are being used to generate slip resistance data and assess the validity of the test data provided.
- Compare slip resistance data held and/or generated by HSL with data provided by manufacturers and suppliers to give an indication of the quality of the slip resistance data being supplied.

## 2 RESULTS AND DISCUSSION

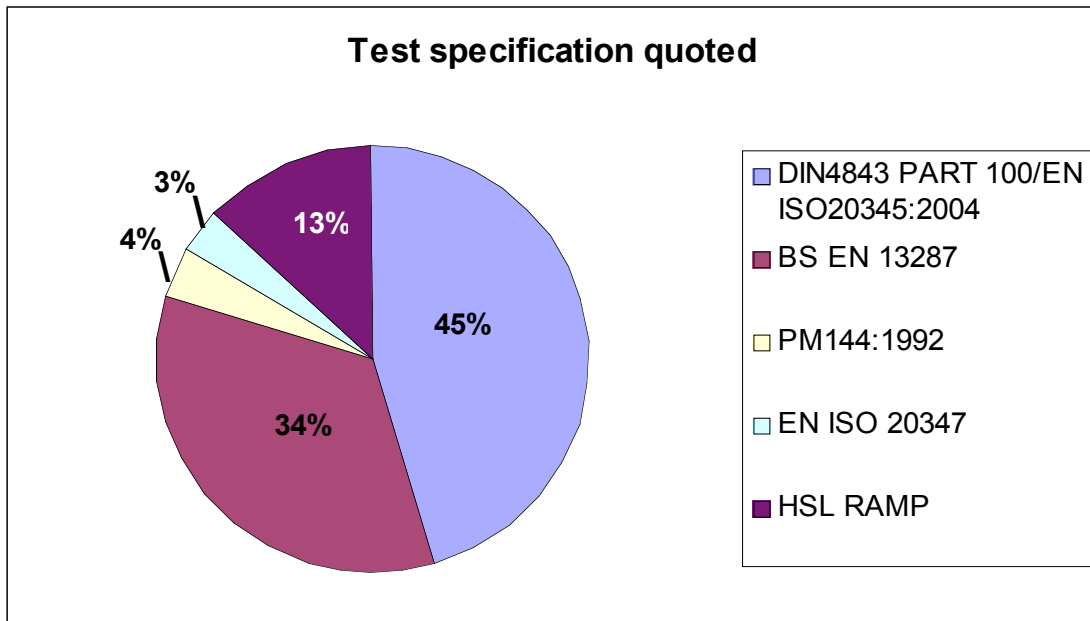
### 2.1 FOOTWEAR INFORMATION

In total, the literature pertaining to 1304 different styles and 55 different trade names of safety footwear was evaluated. Of the 1304 styles surveyed, 685 (53%) claimed to be slip resistant. Of this 53%, 183 (27%) claimed compliance with slip resistance specifications; 65 (9%) had test data in support of these claims and a further 147 (21%) had data available on request. A breakdown of the type of information provided for each style of footwear included in our survey is shown in figure 1.



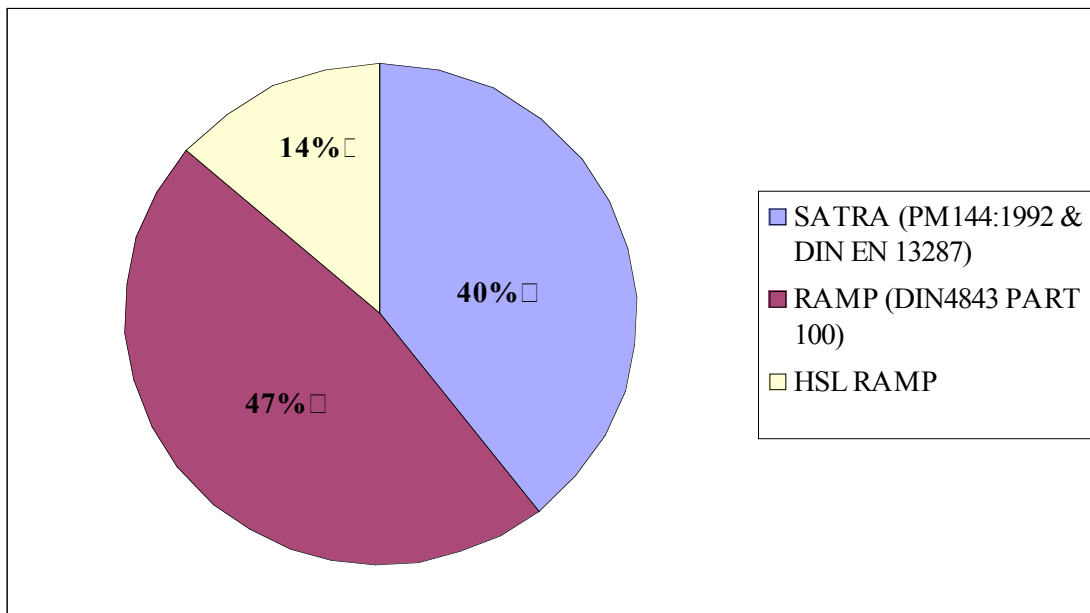
**Figure 1: Graphical summary of the slip resistance claims being made by suppliers, and the information they provide about their footwear.**

A review of the test data being quoted by suppliers showed that the majority of it was generated using tests known to have a lenient pass threshold. Data generated by HSE's preferred test (the HSL ramp test, HSL-PS-SOP12), was quoted for 26 styles. In addition to these, HSL has been employed to conduct ramp testing on other styles included in this study. However, where no details have been published in the suppliers' promotional literature or on websites, these have not been included in our summation. A large proportion of suppliers did not provide test results but did claim their products complied with various specifications. A breakdown of the various specifications quoted by suppliers is shown in figure 2.



**Figure 2: Graphical summary of the test specifications quoted by suppliers, where a test specification was quoted. Issue date/version not always specified. See section 6 for a key to the tests.**

It was noted that some suppliers were quoting compliance with BS EN ISO 20347:2004 in a way that could suggest slip resistance testing had been carried out. However, this version of the standard only makes reference to cleat design and does not specify any slip resistance requirements. The types of tests that were used to assess slip resistance are shown in figure 3.



**Figure 3: Graphical representation of the type of test used.**

To assess the validity of the test data quoted, some footwear products were tested in our laboratory using HSL's routine test procedures. Previous test data was also reviewed.

Unfortunately, due to the limited amount of numerical data provided by suppliers, direct comparisons could only be made on two products; the results generated for these products were in agreement with those quoted by the supplier. For details of footwear test data generated by HSL, refer to report PED/05/04 & PED/07/01 (Published as HSL/2007/33). See [http://www.hse.gov.uk/research/hsl\\_pdf/2007/hsl0733.pdf](http://www.hse.gov.uk/research/hsl_pdf/2007/hsl0733.pdf)

## 2.2 FLOORING INFORMATION

In total, the literature from 67 suppliers of workplace flooring was evaluated. This pertained to 24 different types of flooring materials and 1003 different surfaces. A breakdown of the types of surfaces for which information was assessed is shown in Figure 4. More detailed information is provided in Table 1, Appendix A.

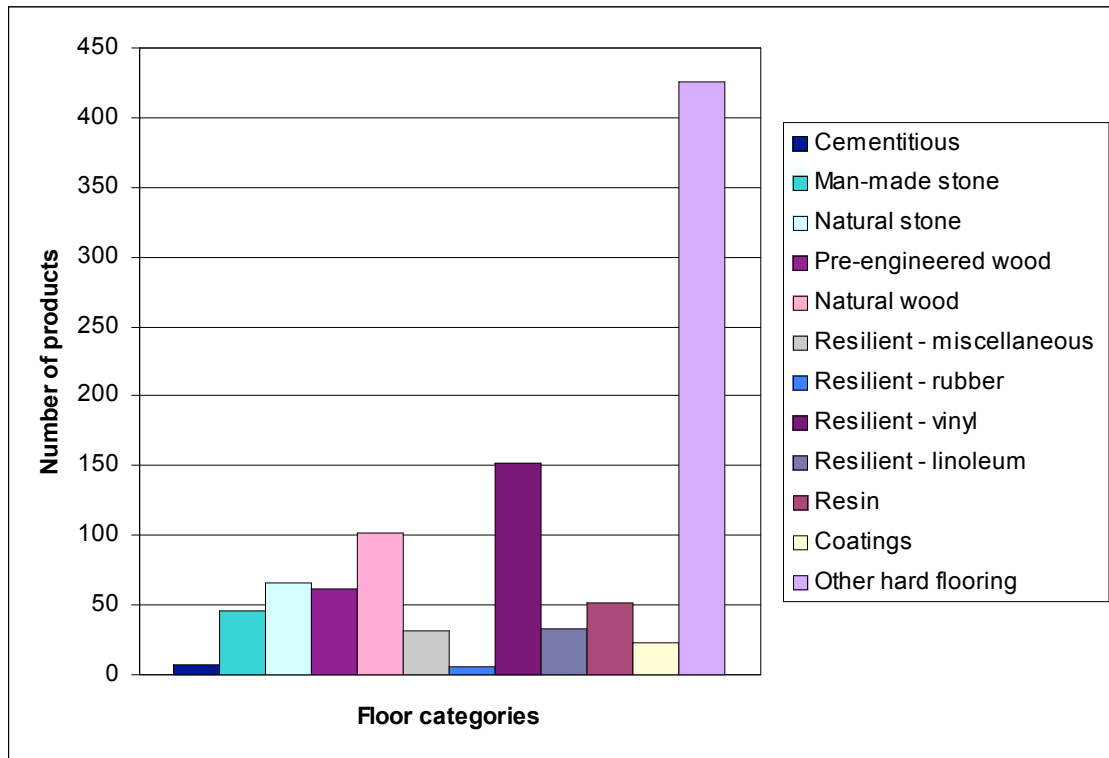
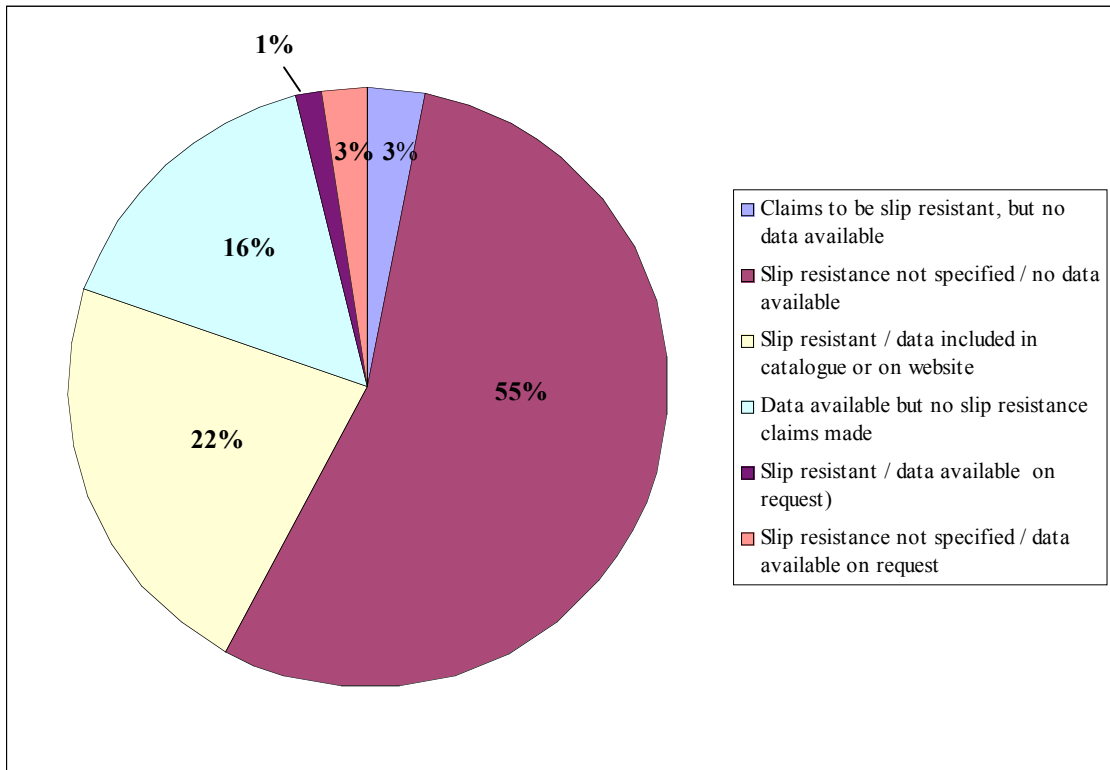


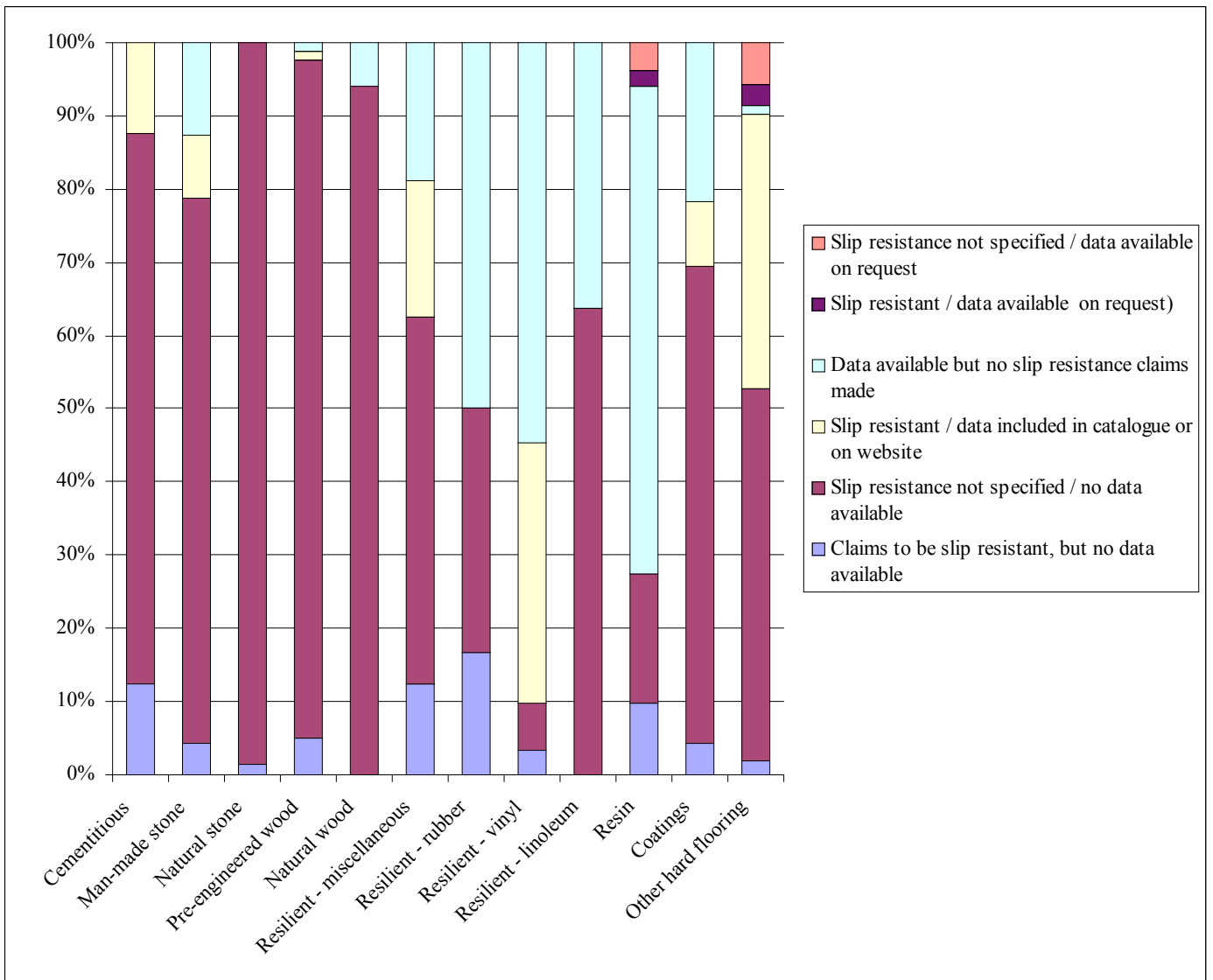
Figure 4: Graphical representation of floor types covered in this study.

Of the 1003 surfaces included in our survey, 269 (27% of total) claimed to be slip resistant. Of this 27%, 237 (88%) provided test data in support of these claims. Test data was also provided for 160 (16% of total) floor surfaces for which no slip resistance claims were made. Data was available on request for a further 26 (3% of total) of these surfaces. A breakdown of the types of information provided by suppliers and any claims they may have made is shown in figure 5.



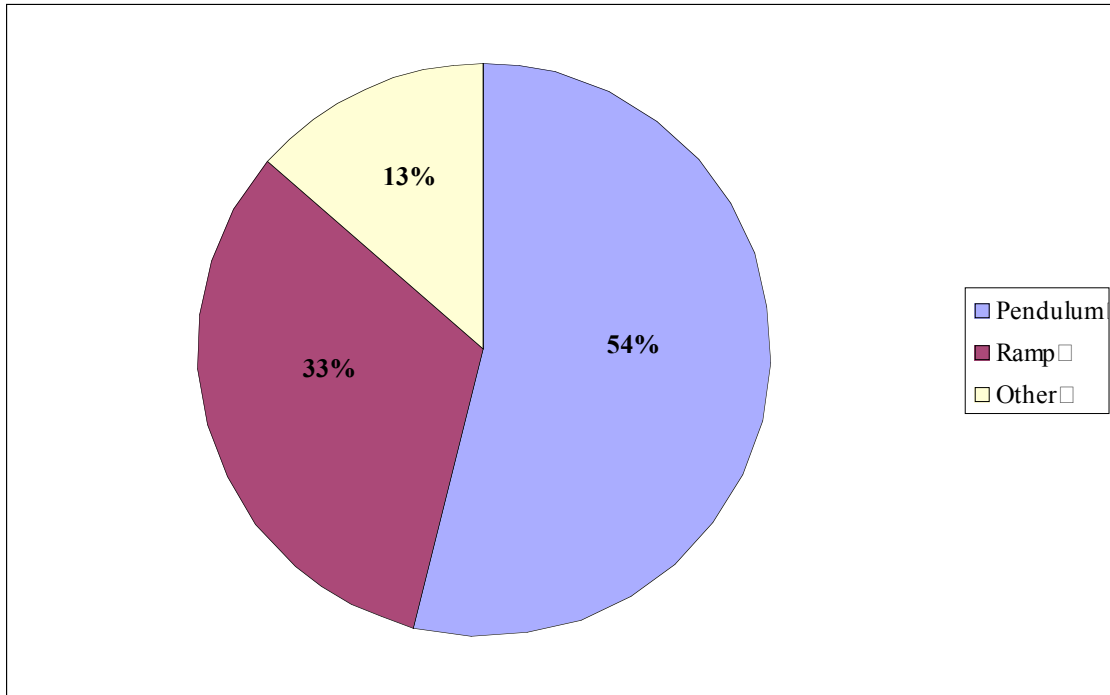
**Figure 5: Graphical representation of suppliers' claims and the information they provide.**

The flooring industry is quite diverse with a huge range of products available from a large number of suppliers. Most suppliers tend to specialise in a small number of floor types. The information provided and the claims made for each floor type are presented in figure 6, to give an indication of how each sector of the flooring industry performs with respect to providing information to their customers.



**Figure 6: Graphical representation of suppliers' claims and the information they provide for each floor type.**

A review of flooring test data showed that 54% was generated using the pendulum test, 33% using the ramp test, 0.2% using roughness measurements and 12.8% was generated using sled-type test methods, which in the opinion of HSE, can provide misleading results in contaminated conditions. Refer to HSE's technical information sheet for assessing the slip resistance of flooring, available from <http://www.hse.gov.uk/pubns/web/slips01.pdf>.



**Figure 7: Graphical representation of the type of test used.**

A more detailed breakdown of the types of tests used is given in Table 2, Appendix A.

To assess the validity of the test data quoted, some floor surface samples were obtained and tested in our laboratory using HSL's routine test procedures, i.e. the HSL ramp and pendulum tests. Previous test data was also reviewed. Unfortunately, due to the extensive range of test methods quoted by suppliers, direct comparisons could only be made on three safety vinyl surfaces; the results obtained for these surfaces were in agreement with those quoted by the supplier.

### 3 CONCLUSIONS

The information provided by footwear and flooring manufacturers was not satisfactory. Many footwear manufacturers made vague claims suggesting slip resistance and did not provide supporting data. Many flooring manufacturers avoid making reference to slip resistance altogether and information was hard to find.

Generally flooring suppliers were better than footwear suppliers at providing data to support their claims regarding the slip resistance of their products. However, due to the broad range of test methods used and, in many cases, the obscure data provided, e.g. the German DIN 'R' classifications, which have very broad acceptance criteria, it is very difficult to gain a clear understanding of how well a floor surface will perform in a particular environment.

Relatively few footwear suppliers provided numerical data for their products, and instead quoted compliance with various specifications. Many claimed their products were slip resistant without providing substantiating data. When a selection of these products was tested using the HSL Ramp Test, the results obtained suggested that several would have poor slip resistance in some conditions (e.g. on a smooth wet steel surface).

It was noted that very few footwear or flooring suppliers offered advice on the suitability (or otherwise) of their products for various environments. Where advice was given, it was generally to recommend a product for a particular environment, seemingly without any evidence to do so, rather than stating that a product was not suitable. Where limitations of use were stipulated, it tended to be based on product durability rather than slip resistance, e.g. some floor manufacturers claimed products were not suitable for wet or outdoor environments on the basis that water would spoil the product rather than because it would become slippery when wet.

Unfortunately, due to the varied range of test methods used and the lack of numerical data, it was very difficult to draw direct comparisons with HSL test results. Where comparisons could be made, it was found that the values quoted by flooring manufacturers were in good agreement with HSL results. However, it was noted that 12.8% of the data quoted by flooring suppliers were generated using tests, which in the opinion of HSE, can provide misleading results in contaminated conditions.

#### **Recommendations**

It was apparent that many suppliers did not consider slip resistance to be a selling point and did not place significant emphasis on it. Currently, it is very difficult to make comparisons between products due to the number of tests used and specifications quoted. Where test data is provided, very little explanation is given and the layperson could be easily confused or misled.

Footwear and flooring suppliers should be influenced to place more emphasis on the slip resistance of their products, and to use more standardised ways of assessing slip resistance; this would allow customers to make comparisons and help them to select the most appropriate product for their needs.

## **4 FURTHER WORK**

Based on the findings of this project, a more targeted selection of footwear and flooring products could be tested by HSL. By specifically selecting those products for which comparable data is quoted, we could gain a clearer indication of the validity of data provided by footwear and flooring suppliers.

After a suitable time period this study could be repeated to assess the influence of HSE's Slips and Trips programme on improving the information provided by industrial footwear and flooring manufacturers.

## 5 APPENDIX

*Table 1: Categorization of floor types*

Floor type	Number of Surfaces	Number of Suppliers	Floor category
Cementitious	5	2	Cementitious
Concrete	2	2	
Conglomerate tiles	10	2	Man made stone
Terrazzo	36	4	
Stone	66	14	Natural stone
Laminate	61	7	Pre-engineered wood
Wood	102	20	Natural wood
Nitrile (rubber)	1	1	Resilient - miscellaneous
Polymer	1	1	
Polyurethane	17	6	
PVC (vinyl)	10	5	
Luxury Non PVC tiles	1	1	
Resilient flooring	1	1	
Rubber	6	2	Resilient - rubber
Vinyl	152	17	Resilient - vinyl
Linoleum	33	4	Resilient - linoleum
Resin	51	9	Resin
Coatings	23	6	Coatings
Glass	5	1	Hard flooring
Metal	2	2	
Ceramic tiles	62	9	
Porcelain tiles	115	8	
Quarry tile	9	2	
Tile	232	9	

**Table2: Test specifications quoted by flooring suppliers**

<b>Data / Test type</b>	<b>Number of Surfaces</b>	<b>Number of Suppliers</b>	<b>Test category*</b>
None	558	53	None
Class A/B/C (DIN 51097)	29	5	Ramp
R rating (DIN 51130)	93	7	
RAPRA test	1	1	
DIN51131	1	1	
EN 13845	14	11	
BGR 181	38	1	
UNE-ENV 12633-2003	8	11	Pendulum
BS7044:1990	1	1	
Pendulum	176	5	
BS7976	47	4	
BS6677	8	1	
BS8204	2	1	
BS2050	4	1	
On request (Pendulum)	45	5	
Surface roughness	1	1	Surface roughness
EN 13893	53	5	Sled test
ASTM C-1028	6	1	
ASTM D2047	5	1	The James machine
ADA	3	1	
Tortus	5	1	Tortus sled test

*\*For descriptions of test categories see ‘Assessing the slip resistance of flooring’  
<http://www.hse.gov.uk/pubns/web/slips01.pdf>*

## 6 REFERENCES AND FURTHER READING

M. Loo-Morrey, "Slip Testing of Occupational Footwear." Report PED/05/04

M. Loo-Morrey & R. Houlihan, "Further Slip-Resistance Testing of Footwear for use at work." Report PED/07/01 (HSL/2007/33) [http://www.hse.gov.uk/research/hsl\\_pdf/2007/hsl0733.pdf](http://www.hse.gov.uk/research/hsl_pdf/2007/hsl0733.pdf)

HSE's technical information sheet for assessing the slip resistance of flooring: <http://www.hse.gov.uk/pubns/web/slips01.pdf>

HSL-PS-SOP12. HSL Ramp Test standard operating procedure

BS EN ISO 20345:2004 (A1:2007). Personal protective equipment. Safety footwear

BS EN 13287:2007. Personal protective equipment. Footwear test method for slip resistance

BS EN ISO 20347:2004 (A1:2007). Personal protective equipment. Occupational footwear

TM144:2004. Friction (slip resistance) of footwear and flooring





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