SKIDDING RESISTANCE STRATEGY	
HGD NO: 5.1	POST: Principal Engineer (Pavements)
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1. Introduction

1.1 The maintenance of adequate levels of skidding resistance contributes significantly to network safety. The term refers to the frictional properties of a wet road surface. However, whilst the frequency of collisions is expected to increase as skidding resistance falls the effect will be more pronounced for more “difficult” sites. These are those where there is an increased risk of skidding collisions, eg bends, junctions, steep gradients, pedestrian crossings and traffic signals. There is no skidding resistance boundary at which a surfacing passes from being “safe” to “dangerous”.

1.2 Road safety is a major concern nationally and locally and is reflected in the authority’s 4th Local Transport Plan (1). The Lincolnshire Road Safety Partnership (LRSP) recognises that the implementation of engineering measures can provide quantifiable casualty reduction. As well as specific local safety schemes, the County also implements an annual programme of surface treatments to improve skidding resistance. A proportion of the maintenance budget is allocated specifically to treat the highest priority sites. In addition an asset management approach is taken with maintenance using a balanced approach between structural, surface and skidding resistance condition to prioritise future works. These make a significant contribution to road safety.

1.3 The recommendations provided in the "Well-managed Highway Infrastructure: A Code of Practice" (3) are based on a guidance note produced by ADEPT (4).

2. Purpose

2.1 The purpose of this strategy is to describe how skidding resistance will be monitored on the County's Strategic Road Network, to identify lengths of road that may have a potential skidding resistance problem and subsequent action to be taken. Reference is made to the approach used to measure skidding resistance and to monitor collisions on the non Strategic Road Network.

3. Network Coverage

3.1 The County's Highways Infrastructure Asset Management Plan (5) states all the Major Road Network (MRN) & Hierarchy 1 & 2 networks are subject to routine skidding resistance testing. The MRN & Hierarchy 1 & 2 networks comprise the County's Strategic Road Network (SRN). The SRN includes the County's Principal Road Network (PRN).

3.2 Changes to the network coverage between 1988 and the current strategy are summarised in Appendix G.

3.3 Coverage beyond the Strategic Road Network is limited to ad hoc requests commissioned by the local network offices or the Lincolnshire Road Safety Partnership.

4. Test Equipment & Operational Procedures

4.1 Routine measurement of skidding resistance on the authority's Strategic Road Network is undertaken by the **S**ideway-force **C**oefficient **R**outine **I**nvestigation **M**achine (SCRIM). The SCRIM test equipment, the calibration requirements and procedures for making skid resistance measurements with a SCRIM are defined in the specification contained within the authority's SCRIM survey contract (6).

4.2 Site specific investigations can be supported by the use of the GripTester to measure skid resistance on footways, cycleways and carriageways. The survey is commissioned and processed by Lincs Laboratory in accordance with their Work Instruction WI/P/13 "GripTester Surveys" (7).

4.3 A portable Pendulum Skid Tester can be used for localised investigations. The site testing is undertaken by Lincs Laboratory in accordance with Road Note 27 (8).

4.4 GripTester and Pendulum Skid Tester results are reported by Lincs Laboratory in accordance with their "Reporting Standard" (9)

5. Survey Method

5.1 In 2005 the authority switched to an alternative survey method to estimate the summer skid resistance known as the Characteristic SCRIM Coefficient (CSC) as recommended in HD28/04 (2). This is designed to reduce within-year and between-year variations of skid resistance.

5.2 To derive the CSC values the authority adopted the method published in HD 28/04 (2) called “Annual Survey with Benchmark Method” albeit with only a third of the Strategic Road Network surveyed each year. Commencing in 2015, six benchmark sites are surveyed four times during the three visits to the County. Two benchmark visits are to take place at the beginning and the end of the required single SCRIM run survey. The remaining two benchmark runs are surveyed as defined in the authority’s SCRIM survey contract (6). The location of these benchmark sites are detailed in Appendix A.

5.3 The survey methods used between 1988 and 2014 are summarised in Appendix G.

5.4 Routine measurements are confined to the SCRIM testing season, a period from 1 May to 30 September, when the lowest skidding resistance is generally observed. For the purpose of routine monitoring, skidding resistance measurements are made on a wetted road surface.

5.5 Processing of survey data includes the application of speed correction, multiplication by the Index of SFC applicable to the SCRIM to derive a corrected SCRIM Coefficient (SC) and calculation of CSC. The CSC calculation follows the guidance contained in HD 28/04 (2).

6. Frequency of Survey

6.1 The routine monitoring frequency on the County’s Strategic Road Network is a 3 year rolling programme, ie one third per annum. Frequency beyond the Strategic Road Network is limited to ad hoc requests commissioned by the local network offices or the Lincolnshire Road Safety Partnership.

6.2 Changes in the survey frequency between 1988 and the current strategy are summarised in Appendix G.

7. Site Categories and descriptions

7.1 The site categories used in Lincolnshire and their respective definitions are detailed in Appendix C. These site categories are compared to those contained in HD28/04 (2) and IAN98/07 (20). The variations are a sub-division of site category Q (HD28/04) into site categories D, E, F and J, the classification of bends and the separate consideration of lay-bys and exits from roundabouts. A site category is assigned to each part of the Strategic Road Network.

7.2 To assist the site categorisation process the additional guidelines contained in Appendix D are applied. These have been developed by the authority while undertaking SCRIM surveys on the County's Strategic Road Network and experience suggests that they are appropriate. The highlighted amendments to the HD28/04 and IAN98/07 site definitions can be traced back to "Highway Maintenance - A Code of good Practice" published in 1989 (10) and the previous HD 28 published in 1994.

7.3 Site categories on the Strategic Road Network will be reviewed on a three year rolling programme, ie one third per annum, to coincide with the programmed SCRIM survey to identify any significant changes to the network, eg traffic signal installation, S278 works.

8. Investigatory Levels

8.1 An Investigatory Level is assigned to each site category on the Strategic Road Network to enable a comparison with the CSC to be made. The Investigatory Levels used in Lincolnshire for SCRIM, GripTester and Pendulum Skid Tester are illustrated in Appendix C.

8.2 Table C1 is for the Strategic Road Network. Compared to those contained in HD28/04(2) and IAN98/07(20) the variations are a lower level for single carriageway non-event lengths, approaches to minor junctions on dual carriageways, the treatment of bends, two investigatory levels for approaches to roundabouts and crossings based on speed limit, the provision for lay-bys and the exit from roundabouts. These local variations have been used by the authority while undertaking SCRIM surveys on the County's Strategic Road Network and experience suggests that they are appropriate. Some of these local variations to the Investigatory Level can be traced back to "Highway Maintenance – A Code of good Practice" published in 1989 and the previous HD 28 published in 1994.

8.3 Table C2 is for the Hierarchy 3, 4 and 5 road networks.

9. 9. Identification of Deficient Sites

9.1 A “preliminary investigation” is undertaken to identify deficient sites on the County’s Strategic Road Network, ie those with a potential skidding resistance problem. This is carried out in accordance with the appended flow chart B1 (Appendix B).

9.2 All lengths identified as being below the Investigatory Level on the Strategic Road Network during the previous two years are reassessed on an annual basis alongside the three year accident record used to assess the most recent survey data - refer to flow chart B1 (Appendix B).

9.3 Across the Classified and Unclassified road network other sites with a potential skidding resistance problem are identified by the Lincolnshire Road Safety Partnership using the authority’s collision database and by network ~~divisional~~ staff in response to feedback from the general public. A site specific investigation using either the GripTester or portable Pendulum Skid Tester will assist with identifying whether a site has a potential skidding resistance problem - refer to flow chart B2 (Appendix B).

9.4 Surface texture depth has an important influence on the skidding resistance afforded to higher speed traffic, ie >40mph. Texture depth measurements are available from a SCANNER survey (**S**urface **C**ondition **A**ssessment of the **N**ational **NE**twork of **R**oads). SCANNER surveys are carried out on the A, B & C road network as part of the mandatory reporting requirements for National Indicator performance monitoring. Texture depth can be also measured by the Mini Texture Meter & “sand patch” method.

10. Slippery Road Warning Sign requirements

10.1 Sign schedules and location details for slippery road warning signs on the Strategic Road Network are prepared to cover all sites identified during the “preliminary investigation” as deficient in accordance with the appended flow chart B1 (Appendix B). These slippery road signing recommendations are passed to the Technical Services Partnership's Signs & Lines team to programme the signing work.

10.2 The slippery Road warning sign is Diagram 557 in “The Traffic Signs Regulations and General Directions” (11). The recommendations contained in the slippery road warning sign schedules and location details are based on advice given in “Traffic Signs Manual Chapter 4 Warning Signs” (12). These

recommendations provide slippery road warning sign cover for deficient sites on the Strategic Road Network and for traffic joining from another Hierarchy 1 or Hierarchy 2 routes. No warning sign provision is provided for traffic joining a signed SCRIM deficient site on the Strategic Road Network from a lower hierarchy road, ie Hierarchy 3, 4, 5, 6 or 7. Further guidance and interpretation is summarised in Appendix E.

10.3 Where there is a need for additional slippery road signs on the Strategic Road Network this must be coordinated with the sign coverage for deficient sites identified by this strategy.

10.4 Below the Strategic Road Network the need for slippery road warning signs is identified on an ad hoc basis by Highways staff, including local network offices and the Lincolnshire Road Safety Partnership. This may include a recommendation from a site specific GripTester or portable Pendulum Skid Tester survey – refer to flow chart B2 (Appendix B).

11. Evaluation & Prioritisation of Treatment Sites

11.1 The prioritisation of work to improve the skidding resistance at deficient sites identified by this strategy on the Strategic Road Network is based on a Priority Rating. This is the "benefit", ie the estimated potential saving gained at a site by reducing the number of collisions in wet conditions to the County's average rate, compared to the cost of the treatment. This ratio is used to prioritise all the deficient sites on an annual basis. The Priority Rating model is detailed in Appendix F.

11.2 In conjunction with Lincolnshire Condition Indicator (LCI) results and deflectograph information, SCRIM results and deficient sites are used to identify and prioritise maintenance schemes to be included in the forward programme on the SRN for either renewal, resurfacing or surface dressing.

12. Site Investigation

12.1 There are far too many deficient sites identified by this strategy on the Strategic Road Network to inspect each one on a yearly basis. A desk based study that includes the "Identification of Deficient Sites" and "Evaluation & Prioritisation of Treatment Sites" enables resources to be targeted.

12.2 A site investigation is carried out at those sites:

- With a sufficiently high priority rating to be considered for imminent treatment;
- Identified for inclusion in the following year's maintenance programme.

12.3 In addition site investigations are carried out by the Lincolnshire Road Safety Partnership at potential local safety schemes identified using the authority's collision database and by local network staff in response to feedback from the general public.

12.4 Further advice about the choice of surfacing materials and aggregates to provide the appropriate level of skid resistance is contained within the authority's "Code of Practice. Highway Works: Standards, Materials and Testing" (14). Other processes such as re-texturing treatments to provide short-term improvements to skid resistance and/or texture depth, eg high pressure water jetting, are referenced in Lincs Laboratory Briefing Notes.

13. Quality Assurance

13.1 The Quality Assurance requirements for data collection by the appointed SCRIM survey contractor are detailed in the County's SCRIM survey contract (6).

13.2 Engineering Consultancy and data collection services are delivered by Lincs Laboratory (Technical Services Partnership), as part of their BSI certified Quality Management System, accredited to ISO 9001:2015 ~~2000~~. The process to monitor the skidding resistance on the County's Strategic Road Network is Work Instruction WI/P/03 "SCRIM Management" (15).

13.3 Signing and Engineering works associated with identified deficient sites and those selected for treatment are delivered by the Technical Services Partnership. The design and supervision is covered by their BSI certified Quality Management System, accredited to ISO 9001:2015

13.4 Lincs Laboratory's testing services are covered by their UKAS accredited Quality Management System.

14. Management Responsibilities

14.1 Management responsibility for delivering the strategy described in this HAT is:

Overseeing the strategy & resources	Head of Highways Asset Management
Implementation of the strategy to monitor the skidding resistance on the County's Strategic Road Network	Highway Assessment & Laboratory Manager (Lincs Laboratory)
Implementation of the slippery road warning sign recommendations	Head of Design Services

15. Timetable

15.1 These functions are carried out every year but only on a third of the Strategic Road network based on the three year rolling programme:

Delivery of raw SCRIM data by the survey contractor to the authority.	Raw data available by 31 October Note; SCRIM survey testing season is 1 May to 30 September.
Review site categories and computation of Characteristic SCRIM Coefficient (CSC).	CSC data available by 31 January in the year following the survey.

15.2 These functions are carried out every year and cover the whole Strategic Road Network using CSC data from the previous three years. All the dates are in the year following receipt of the most recent SCRIM data:

Identification of deficient sites and produce signing recommendations.	Schedules available by 30 April.

Implementation of the slippery road warning sign recommendations.	**ACTION: To be agreed with TSP**
Evaluation and prioritisation of treatment sites and publication of sites identified for treatment.	Details available by 31 August.
Pavement assessment at identified sites.	Report dates to be included in TSP's Works programme for the following financial year
Engineering works; design and supervision.	Design, tender & construction dates to be included in TSP's Works programme for the following financial year

16. Results

16.1 SCRIM results, slippery road warning sign recommendations and site categories and their description are available for the Strategic Road Network through the Corporate GIS system.

17. Monitoring

17.1 Progress is reviewed by the Head of Service Development and the Laboratory Services Manager at their quarterly survey meeting held at Lincs Laboratory.

17.2 As part of the National Road Maintenance Condition Survey (NRMCS) the Department for Transport has collected skidding resistance information since 1999. The authority submits an annual return with information on the percentage of the Principal Road Network and the non Principal classified network at or below the Investigatory Level.

17.3 A local performance indicator to monitor skidding resistance is included in the authority's 2nd Local Transport Plan (1). LTP10 "Skidding Resistance on Principal Roads" monitors the percentage of the Principal Road Network at or

below the Investigatory Level.

18. Early Life Skidding Resistance of Asphalt Surfacings

18.1 Advice on the early life skid resistance of a newly laid asphalt surface is not included in this HAT. Further explanation is provided in the Highways Agency's Interim Advice Note IAN 49/13 (21). It states that Slippery Road Warning signs to cover the extent of a new surfacing should not be erected at any newly resurfaced sites where the surfacing laid complies with the specification.

18.2 Concerns have been raised with regard to horses slipping on a newly laid negatively textured asphalt surface. Further guidance is provided in Lincs Laboratory Briefing Note No 1/2005 (17) and the authority's "Code of Practice" (14).

19. Archived Records

19.1 Records are retained to demonstrate the implementation of this HAT and to defend claims made against the authority.

20. Superseded Document/Instruction

20.1 Work Instruction WI/HM/707.03 Revision 2. SCRIM Process. Highways Division. Lincolnshire County Council. February 1998.

20.2 Highways & Traffic Guidance Note HAT 60/1/09 Skidding Resistance Strategy. Lincolnshire County Council. May 2009.

21. Review Date

21.1 The author is responsible for any updates or deletions to this HAT to meet changes in circumstances.

Appendices

22. References

1. 4th Local Transport Pan 2013/14 to 2022/2023. Lincolnshire County Council. April 2013.

2. HD 28/04 Skid Resistance. Design Manual for Roads and Bridges, Volume 7. Highways Agency, August 2004.

3. Well-managed Highway Infrastructure: A Code of Practice. UK Roads Liaison Group. October 2016.

4. CSS Guidance note “Skidding Resistance”. ADEPT (Formerly County Surveyors Society), May 2005.

5. Highways Infrastructure Asset Management Plan. Lincolnshire County Council. April 2019.

6. Contract for the supply of Highway Condition Survey (SCRIM) 2019-2021. Lincolnshire County Council. February 2019.

7. Work Instruction WI/P/13 GripTester Surveys. Technical Services Partnership. Lincolnshire County Council.

8. Road Note 27 Instructions for using the portable skid-resistance tester. Road Research Laboratory. 1969.

9. Laboratory Reporting Standard. Technical Services Partnership. Lincolnshire County Council.

10. Highway Maintenance. A Code of Good Practice. Local Authority Associations. 1989.

11. The Traffic Signs Regulations and General Directions. The Stationery Office. London. 2016.

12. Traffic Signs Manual Chapter 4 Warning Signs. Department for Transport. 2018 ~~2004.~~

13. Work Instruction WI/S/03 Inventory Surveys. Technical Services Partnership. Lincolnshire County Council

14. Code of Practice. Highway Works: Standards, Materials and Testing. Lincolnshire County Council. Version 5.4.1. January 2019.

15. Work Instruction WI/P/03 SCRIM Management. Technical Services Partnership. Lincolnshire County Council.

16. Lincs Laboratory Briefing Note No 5/2003. Early life skidding resistance. Lincolnshire County Council. 2003.

17. Lincs Laboratory Briefing Note No 1/2005. Thin Surface Courses. Lincolnshire County Council. 2005.

18. Lincs Laboratory Briefing Note 1/2007. Early Life Skidding Resistance. Lincolnshire County Council. 2007.

19. Published Project Report PPR497. Griptester trial – October 2009. Transport Research Laboratory, August 2010.

20. Interim Advice Note IAN98/07. Guidance for HA Service Providers on Implementing the Skid Resistance Policy (HD28/04). Highways Agency September 2007.

21. Interim Advice Note IAN49/13. Use of Warning Signs for New Asphalt Road Surfaces. Highways Agency. February 2013.

22. HD 28/15 Skid Resistance. Design Manual for Roads and Bridges, Volume 7. Highways Agency, July 2015.