

A Guide to ASPHALT FOR LIGHTLY TRAFFICKED STREETS

This guide has been produced with the requirements of Local Government particularly in mind.

PREFACE

Hot-mixed asphalts currently in use on road pavements are generally designed for optimum performance under conditions of medium to heavy loadings and traffic volumes. Asphalt properties that are optimal under these conditions are not necessarily the optimal properties for lightly trafficked pavement surfacing. In these lightly trafficked pavements, factors such as flexibility, impermeability, workability and durability are more critical than factors associated with high strength such as stability, stiffness and resistance to deformation.

SCOPE

This guide applies to the manufacture and placing of hot-mixed asphalts for use as a surfacing on lightly trafficked pavements such as residential streets, carparks, bicycle paths and recreational areas. It deals with the design criteria required to achieve the desired mix properties, as well as modification to standard practice in pavement preparation, spreading and compaction of the asphalt.

APPLICATION

This guide is not intended to be used in isolation. For all aspects of asphalt work, other than as outlined in the Scope above, or as detailed in the following sections, it is to be used in conjunction with the relevant Australian Standards. AS 2150 - 1978: Asphalt (Hot-mixed) AS 2734 - 1984: Asphalt (Hot-mixed) Paving - Guide to Good Practice.

MIX TYPES

Three types of asphalt mix are detailed in the following sections: "Aggregate Grading" through to "Layer Thicknesses".

AGGREGATE GRADING*

The general limits of aggregate grading within which the job mix is to be designed and manufactured are:

% Passing A.S. Sieve	Type A	Type B	Type R
13.2 mm	100	100	
9.5 mm	95-100	90-100	
6.7 mm	80-95	65-85	100
4.75 mm	65-80	60-80	85-100
2.36 mm	45-60	55-75	55-80
1.18 mm	35-50	45-65	38-60
600 gm	25-40	30-50	25-43
300 gm	15-25	20-30	15-30
150 gm	7-15	10-18	8-20
75 gm	3-10	5-11	5-12

BITUMEN CONTENT*

Bitumen content expressed as a percentage of the total mix

Type A	Type B	Type R
6.0%-7.0%	5.8%-6.8%	6.5%-7.5%

AIR VOIDS*

Percentage air voids in the compacted mix as tested by the Marshall method (at 35 blows).

Type A	Type B	Type R
3.0%-5.0%	3.0%-5.0%	3.0%-7.0%

STABILITY

Minimum stability of the compacted mix as tested by the Marshall method (at 35 blows).

Type A	Type B	Type R
4.0kN	4.0kN	3.5kN

FLOW

Flow of compacted mix (35 blow Marshall).

Type A	Type B	Type R
2-5mm	2-5mm	2-5mm

LAYER THICKNESSES*

Optimum range of compacted layer thickness

Type A	Type B	Type R
25-40mm	25-40mm	20-25mm

* Note that aggregate grading, bitumen content and air voids may need to be varied under certain circumstances to achieve other desirable mix properties, or for specialised mixes as in "Modified Binders" and "Additives" below. Also note that the range of layer thicknesses shown may be varied to better suit certain site or traffic conditions.

continued

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Type A – 10 mm nominal size “continuously” graded mix

Type B – 10 mm nominal size ‘!gap’ graded mix

Type R – 5 mm nominal size “continuously” graded mix

Types A & B are recommended for residential streets, carparks and commercial driveways carrying light traffic.

Type R would generally be recommended for use on very lightly trafficked pavements where a fine textured, smooth surface is more desirable. These pavements will generally include footpaths, bicycle paths, private driveways and recreation areas. Type R is also recommended for pavements where handwork is required over a substantial portion of the area being surfaced.

AGGREGATES

Aggregates used in the mix are to comply with AS 2150, but additional requirements may be specified for specialised applications. These additional requirements include such properties as shape of aggregate (e.g. rounded river gravel may be more appropriate to playground surfaces) and colour of aggregate (e.g. lighter or darker aggregates to differentiate varying areas.)

BITUMEN BINDER

It is recommended that the binder used will generally be a bitumen Class 170 (complying with AS 2008). However local conditions, particularly in hot climates, may allow for the use of a Class 320 bitumen.

MODIFIED BINDERS

The bitumen binder may be modified by the addition of various agents (such as SBS or EVA based polymers) to enhance the properties of the asphalt for specialised applications. These improved properties may include among others:

- decreased crack reflection
- greater tolerance to deflections
- increased durability

These improvements are dependent on a number of factors including the type and amount of agent used, the condition of the existing pavement surface and base layers, and the type and volume of traffic.

This guide does not aim to cover the properties, types, detailed design or optimum applications of modified bitumen binders, and intending users should consult the manufacturers for technical advice.

ADDITIVES

Additives may be included in the mix to produce different specialised mixes for particular applications. The additives include various types and sizes of rubbers for use on sporting surfaces.

PREPARATION OF PAVEMENT

It is essential that the pavement being surfaced is correctly prepared to ensure a satisfactory, long lasting asphalt surface. Particular attention should be paid to the following requirements:

For gravel pavements

A prime or primer seal may be considered, to aid adhesion both within the surface structure of the granular base, and between the granular base and the asphalt surface. This treatment should particularly be considered in areas subject to high longitudinal or transverse forces associated with braking, turning or cornering.

For untreated gravel surfaces, ensure that all loose material has been removed and that the surface is tightly bonded and compacted. A light dampening with water will be advantageous for most granular surfaces prior to sweeping and surfacing.

For surfaced pavements

Existing defects will need to be treated prior to surfacing, with particular attention being paid to the following:

Cracks and joints: particularly so if these are moving under load or wider than “hairline”. Non-treatment may result in reflection of these cracks or joints into the new surface.

Ruts, depressions and potholes: failure to reinstate these to the same level and density as the surrounding surface may again result in reflection of these defects into the surface.

Areas affected by distillate or chemical spillage: these result in softened binder which is flush at the surface. The deteriorated binder may flush through to the new surface unless removed or treated.

Unsound areas resulting from surface or base defects: these defects will reduce the life of the new pavement surface.

For surfaced pavements, other than those recently laid and still clean and dry, a tack coat should be applied to ensure adhesion between the existing layer and that to be placed. The residual binder content of the sprayed tack coat should be in the range of 0.1 to 0.2 litres per square metre.

SPREADING

The thin layer thicknesses often used on lightly trafficked pavements tend to cool more quickly than the thicker layers typical of heavily trafficked roads. It is thus important in planning the job to pay particular attention to the paving pattern.

The number of joints, both longitudinal and transverse, should be kept to a minimum. Care should be taken to ensure that as many of these joints as practicable are hot joints, particularly in areas subject to vehicle turning or braking forces.

Paver runs with associated handwork should be set out so that the compaction equipment has access onto the surface immediately spreading is completed.

When spreading by hand, ensure that the mix is not segregated by being thrown or scattered. The mix should be selectively placed and spread by lutes or the backs of rakes.

COMPACTION

The properties and the life of a correctly designed and spread asphalt surface are very dependent on the air void content of the insitu asphalt mix, which is in turn dependent, for lightly trafficked pavements, on the degree of compaction achieved during construction. The aim is to achieve a dense, smooth, impermeable mix with air voids attained after placement being as close as possible to a range between 6% and 8% which has been shown to provide adequate binder durability.

It is essential for the thin layers normally associated with lightly trafficked pavements that compaction is commenced as soon as possible after spreading, and completed in the shortest possible time.

Special attention should be paid to rolling techniques for gap-graded mixes. Generally less passes of the roller are required to produce the same degree of compaction as dense graded mixes. To lessen the risk of overcompaction, a second initial pass with a steel wheel roller in the static mode should be made where a single initial static mode pass is more normal with a dense graded mix.

FINAL NOTE

Reference is made under ‘Application’ that this guide is to be used in conjunction with the relevant Australian Standards. Much detail and many topics, such as safety, traffic control, delivery of mix etc, have been omitted from this guide because they have been well covered in these existing standards.