Skid policy – guidance for implementation

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ABSTRACT

IAN98/07 was prepared to assist HA service providers in implementing the UK policy for managing the skid resistance on trunk roads effectively and, in doing so, to facilitate good record keeping, promote consistent and effective decision making and maximise the benefits by targeting maintenance to improve the skid resistance at those sites most likely to deliver safety benefits. The approach taken to developing the advice, combining the results of accident studies on the English trunk road network with a general knowledge of the factors influencing accident risk, is described in this paper.

1. INTRODUCTION

HD28 sets out a generic approach to managing skid resistance on trunk roads in England, Wales, Scotland and Northern Ireland. In practice, local circumstances in these different regions can vary substantially, in terms of traffic levels, traffic speeds, road types, maintenance regimes, local priorities, etc. Conditions in local authorities, in which HD28 is commonly used as a basis for managing skid resistance, can be even more varied: consider, for example, the range of road layouts, design standards and pavement condition that exist. It is therefore recognised that, to maximise the benefits of the Standard, it is necessary to adapt it to cater for local circumstances.

In this spirit, interim advice note IAN98/07 was issued by the Highways Agency (HA) in 2007. The advice note is intended to accompany HD28/04 - it indicates how the Standard will be implemented for trunk roads in England and provides additional guidance to the Managing Agents, Managing Agent Contractors and DBFO Companies responsible for implementing it. In principle, this will both ensure that the benefits of the Standard are maximised, and provide a basis for collecting evidence of the actual benefits that are achieved, which can be used to support decisions about funding priorities. This paper reviews the objectives and the basis of this advice.

2. OBJECTIVES OF IAN 98/07

There is potential to significantly enhance the benefits of the skid resistance Standard by effective targeting of maintenance treatments at the sites most likely to deliver safety benefits. Work carried out prior to the 2004 update to HD28 estimated the "realisation period" associated with treatments to improve the skid resistance on English trunk roads - the time period over which it was estimated that the cost of the treatment would be matched by the financial cost of accidents saved as a result of the improved skid resistance (Parry and Viner, 2005). Two scenarios were investigated, and Table 1 shows a substantial difference in realisation period depending on whether the best or worst case scenario was achieved:

Site category and definition		Realisation period (years)	
		Best case	Worst case
B	Dual c/way	0.7	3.8
C	Single c/way	0.7	7.6
Q	Dual c/way minor junctions	0.6	16.0
Q	Single c/way minor junctions	0.3	3.3
G1	Gradient 5-10%	0.8	5.6
S1	Dual c/way bend <500m	0.2	4.3
S2	Single c/way bend <500m	0.4	11.0

Table 1 Realisation period for improvements in skid resistance

The worst case scenario assumes "average" accident savings as a result of improving the skid resistance. Although the realisation period in this case remains generally less then the lifetime of the surfacing, it is substantially worse then the best case scenario, which assumes that the most high risk sites are correctly identified and treated. Further details of the background to these figures are given in Appendix 1.

The objectives of IAN98/07 are related firstly to effective targeting of maintenance, i.e. to achieving the best case scenario identified above. Secondly, they relate to enabling the HA to monitor implementation, to demonstrate implementation in a Court of Law if necessary, and to quantify the benefits achieved. The objectives were to:

- Facilitate the effective and consistent application of the Standard across the whole network.
- Provide additional detail in some areas in response to feedback from [HA] Service Providers.
- Clarify the division of responsibility between the HA and its Service Providers.
- Facilitate the collection and retention of adequate information to allow the operation of the policy to be demonstrated and its success monitored.

The following sections describe how these objectives were met.

3. EFFECTIVE TARGETING OF MAINTENANCE

There are two components to the effective targeting of maintenance in the skid resistance Standard: setting an appropriate IL, so that a detailed investigation of individual sites is undertaken at an appropriate stage, and robust assessment of risks during that site investigation.

The major part of IAN98/07 is concerned with providing detailed advice on setting appropriate site categories and IL. For each site category, this consists of a concise description of where the site category should be used plus a description of how to select the most appropriate IL from the range specified in HD28/04.

The IL ranges in HD28/04 were established following an analysis of accident data, from the relative levels of accident risk, and from the relationship between skid resistance and accident risk, for the different site categories. In some cases, these data were used to develop the more detailed advice contained in IAN98/07. For example, on all purpose trunk roads in England the accident findings clearly indicated an elevated risk and a highly significant effect of skid resistance for minor junctions, compared with non-event sections and compared with other junction types.

However, in general, the data were not sufficiently detailed to form the basis of more detailed advice about specific risks. IAN98/07 was therefore based on a combination of findings from the accident analysis, plus a general knowledge of the factors influencing accident risks, specifically considering:

Identifying hazards present or conflicts between road users that could lead to a vehicle loosing control or to sudden braking or avoidance manoeuvres.
Examples of this situation include lay-bys and junctions with poor layout, such as the busy access to a petrol stations illustrated in Figure 1. In these cases there could be a substantial speed differential between the accelerating vehicles and the traffic on the main line at the point at which the vehicles merge.

Figure 1 Example of poor junction design for a busy acces on to a 70mph road

The likelihood of an accident situation occurring
Key factors to consider are:

- Traffic flow and speed. In rural areas, accident risk is known to be linked to both of these factors. In urban areas, the influence is not straightforward, and increased traffic flow can sometimes be associated with reduced accident risk, presumably because the resulting speeds are lower.
- The presence of warning signs or other measures that reduce the risk. Permanent, mandatory speed restrictions are a prime example of this case, and such measures may well be preferred over improving the skid resistance as a way of reducing risk.

The severity of the outcome in the event of an accident
In particular, it is known that head-on or side impacts at speed, and impacts involving vulnerable road users are frequent mechanisms of death and serious injury.

These examples illustrate the approach taken to develop advice for assigning ILs for each of the site categories. Similar considerations apply to the site investigation stage of the Standard. However, unlike the situation with the bulk reviewing of ILs, at the site investigation stage, there is an opportunity to review the nature of the site in detail. Therefore, the site investigation also considers:

- Other information about the pavement condition, such as the texture depth, the presence of surface defects and the location and extent of the deterioration in skid resistance.
- The observed accident history, including whether the location of wet or wet-skid accidents appears to be linked to the lengths with low skid resistance.

- The adequacy of the road layout for different types of road user, and the clarity of direction signs and road markings.

Although, as noted in Appendix 1, the objective of the site investigation is to identify "high risk" sites for treatment to improve the skid resistance, the observed accident history is not the only factor to consider in making this assessment. Firstly, this is because the number of accidents at an individual site is generally too small to allow a statistically robust assessment of the actual risk, and therefore other ways of assessing the risk are important. Secondly, in the event of continued to deterioration, it is desirable to intervene to improve the skid resistance even in the absence of a previous accident history, to avoid the "accident waiting to happen".

4. RESPONSIBILITIES AND MONITORING

Implementation of HD28 inevitably involves a number of different parties - for English trunk roads this is indicated in Figure 2. It is vital for effective implementation that all parties involved understand their responsibilities and how fulfilling them contributes to achieving the overall objectives. Within IAN98/07 this is addressed through:

- Summarising the background to HD28, and indicating how the processes within the Standard contribute to meeting the objectives (section 2).

- Listing the responsibilities of HA and its service providers associated with each of the main processes, i.e. setting and reviewing IL, obtaining skid resistance data, and carrying out site investigations and subsequent actions (section 3).

- Specifying minimum requirements for documentation (section 3.4). This is important to enable the HA to check that its processes are being implemented, but also to provide records of the sites that are, and are not, treated to improve the skid resistance as a result of implementing this policy. This information is crucial to provide a means of monitoring the overall safety benefits, and determining whether an overall increase in skid resistance on the network would be justified in terms of the safety benefits, or whether the resource would be more effectively targeted at other improvements.

- Giving a template for recording the outcome of site investigations in a way that promotes effective risk assessment by highway engineers, and enables robust and consistent recording.

5. SUMMARY

IAN98/07 was prepared to assist HA service providers in implementing the UK policy for managing the skid resistance on trunk roads effectively, and in doing so to facilitate good record keeping, promote consistent and effective decision making and maximise the benefits by targeting maintenance to improve the skid resistance at those sites most likely to deliver safety benefits. The advice was developed based on a combination of the results of accident studies on the English trunk road network and a general knowledge of the factors influencing accident risk.

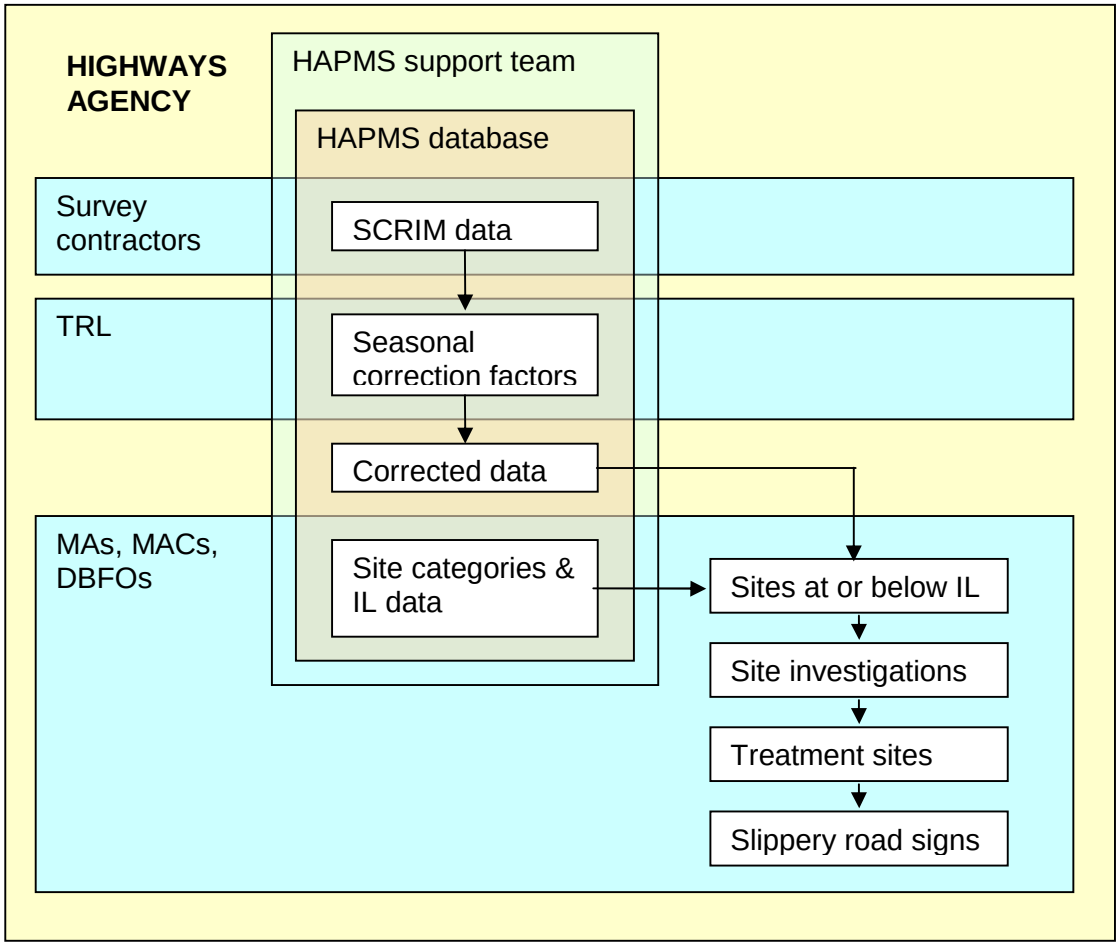

Figure 2 Parties involved in implementation of HD28 for English trunk roads

6. ACKNOWLEDGEMENTS

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APPENDIX 1: BACKGROUND TO ACCIDENT FINDINGS

On trunk roads, for most site categories, there is an increase in the mean accident risk (the number of accidents per 100 million vehicle km) as the skid resistance falls. This is shown in Figure 3 for single carriageway non-event sites on English trunk roads (Viner et al., 2004; Parry and Viner, 2005).

Figure 3 also shows there is a substantial difference in accident risk between the mean trend (shown by the filled symbols) and the sites with the highest risk, indicated by the 95 percentile trend (shown by the open symbols). Although not shown on the Figure, a substantial number of sites in each skid resistance band were found to have zero accident risk, i.e. no accidents had been observed in the six year study period (1994-2000). This behaviour is consistent with the tendency for accident data to follow a Poisson distribution; similar patterns were found for the other site categories.

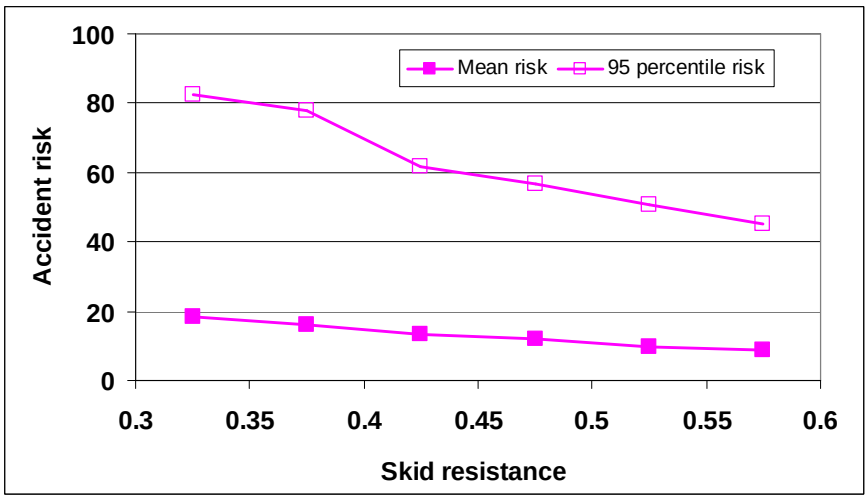

Figure 3 Mean and 95 percentile trend for single carriageway non-event sections

The implication of this variability in accident risk is that the Standard will be most effective if treatment can be targeted effectively at sites, below the investigatory level, that exhibit the highest accident risk. Furthermore, there could be benefits in maintaining a higher level of skid resistance at sites with a higher accident risk and these should therefore be assigned higher ILs.

However, these statements presuppose that "high risk" sites can be identified in practice, and the observed accident risk proves to be amenable to reduction through improving the skid resistance (Viner et al., 2005). This requires that an element of variability in the accident risk between different sites is systematic as opposed to random. Random variation implies that a site for which a high accident risk has been observed in the past has no greater or lesser chance of accidents in future than any other site. Conversely, if the variation is systematic, i.e. as a result of real differences between sites that influence accident causation, then the skid resistance Standard can provide the greatest benefits by targeting treatment effectively at sites with the greatest potential for reducing accidents.

To investigate this, the accident data in the study were summarised over two time periods: 1995 to 1997 and 1998 to 2000. The sites were then grouped according to whether or not accidents had been observed in each of these time periods. The leftmost pair of bars on Figure 4 indicates that, for all sites taken together, no accidents were observed in the period 1998-2000 for about 75% of sites, with at least one accident recorded for the remaining 25% of sites.

However, when the sites are split using the criterion of whether or not any accidents had been observed in the preceding period (1994-1997), it can be seen that a clear difference emerges: sites at which accidents had been observed in the previous three year period (right hand bars) were much more likely to have accidents in 1998-2000 than the sites where there had been no accidents in the previous three years (central bars). These findings need to be treated with caution, since it has not been demonstrated that improving the skid resistance alters this pattern. However, the indication that at least an element of the variation in accident risk is systematic in nature means that there is potential to maximise the benefits of the Standard by correctly identifying "high risk" sites for treatment.

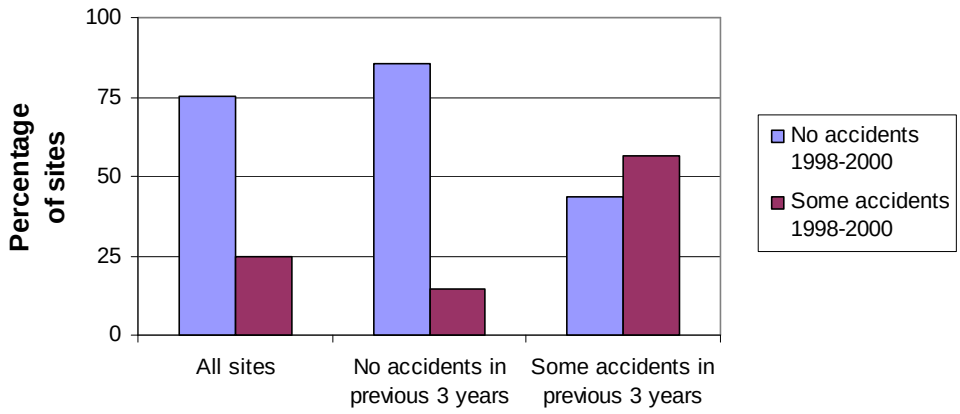

Figure 4 Random vs. systematic variation in accident risk