High risk sites require HFS

Across the UK highway authorities are looking for cost effective solutions to meet their responsibilities for providing safe road surfaces at high stress wet skid potential sites.

For some authorities this search has taken them away from using the traditional calcined bauxite antiskid solution preferring instead to use a high polished stone value (PSV) natural aggregate. But how many engineers realise that PSV is not a direct measure of the resulting skid resistance achieved on a road surface. Skidding resistance measured using SCRIM (Sideways force Coefficient Routine Investigation Machine) can vary significantly for any given aggregate source and between different sources having the same PSV depending on traffic volumes and vehicle stress imposed. There is growing evidence authorities should not be replacing high friction surfacing (HFS) with high PSV aggregate in critical skid risk locations and this article attempts to explain why.

From the introduction of Shellgrip in the 1960s improving the skid resistance of road surfaces under wet conditions has been shown to reduce the risk of traffic accidents by compensating for road user error and reducing the potential impact from a vehicle collision by reducing the braking distance in an emergency. HFS has a long history of proven use in saving lives by imparting the highest level of skid resistance onto a road surface. In the UK, the first evaluation trials were conducted in 1967 for the Greater London Council. The study over a period of 12 months demonstrated a 50 per cent reduction in skid related accidents and casualties on roads treated with high friction surfacing. This well tried and tested solution has traditionally required the application of calcined bauxite bonded to the road surface. With a high SCRIM value (+0.55), high PSV and a very low aggregate abrasion value (very hard wearing) calcined bauxite has proven its safety credentials.

**Skid resistance guidance**

Every highway authority is meant to have a skid resistance policy which may include guidance on PSV selection and risk rating which identifies the level of wet road skidding resistance required at different road locations, usually described as the investigatory level (IL). Guidance on assigning the IL to road categories is provided in HD28/15 part of the Design Manual for Roads and Bridges (DMRB). HD36 table 3.1 advises the engineer what aggregate PSV is required for each site taking into account the site category (e.g. dual or single carriageway and risk rating) and the number of commercial vehicles using the site each day. The IL is the minimum skid resistance required on each site as measured using a test machine called SCRIM developed by TRL (Transport Research Laboratory).

It is perhaps less well understood however that different aggregate sources with the same PSV can deliver different levels of skid resistance. Roe and Hartshorne (TRL Report 322, 1998) investigated the relationship between PSV and Mean Summer Scrим Coefficient (MSSC) and concluded that different aggregate sources with the same PSV provide a range of skidding resistance in practice. More recently a study conducted by WDM Ltd in Somerset confirms these findings. The Somerset •

Dr Howard Robinson, chief executive of the Road Surface Treatments Association (RSTA) and a member of the Highways Magazine editorial board, explains the reasons why local authorities should be considering high friction surfacing (HFS) as an alternative to high polished stone value (PSV) natural aggregate.
A study which considered surfacings up to eight years old found that MSSC for a given aggregate source will often decrease with increasing traffic. Highway authorities must therefore use local knowledge of aggregate PSV and skid resistance performance when assigning IL values to sites. Additionally, the IL should be reviewed periodically to ensure wet surface accidents are minimised and adjusted if necessary. This often results in the need for surface treatment to attain a higher IL. On some older surfacings the PSV originally specified will regularly deliver an MSSC which is now too low because of the increase in traffic.

A recent skid resistance survey across London conducted by WDM Ltd found that high friction surfacing (HFS) consistently outperformed high PSV asphalt on sites requiring 0.55 IL i.e. high risk sites where braking distance is critical for protecting public safety. Research undertaken at the University of Ulster has also concluded from laboratory tests that HFS containing calcined bauxite aggregate outperforms high PSV asphalts in retaining a higher level of skid resistance following lengthy periods of accelerated trafficking.

So whilst HD36 is a useful guide for PSV selection it doesn’t take account of aggregate source which can result in the desired skid resistance (MSSC) not being achieved where it matters most on the road surface. At high risk sites where braking distance is critical to maintaining public safety i.e. on approaches to pedestrian crossings, junctions and the like, having high confidence in aggregate performance becomes even more critical. The engineer needs to be certain they are using a surfacing that can deliver the required MSSC value consistently over time particularly as evidence suggests SCRM decreases with increasing traffic on more heavily trafficked roads. Without site specific evidence the safest solution for the engineer is to use the best performing aggregate available, calcined bauxite. 

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