

## **Roughness measurement – is it a reliable guide to slip resistance?**

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Earlier this year I wrote an article in response to a question posed by a reader. I repeated almost verbatim what is written in the UK Slip Resistance Group Guidelines, namely that micro-roughness measurements on flooring should not be used by themselves to assess slip resistance.

The measurement of micro-roughness of flooring started several years ago when we first began to understand why a wet surface gave lower slip resistance values when measured by some instruments, for instance the Pendulum, and not by others, such as the Tortus. It was thought that there might be a direct link between micro-roughness and slip resistance which would not only help us to understand better what was going on but might also be a simple means of assessing slip resistance.

The UKSRG decided to include roughness measurements in its first Guidelines so that we could start to amass data from a wide variety of surfaces in order to give credibility to any future use of roughness as a means of assessing slip resistance. Unfortunately the data collection aim became lost in the mists of time and roughness measurement moved from being a means to an end to become an end in itself.

Several of us in the UKSRG who were involved in measuring slip resistance became aware that in the majority of cases there was really little correlation between micro-roughness and slip resistance. Invariably in the many cases where there was disparity we simply ignored the micro-roughness measurement. Over the years however data has been collected by this author and the results are shown in the graph below. As you can see, if you were to obtain a measurement of say 20  $\mu\text{m}$  on a particular floor the commonly used criteria for roughness would suggest that the floor was 'safe'. That is it has a low risk of slipping. In practice the real slip resistance could be anything from ... to ... , that is a very high risk to a low risk – so what do you do – toss a coin? If you can see a useable correlation between micro-roughness and slip resistance from the results, please let me know!

The proponents of roughness frequently justify its use by saying it tells you 'something' about the surface. Unfortunately while this may sound 'scientific' to a lay audience, they are unable to define what that 'something' is. The reality is that while that 'something' whatever it is might be interesting for a researcher into the subject, it is in practice totally useless information to the average person trying to assess the slip resistance of the floor.

It has also been thought that micro-roughness or changes in micro-roughness could help to indicate wear or a change in slip resistance. Unfortunately research and tests have shown that this too is untrue. The second graph shows tests carried out on a wide variety of surfaces where the surface was artificially worn and both the micro-roughness and slip resistance measured both before and after. The results clearly show that one cannot say that wear will necessarily cause either an increase or decrease in

roughness, nor will an increase in roughness necessarily lead to an increase in slip resistance. Similar results have been found by Carl Strautins in Australia.

Finally, it must be understood that micro-roughness measurements cannot be of assistance in assessing the degree of contamination of a surface, for instance whether cleaning or the lack of it is causing the surface to become more slippery in either wet or dry situations.

The message that needs to be understood is that direct measurement of the slip resistance of the floor is the only way to get reliable information upon which one can make a judgement. The Pendulum is the definitive method and it is this instrument which should always be used for legal cases and manufacturers' specifications. The Pendulum, however, does need an experienced and properly trained operative to use it in order to ensure reliable results. It is a heavy and cumbersome instrument and it takes time to set up and obtain a set of readings.

The author has taken over 100,000 readings with a Pendulum, so this is not intended as a destructive criticism of the instrument, simply a factual observation. He is well known as having championed the instrument both in the UK and Europe where he has for many years been battling to get it adopted as the European Standard.

SlipAlert was developed specifically to correlate with the Pendulum and also to be simple and quick to use. It was never intended to compete with the Pendulum but to complement it. It is intended as a means of getting people to test their floors where they previously would never have considered doing so or of getting them to do it more often than would have been economic or practical with the Pendulum. It is ideal for a rapid accurate assessment of a floor and for monitoring it, particularly to see whether cleaning is being carried out correctly or how changes in the cleaning regime affect the slip resistance. It is being used in many countries throughout the world, not just the UK, and one of its most important attributes is that it is very 'visual'. On a good floor it comes to a halt very rapidly but on a slippery floor it slides, often for several feet, before coming to a stop. People also tell us that it is fun to use!

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