

CFJ ARTICLE – Response to Brian Newell and Paul Lemon

In response to Brian Newell's and Paul Lemon's points of view in the September issue, I suggest their arguments are specious and it is they, not I, who have missed the point! Paul suggests that it is a simple 'squabble'. That suggests that it is of minor significance. In practice it is of fundamental import in the field of slip resistance.

Brian has missed the point because if he had carefully examined the graph which I published, alarm bells should have started ringing. The results show that ceramic tiles can have what appears to be significant 'roughness' but yet in practice have low slip resistance and vice versa. It is the same for all flooring materials – real life testing, not just theory, has shown there is no direct or usable relationship between the micro-roughness of the flooring and the wet slip resistance. I should add that there is not a single piece of supporting test data in the PAS document.

Brian is incorrect that I was at the UK Slip Resistance Group Meeting when the presentation of the Slips STD Consortium was given. I have however studied their report and was at a similar presentation given to TC 339. The members of TC 339, like myself, considered the report interesting, but not such that it demanded our attention or affected in any way the work we were doing. Indeed, it has not been considered necessary to discuss the contents of the report since that presentation. The term 'ground breaking' as used by Paul Lemon is not the term I would use. Similarly, in the UK mirror group (which Paul Lemon attends) it has hardly been mentioned. The only thing which has impressed us is how the Consortium managed to get so much money out of the EU Commission to fund the work!

I return however to my main criticism, namely that classifying tiles or indeed any floor surface for wet slip resistance other than by the friction they can develop under a wet pedestrian slip situation, as measured by a device which correctly recreates the characteristics of the hydrodynamic film as generated under the heel of the shoe worn by a slipping pedestrian, is fundamentally misleading.

Brian asks whether I believe that all the august experts in the Consortium were ignorant of the fact that the slip resistance of a surface changes in wet contaminated conditions. With respect that was not the proposition I put forward. What I contend is that most experts do not fully understand the physics of hydrodynamic lubrication as applied to pedestrian slipping. I doubt if a single 'expert' in the UKSRG prior to reading the article could quote offhand the equation relating to the critical film thickness and explain cogently and correctly how it affects the friction developed, even though they all have a copy of the paper which I gave them on the subject. It is in the understanding of precisely how that hydrodynamic film works that the crux of the matter lies.

Both Brian and Paul cast doubts about the reliability of the Pendulum. Brian, I suspect, through received wisdom rather than practical experience. I have taken over 100,000 readings with a Pendulum, tested several thousand floor surfaces, and investigated countless slipping accidents. I cannot recall either Paul or Brian voicing

their misgivings about the Pendulum to the UKSRG. Indeed, Paul and I were joint editors of the UKSRG Guidelines.

Certainly there are situations where the Pendulum cannot or should not be used. It cannot measure the nosing of a stair in the direction of travel, nor can it measure the base level of a tactile tile. This is a case where a pedestrian's heel can travel continuously on the flat 'base' of the tile through the rows of raised studs, whereas the wider pendulum slider is forced to interact with the studs. These restrictions in practice are few and far between and do not affect 'normal' floors. And, yes, from a strict theoretical point of view the Pendulum only simulates part of the length of slide in a pedestrian slip, hence its accuracy is not 'absolute'. However, it is an instrument which in the right hands is fundamentally reliable in its prediction of the slip characteristics of the flooring surface and has been shown to correlate well with the slip history of floors. The GLC analysed 3500 tests on real floors.

With regard to my criticism of roughness/micro-roughness measurement, I resigned from the UK Slip Resistance Group because I was not prepared to stay silent on the matter. The Group, at the last meeting I attended, generally accepted that there was no relationship between Rz and PTV, and that changes in Rz did not ipso facto signify changes in PTV (and vice versa). They balked however at admitting it was a complete waste of time and instead passed a motion that *'when used in conjunction with other appropriate information, the measurement of surface roughness is useful in interpreting the slip characteristics of a pedestrian surface in water wet conditions'*. It should be noted that *'appropriate information'* is not defined even though it is critical, and no definition is given as to how it is *'useful'* and what you do with the information when you have got it. No scientific data or logic was put forward to justify this motion.

Arguing micro-roughness measurement is 'useful' is rather like trying to measure the speed of a car using a measure of the driver's pressure on the accelerator. Yes, in certain very particular ideal circumstances there is a direct relationship between the speed and that pressure, but there are so many other factors involved. To describe that information as 'useful' when the driver can look at the speedometer (the equivalent of what the Pendulum is indicating) is laughable. What is worse is authorities who ought to know better telling people to use that measurement (Rz). Their problem is that they cannot admit they might be wrong – there are vested interests at stake! It has gone beyond being a straight scientific debate.

The proponents of roughness (Paul Lemon included) have never been able to put forward a convincing scientific case for using roughness measurement, be it Rz or some other form of roughness for assessing slip resistance, coupled with extensive test data to prove their point. Their arguments appear to rely on rhetoric, hyperbole and hypothesis, and are often totally misleading.

As I suggested in my first article, the part that roughness, both macro and micro, plays in wet slip resistance is very complex indeed and such that it is not amenable to simple measurement and direct application to assessing the slip resistance of a surface. Paul Lemon states, as do the UKSRG, that it should not be used as the sole means of measurement, and that the Pendulum should be used as well. The first problem is that hundreds if not thousands of organisations have been

persuaded to use roughness meters as the sole means of measurement, and the second is that if you do use both instruments what do you do with the Rz measurement, particularly if as often happens, its assessment of the surface as suggested by the UKSRG criteria, is wildly different from that of the Pendulum. The third problem is that one cannot rely on two areas of similar flooring which have the same roughness having the same PTV, nor can one suggest that because the surface roughness has changed in a particular direction that the slip resistance has either changed at all or changed in that same direction. In addition, by using a roughness measurement one cannot tell if the floor surface is contaminated, for instance by silicone polish overspray. It is therefore not a helpful device for monitoring of floors, and thus the advice given in the Slips PAS document (see Section B1 of that document) which suggests using Rz for this purpose calls into question the validity of the Slips PAS document and their arguments for using roughness measurements for the purpose of classification in relation to slip resistance.

Throughout the ages, many brilliant scientists have turned their minds to the study of friction and its relation to the surface characteristics of the materials involved. No one has yet succeeded in directly relating roughness characteristics to friction such that one could predict the frictional characteristics of that material/surface as applied to another when the two are in contact. That is in the dry; the situation becomes significantly more complex in wet contaminated conditions. It is my firm opinion that with our present state of scientific knowledge the only certain way to assess a floor is by direct measurement using a device which correctly reproduces the characteristics of the hydrodynamic film as induced under the part of the heel of a slipping pedestrian which is in contact with the floor during the slip.

Finally, I challenge all those who commend roughness or micro-roughness measurement as a means of assessing slip resistance to put forward a properly reasoned scientific paper supported by test data from at least several hundred floorings to show that it does what they claim and to lay out clearly and unambiguously what they claim it tells you about the slip resistance of a floor's surface. No hyperbole, no unsupported hypothesis, no mud slinging, no '*we are the experts and know what we are doing*', just plain straightforward scientific fact, data, logic and analysis! In other words – PROVE IT!

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