Technical Note

Using Polish Resistance Aggregate

TN 42

March 2018

1. INTRODUCTION

The purpose of this Technical Note is to provide guidance for the selection of aggregates used in chip seal or asphalt pavement surfacing. The aim is to improve long term skid resistance of sites where demand for high levels of friction (skid resistance) are required. This may require the use of aggregates with significantly higher Polished Stone Value (PSV) than that provided for in current VicRoads standard specifications.

This Technical Note is based on VicRoads research [1,2] involving the investigation of skid resistance of pavement surfaces and on information from similar overseas studies. The research clearly shows a trend for improved long-term skid resistance with the use of more polish resistant (higher PSV) aggregates.

2. BACKGROUND

Skidding is generally the result of sudden braking or turning. Thus, higher surface friction may be required at sites where such manoeuvres are likely to occur. However, at these sites, the surface aggregate is often more prone to polishing.

Site Categories have been established based on risk of accidents and frictional demand. A brief description of the higher risk site categories is given in Table 1 (a full description of Site Categories is given in VicRoads Technical Note TN 110[3]).

3. DEFINITIONS

Polished Stone Value (PSV)*:* The laboratory measured parameter number which indicates the potential of an aggregate to polish under the action of traffic. The higher the PSV the greater is the resistance of an aggregate to polishing.

Sideways Force Coefficient (SFC)*:* The ratio of sideways force to the vertical reaction of an angled, rubber-tyred test wheel on a surface that is wet.

SCRIM® **:** Sideways-force Coefficient Routine Investigation Machine used to measure the skid resistance of a wet road surface referred to as SFC .

Note: SCRIM® is a registered trademark of W.D.M. Limited

Table 1: High Risk Site Category

Description
Signalised intersections, pedestrian and school crossings, railway level crossings and approaches to roundabouts
Curves with tight radius ≤ 250 m and > 100 m, Gradients ≥ 5 % and ≥ 50 m long, freeway/highway ramps
Intersections
Curves ≤ 100 m radius
Roundabouts

4. RELATIONSHIP BETWEEN PSV, TRAFFIC AND SFC VALUES

The major findings from VicRoads research into deterioration of skid resistance over time are as follows:

A. The value of SFC measured by the SCRIM® machine, after the pavement has been in service for a number of years, is related to:
   - The PSV of the aggregate used in the asphalt or sprayed seal surfacing; and
   - The volume, mix and manoeuvres of traffic.

B. The value of SFC of a surface typically:
   - Approaches the PSV of the aggregate used in the surfacing about one to four years after commencement of traffic;
   - Decreases at a rate of about 0.01 to 0.02 units of SFC/year when the traffic volumes are about 10,000 vehicles/lane/day but decreases more rapidly at sites subject to braking, turning and with a higher percentage of heavy vehicles.

5. APPLICATION OF FINDINGS

Considering aggregate PSV, traffic volumes and site category, an indication of when frictional resistance of the surface may cease to be satisfactory is given in Table 2.

Table 2: Indicative Friction Life

Aggregate PSV	Traffic volume vehicles/lane/day	Indicative Friction Life (Years)			
		Curves with radius ≤ 100 m	Controlled Intersections, Pedestrian crossing and Roundabouts	Tight Curves (100 m < radius ≤ 250 m) Freeway Ramps	Other Intersections
48	5000	NS	NS	3 to 6	9 to 12
	10000	NS	NS	1 to 2	4 to 6
52	5000	NS	NS	6 to 8	15 to 18
	10000	NS	NS	3 to 6	8 to 10
56	5000	NS	3 to 7	14 to 16	> 20
	10000	NS	3 to 5	7 to 10	12 to 14
60	5000	4 to 6	12 to 15	> 20	> 20
	10000	2 to 4	6 to 8	11 to 14	16 to 17

The table shows the benefits, in terms of indicative frictional life (hence potential reduction in crashes) of selecting an appropriate PSV aggregate at sites with high skid resistance requirements and high traffic volumes

6. USE OF HIGH PSV AGGREGATES

Victoria has a limited supply of aggregates having a high PSV. It is therefore important that high PSV aggregates be conserved for use in surfacing at locations of high need. This will generally restrict the use of high PSV aggregates to locations carrying high traffic volumes and which require high friction resistance.

In some areas, high PSV aggregates may not be economically available. As an alternative to an aggregate with high PSV, it may necessary to:

- Plan to replace the surfacing on a more frequent basis;
- Use artificial aggregates in the asphalt or sprayed seal, or as a special treatment with high performance binders. (Further advice on artificial aggregates and special treatments may be obtained from VicRoads Asset services).

The choice of treatment must be made based on an economic analysis of the possible treatments considering initial cost, treatment life and effectiveness.

7. REFERENCES

1. VicRoads Materials Technology Department Technical Report TR 104 - *Road Safety and the Development and Design of Skid Resistant Surfaces*, 1998.
2. VicRoads/AARB TR Contract Report - *Pilot Study of Skid Resistance, Aggregate Performance and Accident Relationships*, 1997.
3. VicRoads- *Measuring and Interpretation of Skid Resistance using a SCRIM® Machine*, 2018.

VicRoads Technical Note - Revision Summary

TN 42 – Using Polish Resistant Aggregates

Date	Clause	Description of Revision	Authorised by
February 2018	2	Updated test method name as relevant	Manager – Pavement Technology
	3, 4(A), 7	Revised to reflect SCRIM® is a registered trade mark of W.D.M. Limited	
	3, 4(A), 4(B),	Changed sfc to SFC for maintaining consistency with relevant technical documents	
	Table 1 and Table 2	Defined lower limit (>100m) of the tight curves	
	7	Updated references according to the latest publication	