

Polymer Modified Binders and Multigrade Bitumens

pavement work tips - No 6

April 2014

INTRODUCTION

This Work Tip is a summary of the binder selection guidelines provided in the Austroads *Guide to the Selection and use of Polymer Modified Binders and Multigrade Bitumens* for binder types described in the Austroads *Specification Framework for Polymer Modified Binders* and for Multigrade Bitumens described in AS 2008 *Bitumen for Pavements*.

CLASSIFICATION OF PMBs

The polymer modified binder (PMB) classification system is coded in three parts; the application, an arbitrary numerical designation and the predominant polymer group.

Binder systems are coded as **S** for sealing grades and **A** for asphalt grades.

Polymer Groups are coded as in four specific polymer groups as:

- **E** for Elastomeric types
- **P** for Plastomeric types
- **R** for crumb Rubber materials
- **RF** for crumb Rubber binder that is produced in the Field.

For example:

- S10E is a sealing class based on an Elastomeric polymer
- A35P is an asphalt class based on a Plastomeric polymer
- S45R is a sealing class based on a crumb Rubber binder
- S18RF is a sealing class manufactured in the Field from crumb Rubber.

CLASSIFICATION OF MULTIGRADE BITUMENS

Multigrade bitumens are designated as **M** for Multigrade bitumens followed by a number to indicate the approximate viscosity at the classification temperature of 60°C (*AS2008 Bitumen for Pavements*).

M500 has a specified binder viscosity at 60°C of 400-600 Pa.s while M1000 implies a nominal viscosity of 1000 Pa.s at 60°C. Further test limits applied to multigrade bitumens define high and low temperature performance limits.

SPRAYED SEALS

PMBs and multigrade bitumens may be used to:

- improve shear resistance of surfacings in high traffic situations
- minimise or delay reflection cracking.

Benefits from improved shear resistance are utilised in High Stress Seal (HSS), and Extreme Stress Seal (XSS) applications, while

Strain Alleviating Membranes (SAM) and Strain Alleviating Membrane Interlayers (SAMI) are used for reducing the emergence of reflective cracking.

Further performance benefits leading to the selection of PMBs and multigrade bitumens in sprayed seals include:

- improved aggregate retention
- reduced risk of bleeding
- improved waterproofing
- better balance between high and low temperature performance properties
- ability to undertake earlier brooming and removal of surplus aggregate
- extended service life.

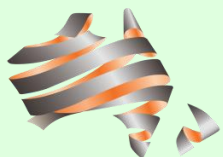
ASPHALT

PMBs and multigrade bitumens may be used in all types of asphalts (e.g. dense graded, open graded and stone mastic asphalt) to improve service performance or meet specific requirements including:

- improved rut resistance
- improved fatigue resistance
- improved aggregate retention (delay in onset of ravelling)
- improved resistance to high traffic stress (turning movements)
- increased crack control
- increased stiffness (possible reduced layer thickness).

Key Summary

This issue of "pavement work tips" provides a handy reference as a summary of the Austroads Guide to the Selection and use of Polymer Modified Binders and Multigrade Bitumens.



Austroads



continued on reverse

Table 1: Summary guide to the selection of PMBs and multigrade bitumens for sprayed seals

Application (1)	Service condition(2)				Binder class(3)							
	Cracking		Traffic		M500 /170	S10E	S15E	S20E	S25E	S35E	S45R S15RF	S18RF
	Activity	Width severity	Site severity	Loading								
HSS1	NA	NA	Moderate	Medium								
				Heavy								
			Severe	All								
HSS2(4)	NA	NA	Severe	Medium								
				Heavy								
XSS(5)	NA	NA	Severe	All								
SAM	Slow	All	NA	All								
	Rapid	Low	NA	All								
		High	NA	All								
SAMI	All	All	NA	All								

Recommended applications

NOTES:

- For description of sprayed seal types refer to Austroads reports AP-T68 and AP-T235. Note that HSS1 refers to single/single seal and HSS2 refers to double/double seal.
- For definition of service conditions refer to Austroads *Guide to the Selection and Use of Polymer Modified Binders and Multigrade Bitumens*.
- For details of binder classes, refer to Austroads *Guide and Specification Framework for Polymer Modified Binders and AS 2008*.
- In HSS2 applications, the suggested PMB materials relate to the first binder application only. The second binder application may use the same binder, but more commonly an unmodified or slightly modified binder.
- XSS involve the use a double/double seal with the same PMB in both binder applications.

Table 2: Summary guide to the selection of PMBs and multigrade bitumens for asphalt

Application	Service conditions(1)		Binder class(2)					
	Traffic	Temperature	M1000/ 320	A35P	A25E	A20E	A15E	A10E
Rutting resistance (Adequate pavement)	All	All						
Fatigue resistance (Marginal pavement)	All	All						
Rutting and fatigue (Adequate pavement)	All	Low						
		Medium or high						
Rutting and fatigue (Marginal pavement)	Medium	All						
	Heavy to very heavy							
Open graded asphalt	Light to medium	All						
	Heavy to very heavy	Low or medium						
		High						

Recommended applications

NOTES:

- For definition of service conditions refer to Austroads *Guide to the Selection and Use of Polymer Modified Binders and Multigrade Bitumens*.
- For details of binder classes, refer to Austroads *Guide and Specification Framework for Polymer Modified Binders and AS 2008*.

REFERENCES

- Austroads 2006, *Update of the Austroads Sprayed Seal Design Method*, AP-T68/06.
- Austroads 2013, *Guide to the Selection and Use of Polymer Modified Binders and Multigrade Bitumens*, AP-T235/13.
- Austroads 2013, *Update of Double/Double Seal Design for Austroads Spray Seal Design Method*, AP-T236/13.
- Austroads 2014, *Specification Framework for Polymer Modified Binders and Multigrade Bitumens*, Austroads Test Method AGPT/T190.
- Standards Australia 2013, AS 2008 Bitumen for Pavements.

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. Material may be freely reproduced providing the source is acknowledged. This edition was prepared by members of the Austroads Bituminous Surfacing Workings Group.