

Surface Characteristics of Bituminous Surfacing

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INTRODUCTION

This worktip provides guidance on selection of bituminous surfacing treatments in terms of surfacing characteristics and user performance requirements.

The primary characteristics that affect users are safety, noise and ride quality. Safety particularly relates to skid resistance, but also includes the effect of water spray on visibility.

SKID RESISTANCE

Skid resistance has two main components:

- a) surface texture (macro texture), which influences water dispersal and ability of a tyre to contact the road surface. It can be measured directly using the sand patch method or laser devices.
- b) degree of polishing (micro texture) of individual stone particles, which influences friction between a tyre and the stone surface. It is measured indirectly using friction testing devices.

Field measurement of skid resistance can be obtained using the following devices:

- Sideways Force Co-efficient Routine Investigation Machine (SCRIM) see Ref. 1
- Road Analyser and Recorder (Norsemeter, or commonly known as ROAR)
- Griptester
- British Portable Skid Resistance Tester (Pendulum).

Sufficient and uniform texture depth is relevant to high speed applications and is particularly important where changes in speed and direction are required, such as curves and braking areas.

Texture depth is generally greater with sprayed seals and increases with increasing aggregate size, provided the seal is in good condition.

Texture depth of asphalt is influenced by nominal size plus the grading of the asphalt mixture. The finest texture is obtained with mixes comprising small aggregate sizes only. These are generally only considered satisfactory in low speed

situations, such as residential streets and pedestrian areas.

The greatest texture in asphalt mixes is obtained with mixtures with a large proportion of coarse aggregate such as open graded asphalt (OGA), thin open graded asphalt (TOGA) and stone mastic asphalt (SMA).

OGA and TOGA provide additional water dispersal ability through porosity of the surfacing.

Susceptibility of aggregates to polishing is predicted using either the Polished Stone Value (PSV) test or Polished Aggregate Friction Value (PAFV).

Polishing is important in high risk situations such as signalised intersections, tight radius curves and stopping on steep grades.

Most road authority specifications apply minimum PSV or PAFV requirements for heavy traffic. In high risk situations, a value some 5 units higher than the minimum may be appropriate in order to reduce risk of skidding in wet weather.

SPRAY GENERATION

Water spray generation primarily affects visibility and safety. The amount of spray generated by vehicles is directly related to texture depth as discussed above. A device is available to measure spray generation.

NOISE

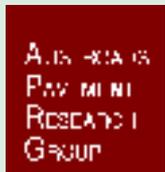
Surface noise generated by vehicles can be an important factor in urban areas, particularly for high speed arterials and freeways.

Asphalt surfaces are quieter than sprayed seals. The lowest noise levels are provided by OGA, TOGA and SMA.

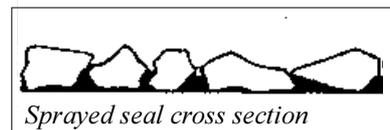
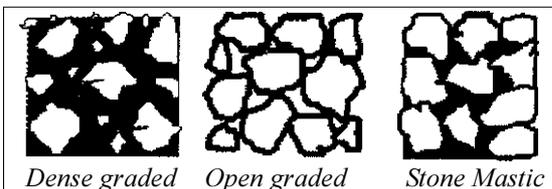
An indication of the relative noise rating of different surface types is provided in Table 1.

Key Summary

This issue of 'pavement work tips' provides guidance on selection of bituminous surfacing in terms of surface and user performance characteristics



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A further important factor in surface noise is surface roughness, particularly if it causes rattling of vehicles such as empty trucks.

RIDE QUALITY

A sprayed seal will reproduce the ride quality of the underlying surface. Where shape correction and improved ride quality is required, asphalt surfacing can be used, although slurry surfacing can provide minor shape correction in some circumstances.

SELECTING SURFACING TREATMENT TYPE

Selection of surfacing type involves a complex interaction of a number of factors, including pavement type, traffic stresses and required operating characteristics. Maintenance requirements and whole-of-life costs should also be considered.

Sprayed seals are generally used in rural areas due to cost, availability and suitability for flexible granular pavements.

Hot mix asphalt is used where greater resistance to traffic stresses is required for pavement strengthening or shape correction, and lower maintenance. These factors are generally applicable to urban areas and the more heavily trafficked roads. Asphalt surfacing avoids any concerns regarding loose stones from new seals in urban areas.

Dense graded asphalt mixes are most commonly used for strength, durability and resistance to traffic stresses. They can provide substantial improvement in noise reduction of existing pavements through improvement in smoothness and ride quality.

Other types of asphalt mixes (OGA, TOGA and SMA) have specialist application, providing particular texture characteristics in terms of noise or



Slurry surfacing shape correction work (photo courtesy Pioneer Road Surfaces)

compromise in terms of cost, durability, or lack of contribution to structural stiffness. Open graded mixes have low resistance to surface shear and should not be used at heavily trafficked intersections. SMA would be suitable at intersections. OGA must also be placed on a sound waterproof base or used in conjunction with a waterproofing membrane seal.

A further surfacing type is slurry surfacing, which provides a thin, uniform, fine textured surface, suitable as a maintenance retreatment on sound, stiff pavements with low to medium traffic levels.

Table 1 provides an indication of the relative noise generation, texture depth and initial cost of the various surfacing types on a rating scale of 1 to 10, with 10 providing the highest level of performance (greatest texture for skid resistance and lowest water spray, lowest noise level, and lowest cost).

Reference 1: A Guide to the Measurement and Interpretation of Skid Resistance using SCRIM (1985) – published by VicRoads and RTA, NSW.

For more information on any of the construction practices discussed in "pavement work tips", please contact either your local AUSTRROADS Pavement Research Group representative or AAPA — tel (03) 9853 3595; fax (03) 9853 3484; e-mail: info@aapa.asn.au

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TABLE 1: SURFACE CHARACTERISTIC RATINGS

Surfacing Type	Typical uses	Texture rating	Noise rating	Cost rating
Spray Seals 7mm 10 mm 14 mm	Light surfacing retreatment. General retreatments on all classes of roads, particularly in rural areas Treatment where high level of texture and skid resistance is required.	6 to 7 8 to 9 9 to 10	5 to 6 3 to 4 2 to 3	10 9 8
Dense Graded Asphalt 7 and 10 mm 14 mm	Surfacing for a large variety of light and medium duty applications Surfacing for heavily trafficked roads. Choice of binder type, mix design and aggregate PSV or PAFV is important for heavy duty applications	4 to 5 5 to 6	7 to 8 6 to 7	4 to 6 3
Open graded asphalt	Surfacing on high speed urban arterials and freeways where reduced water spray and noise levels is required	9 to 10	9 to 10	2
Thin open graded asphalt	Treatment where a thin, well textured but quiet surfacing is required	9 to 10	9 to 10	5 to 6
Stone mastic asphalt	Well textured, deformation resistant and crack resistant surfacing for heavily trafficked urban applications	8 to 9	8 to 9	1
Slurry	Maintenance retreatment with fine textured surface	6 to 7	7 to 8	7