

Primersealing of Pavements

pavement work tips - No 43

August 2010

INTRODUCTION

The success of a primerseal relies on:

- preparation and finished condition of base materials
- selection of an appropriate primerbinder
- selection of an appropriate aggregate size
- selection of appropriate binder and aggregate application rates
- application procedures.

General guidelines for selection of primerseals are provided in pavement work tips No 18, Selection of initial treatments. The purpose of this particular work tip is to provide guidelines for the determination of binder and application rates.

SELECTION OF PRIMERBINDER

The choice of primerbinder is mainly influenced by the prevailing weather conditions, as well as the desired life of the treatment, and timing and type of final treatment. A guide to selection of common type and grade of primerbinder is shown in Table 1.

Alternative primerbinders for very heavy traffic and/or very warm to hot conditions include proprietary grades of polymer modified emulsions and cutback bitumen manufactured with Class 320 base bitumen in place of Class 170. These primerbinders provide for more rapid curing and reduced risk of bleeding in more demanding performance applications.

Table 1 Selection of type and grade of primerbinder

Primerbinder	Recommended Use
Medium grade (winter grade) of cutback bitumen	<ul style="list-style-type: none"> ▪ Cool and/or damp conditions. ▪ Tightly bonded or medium porosity type pavements.
Heavy grade (summer grade) of cutback bitumen	<ul style="list-style-type: none"> ▪ Warmer and/or dry conditions. ▪ Porous type pavements.
Bitumen Emulsion (60% and 67% bitumen content)	<ul style="list-style-type: none"> ▪ All year, but more suited to cool and/or damp conditions. ▪ Porous type pavements. ▪ When final surfacing is to be applied immediately or before adequate curing of a cutback bitumen primerbinder.

Typical composition of standard classes and field produced cutback bitumen primerbinders is shown in Table 2.

Table 2 Preparation of cutback bitumen primerbinder

Grade	Standard class (AS2157)	Approximate proportion of cutter oil. (vol. at 15°C)		Viscosity at 60°C (Pa.s)
		parts of cutter oil per 100 parts of bitumen	%	
Medium	AMC4	20	17	2.0–4.0
Heavy	AMC5	14	12	5.5–11.0

Key Summary

This issue of 'pavement work tips' provides some practical guidelines for the design of primerseals

SELECTION OF AGGREGATE SIZE

The aggregate size will depend on traffic and climatic conditions. For less than 1200 v/l/d, 5 or 7 mm aggregates are appropriate. For higher traffic volumes, 7 or 10 mm aggregate may be used except where conditions are either very hot or wet and 10 mm aggregate may be more appropriate.

PRIMERBINDER APPLICATION RATE

Basic application rates are shown in Table 3. These rates refer to the total volume of the mixture (i.e. including cutter oils and/or water content) expressed at 15°C. Rates will generally need to be adjusted to cater for allowances for absorption, surface condition and aggregate embedment.

Allowances for absorption are not generally required for primerseals except for unusually porous pavement materials such as sandy or silty rubble base course (sandstone, limestone or silty gravels), particularly in hot dry climates.

continued on reverse



In such cases, an allowance of + 0.1–0.2 L/m² may be applied.

Aggregate embedment allowances depend on the volume and mass of traffic and condition (hardness) of the pavement, in particular the top 20 mm of the surface layer. A guide to embedment allowance based on the Austroads Ball Penetration Test AG:PT/T251 is shown in Table 4.

Table 3 Basic primerbinder application rates (total volume of binder at 15°C)

Traffic (v/l/d)	Aggregate Size	Total Primerbinder Application Rate (L/m ² @ 15°C)		
		Cutback Bitumen	Bitumen Emulsion	
			60%	67%
≤150	7 or 5	1.3	1.6	1.4
	10	1.4	1.8	1.6
151–1200	7 or 5	1.2	1.5	1.3
	10	1.3	1.6	1.4
>1200	7 or 5	1.1	1.4	1.2
	10	1.2	1.5	1.3

Table 4 Embedment allowance

Ball Penetration Value (mm)	Traffic (v/l/d)			
	≤150	151–1200	1201–2500	>2500
Embedment Allowance (L/m²)				
<1	nil	nil	nil	nil
1–2	nil	– 0.1	– 0.1	– 0.2
2–3	nil	– 0.1	– 0.2	– 0.3
3–4	nil (Note 1)	– 0.1 (Note 1)	– 0.2 (Note 1)	See note 2
>4	See note 2			

Notes:

- Where the ball penetration value exceeds 3.0 mm, the maximum aggregate size should be limited to 7 mm.
- Primersealing is not recommended..

AGGREGATE SPREAD RATE

Aggregate spread rates should be about 120–140 m²/m³ for 5 and 7 mm aggregates and 100–120 m²/m³ for 10 mm aggregates.

BASE PREPARATION

Pavements should be prepared to a smooth dense surface and dried back to a suitable moisture content.

Surfaces to be primersealed should be slightly damp, but not wet. A dry surface will prevent the primerbinder from properly “wetting” the surface resulting in pinholes and a non-uniform film of primerbinder. Where the surface is excessively dry, a water tanker should be used to lightly dampen the surface just prior to spraying the primerbinder.

The need for a damp surface to assist uniform binder coverage should not be confused with the need to dry back the underlying base. Drying back affects both pavement strength and surface hardness. Aggregate embedment into excessively wet base materials can lead to severe flushing in the wheelpaths and, in extreme cases, binder pick-up, potholing or pavement rutting.

Further guidelines for the preparation of pavements, including drying back and degree of moisture saturation, are provided in Pavement Work Tip No 49 and Austroads Pavement Technical Note 13.

CURING AND LIFE EXPECTANCY

Primerseals constructed with cutback bitumen binders should not be resealed or asphalted until a reasonable period of curing has elapsed as any residual volatile cutter oil can soften the subsequent bituminous surfacing. The rate of curing depends upon primerbinder grade, application rate, and temperature. A minimum period of six months is generally recommended, but up to 12 months may be desirable in cooler conditions.

Primerseals constructed with bitumen emulsion binder may be covered with asphalt as early as 2 to 3 days, although a minimum curing period of three months is recommended before sprayed sealing.

A guide to the life expectancy of a primerseal is shown in Table 5.

Table 5 Life expectancy of Primerseals

Type of Primerbinder.	Grade	Life Expectancy
Bitumen emulsion	All	12–36 months
Cutback bitumen	Medium	6–18 months
	Heavy	12–36 months

REFERENCES

- Pavement Work Tip No 18, Sprayed sealing – Selection of initial treatments.
- Pavement Work Tip No 49, Preparation of pavements for priming and primersealing.
- Austroads Pavement Technical Note 13 – Controlling moisture in pavements.
- Austroads Test Method AG:PT/251 – Ball Penetration Test.
- Update of the Austroads “Sprayed Seal Design Method (AP-T68/06)”.

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

A complete list of “pavement work tips” issues is available on AAPA’s website: www.aapa.asn.au

Issues may be downloaded using Adobe Acrobat Reader. Copies may also be obtained from AAPA.

Material may be freely reproduced providing the source is acknowledged.

This edition was prepared by members of the Bituminous Surfacing Research Reference Group.