

Selection of Surface Treatments to Improve Skid Resistance

This Technical Direction provides surface treatment options to improve skid resistance for various pavement surfacing types.

Introduction

This Technical Direction (TD) complements the RMS Policy PN 263 Management of Skid Resistance and associated technical procedure for skid resistance investigation. It provides surface treatment options to improve skid resistance. The selection of appropriate treatments is based on the outcomes of RMS Technical Procedure ILC-AM-TP1-401 Management of Skid Resistance.

Skid resistance is the frictional relationship between a pavement surface and a vehicle's tyres during braking or cornering manoeuvres. There are many factors contributing to the occurrence of crashes other than those involving skidding on wet road surfaces. Where skid resistance can be identified as a factor, appropriate surface treatments can be an effective option.

During the investigation process a range of pavement defects may be identified at an individual site. Not all the identified defects will contribute to low skid resistance. In general two types of pavement defects occur, namely structural and surface. Structural defects are those defects, such as cracking, which may weaken the pavement but do not have a direct influence on skid resistance. Alternatively, surface defects, such as excess binder on the surface, have no long term effect on the pavement strength but have a significant impact on the pavements skid resistance. To assist in the selection of an appropriate treatment, an engineering decision needs to be made to identify which defects are intrinsically linked to the pavement's low skid resistance.

Scope

The scope of this TD is limited to providing appropriate surface treatment options for pavements with surface defects which directly contribute to low skid resistance. This TD does not provide treatments for structural defects.

Surfacing types

Surface types considered in this TD are:

- Textured Concrete: Hessian drag finish, longitudinally tyned, horizontally tyned, conventional diamond grinding (CDG), broomed finish and steel float finish
- Steel Fibre Reinforced Concrete (SFRC): horizontally tyned and conventional diamond grinding (CDG)
- Asphalt: Dense Grade Asphalt (DGA), Stone Mastic Asphalt (SMA) and Open Grade Asphalt (OGA)
- Sprayed seals (SS)

For:	Asset Managers, Network Managers, Pavement Planners and Engineers		
Enquiries:	Principal Engineer RP&GE	Phone:	8837 0580
Amendment / Addition to:	None	Ref File:	

- Slurry and Microsurfacing (S&M)

Treatment types

Treatment types and relevant specification considered in this TD are:

1. Waterblasting - High pressure waterblasting can be used to improve the macrotexture of pavements by removing the excess binder and residues such as petrol, oil, grease, or rubber tyre particles. RMS specification R103 High Pressure Water Blasting is to be used to procure this treatment. The application of this specification does not include the treatment of asphalt. For use as an asphalt treatment, seek advice from RMS Pavement Surfacing. Typical treatment lifespan is 3 to 7 years.
2. Slurry and Microsurfacing (S&M) - the term 'bituminous slurry' or 'slurry' can include 'slurry seal' and 'microsurfacing'. It is a mixture of aggregate, filler, binder, water and additives to form a slurry. The process can be used to improve surface shape through the filling of ruts in the pavement. Procurement of this treatment is through RMS specification R109 Bituminous Slurry Surfacing. Typical treatment lifespan is 4 to 8 years.
3. Shot blasting – Shot blasting is a process where metal pellets are shot at high speed at the pavement surface in order to restore both macrotexture and microtexture. The process is predominately used to restore microtexture to polished aggregates. RMS do not have a specification for the procurement of this treatment type, therefore advice should be sought from RMS Pavement Surfacing. Typical treatment lifespan is 2 to 3 years.
4. Reseal/Resurface – A seal or asphalt applied to an existing sprayed sealed, asphalt, or concrete surface. This treatment also includes asphalt mill and resheet as an option. Selection of this treatment type must ensure that aggregate selected does not have a lower PAFV than the existing aggregate. RMS specification to be adopted for sprayed seal works and asphalt works are R106, R107, R111, R116, R117, R119 and R121. Typical asphalt treatment lifespan is 10 to 15 years. Typical sprayed seal treatment lifespan is 5 to 10 years.
5. Cold milling – The use of this treatment should produce groove depths in the existing surface of between 5 to 10 mm in depth without fully removing the existing surface. This is achieved by the use of a fine milling drum. This process is to be carried out in accordance with Clause 4.4 of RMS Specification R101 Cold Milling of Road Pavement Materials. Typical treatment lifespan is 3 to 4 years.
6. Diamond Grinding (DG) - Diamond grinding is used to achieve one or all of the following: (a) improvements to ride characteristics and surface correction; (b) restoration of proper surface drainage; (c) provision of surface texture. Diamond grinding must be carried out in accordance to RMS specification R93 - Diamond grinding of concrete pavement. Typical treatment lifespan is 4 to 6 years.

Selection of treatments

To simplify the treatment selection process refer to Table 1, which consists of a matrix of common surface types, surface defects and treatments. To use Table 1, select the affected surface type from the top row, then from the first column select the cause of low skid resistance (as determined by RMS TP ILC-AM-TP1-401). The intersection of the selection above is the treatment option/s. Where '★' is nominated as the treatment type, further advice should be sought from RMS Pavement Surfacing as alternate treatments not listed in this TD may be considered.

Table 1 below must be used in conjunction with RMS TP (ILC-AM-TP1-401). Prior to carrying out the selected surface treatment all structural defects must be repaired. It should be noted that the repair of the structural defect/s may also have a positive affect on the pavements skid resistance and additional surface treatment may not be required.

For:	Asset Managers, Network Managers, Pavement Planners and Engineers		
Enquiries:	Principal Engineer RP&GE	Phone:	8837 0580
Amendment / Addition to:	None	Ref File:	

Other consideration for the selection of treatments are:

- cost of treatment
- availability of treatment
- Impact to traffic - time taken to carry out the treatment and any down time associated with the treatment
- local experience with treatment
- environmental factors

Table 1 Suitable treatments for improving pavement skid resistance

		Surface Types					
		Concrete		Asphalt		SS	S&M
		Non - SFRC	SFRC	DGA & SMA	OGA		
Possible Causes of Low Skid Resistance	Flushing/Bleeding (Excess binder)	N/A	N/A	1, 5, 4	1, 4	1, ★	1, ★
	Ravelling/Fretting	N/A	N/A	4	4	4, 2	4, 2
	Scaling	6, 4, ★	6, 4, ★	N/A	N/A	N/A	N/A
	Stripping	N/A	N/A	4	4	★, 4	★, 4
	Texture Loss (macrotexture)	1, 6, 2, 3, 4	1, 6, 2, 4	1, 5, 2, 3, 4	1, 3, 4	★, 1, 4	★, 1, 4
	Polishing (Loss of microtexture)	6, 3, 2, 4	6, 2, 4	5, 2, 3, 4, 6	3, 4	4	4
	Surface contaminants are bitumen, oil, grease, tyre rubber, mud, clay, and organic matter.	1, 4	1, 4	1, 3, 4	1, 4	1, 2	1, 2
	Pothole	★	★	4, ★	4, ★	4, ★	4, ★
	Corrugation	N/A	N/A	4	4	N/A	N/A
	Delamination	N/A	N/A	4	4	4	4
	Shoving/Depressions	N/A	N/A	★	★	★	★
	Excessive crack seal	★	★	★	★	★	★
Notes: 1 Water blasting, water cutting 2 Slurry/microsurfacing 3 Shot blasting 4 Reseal/resurface 5 Cold milling 6 Diamond Grinding ★ Seek advice							
<ul style="list-style-type: none"> • N/A - Combination of surface type and cause does not occur. • ★ – Seek advice from Pavement Surfacing • Recommended treatment types are ordered in terms of treatment effectiveness 							

Further advice

The range of surfaces, causes and treatments listed in Table 1 is not all inclusive. During site investigations, conditions may be uncovered that are not included in Table 1. In these circumstances technical advice can be sought from Pavements Surfacing.

For further information

- RTA (1996) Joint RTA/VicRoads Guide: Guidelines for the measurement and interpretation of skid resistance using SCRIM, Roads and Traffic Authority, Sydney, NSW
- RMS (2012) Management of skid resistance, Policy (PN 263), Roads and Maritime Services, North Sydney, NSW
- RMS (2012) Management of skid resistance, Technical Procedure (ILC-AM-TP1-401), Roads and Maritime Services, North Sydney, NSW

(signed)

Chris Harrison
 Group General Manager,
 Engineering Technology Services

For:	Asset Managers, Network Managers, Pavement Planners and Engineers		
Enquiries:	Principal Engineer RP&GE	Phone:	8837 0580
Amendment / Addition to:	None	Ref File:	