AUSTRALIAN ASPHALT PAVEMENT ASSOCIATION

advisory note 4

A GUIDE TO THE SELECTION OF BINDER FOR ASPHALT PAVEMENTS

This Advisory Note provides a summary of the principal binder types used in common applications. A more detailed guide to selection of binder type for specific applications, as well as determination of volumetric properties, is provided in the references listed below.

The selection of a binder for use in an asphalt mix depends on the environmental conditions and required engineering properties of the asphalt. Asphalt properties are a function of the volumetric properties of the mix (grading, binder content and voids relationships) and the characteristics of the aggregate, filler and binder.

Bituminous binders used in hot mix asphalt manufacture comprise two major groups:

- conventional bitumen
- modified bitumen binders.

Modified bitumen binders are further categorised as:

- multigrade binder (M)
- polymer modified binder (PMB).

Bitumen

Conventional bitumen complying with Australian Standard AS 2008 – Residual bitumen for pavements is the most common bituminous binder used in asphalt work in Australia. Bitumen is classified by its viscosity at 60ºC and comprises three major grades, Class 170, Class 320 and Class 600.

Class 170 bitumen is the softest grade and provides the greatest flexibility and durability for use in cool climates, and for light traffic.

Class 320 is a slightly harder grade of bitumen that is the most versatile and commonly used binder for hot mix asphalt in a wide range of applications. Compared to Class 170 bitumen, it provides greater resistance to potential for rutting and deformation at high service temperatures or heavy traffic.

Class 600 is an even harder grade of bitumen than Class 320. Its use is generally confined to heavy-duty asphalt base layers where greater asphalt mix stiffness is required. It can also provide increased rutting resistance for use as a wearing course layer, but increased stiffness can result in reduced resistance to cracking and fatigue in thin layers and it is generally more effective to use modified binders for such applications.

Modified Bitumen Binders

Multigrade binder

Multigrade binder is less susceptible to temperature changes than standard bitumen grades. For example, the C1000/320 grade used in asphalt mixes has a viscosity that is even harder than a Class 600 grade at a temperature of 60ºC (the temperature used for classification of bitumen and the highest surface temperature likely to be reached in service) but retains low service temperature properties comparable to a Class 320 bitumen. Rutting resistance and structural performance at high temperatures are thus at least equal to Class 600 bitumen, while fatigue and cracking resistance are similar to Class 320 bitumen.

To be classified as a multigrade binder, the bitumen must not contain polymer additive and can be generally stored and handled in the same manner as a conventional bitumen. Multigrade binder may not be readily available in all locations. A guide to specification criteria is provided in the Austroads Provisional Specification for Multigrade Binders.

Polymer modified binders (PMBs)

Bitumen may be modified by the addition of a polymer to increase binder toughness and elasticity. A range of PMBs that provide different levels of flexibility and resistance to surface stresses are available for various applications. A guide to the selection of PMB type and grade for specific applications is provided in the Austroads Specification Framework for Polymer Modified Binders.

continued

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PMBs require particular care in transport, handling and storage to avoid deterioration. PMBs are generally manufactured in minimum quantities, for use within a limited time after manufacture, and may not be readily available in small quantities, or in all locations. It is recommended that specialist advice be sought on the type, availability and suitability of all specialised binders (multigrade or PMB) before making a selection.

Table 1 Guide to selection of binder for asphalt wearing course applications

	CLIMATE		
APPLICATION	**HOT**	**MODERATE**	**COLD**
HIGHWAYS/FREEWAYS			
Heavy/Very Heavy Traffic – general applications	320	320	320
– special applications	M or PMB	M or PMB	M or PMB
Medium Traffic	320	320	170 or 320
STREETS			
Heavy Traffic	320	320	170 or 320
Medium & Light Traffic	320	170 or 320	170
DRIVEWAYS			
Industrial	320	320	170
Residential	320	170 or 320	170
PARKING LOTS			
Industrial	320, M or PMB	320, M or PMB	320, M or PMB
Passenger cars	320	170 or 320	170
RECREATIONAL/PEDESTRIAN			
Tennis courts, playgrounds, footpaths, etc.	320	170 or 320	170

References:

Asphalt Guide, AP-G66/02, Austroads, 2002

Australian Standard AS2008 – Residual Bitumen for Pavements

Austroads Provisional Specification for Multigrade Binders, AP-T01, Austroads, 2000

Austroads Specification Framework for Polymer Modified Binders, AP-T04, Austroads, 2000

Guide to the Selection of Road Surfacings, AP-G63/03, Austroads, 2003