ROAD SPECIFICATION

R50 GUIDE NOTES FOR BITUMINOUS SURFACING SPECIFICATIONS

Date JUNE 2011

Department *of* Infrastructure, Energy *and* Resources

Tasmania
Explore the possibilities

Index

SECTION 1 – GENERAL

R50.1 PURPOSE

This document has been produced to assist Department of Infrastructure, Energy and Resources (DIER) Contract Administration personnel and Contractors involved with Bituminous Surfacing works. It aims to provide guidance for users to facilitate a common approach, particularly toward receipt and management of documents and quality assurance records to be provided by Contractors. These notes attempt to provide a road map to the documented records to be provided by the Contractor at various stages of the works delivery process.

They do not override any of the requirements in a Standard or Project Specific Specification.

R50.2 REFERENCES

R50.2.1 DIER Standard Specifications

DIER maintains a series of Standard Specifications applicable specifically to the Department's requirements for Bituminous Surfacing projects; these include General Specifications identified by the prefix 'G' and Roadworks Specifications identified by the prefix 'R'. These specifications are available on the DIER website http://www.transport.tas.gov.au/road/specifications/specification_listings where they can be accessed and downloaded for use. Relevant specifications available through this source are:

General Specifications

- G1 General Provisions
- G2 Contract Management Plan
- G3 Traffic Management
- G4 Compaction Assessment
- G5 Descriptive Terms in Geomechanics
- G6 Production of Aggregates and Rock Products
- G6 Production of Aggregates and Rock Products – Explanatory Notes
- G7 Asphalt Production
- G7/R55 Asphalt Production – Explanatory Notes
- G8 Construction Survey
- T4 Planning and Design Survey

Roadworks Specifications

- R51 Sprayed Bituminous Surfacings
- R55 Asphalt Placement
- R57 Bituminous Slurry Surfacing
- R59 Sealed Pavement Maintenance.

R50.2.2 Austroads Guides

Austroads guides are referenced in many of DIER's Standard Specifications with the *Guide to Pavement Technology* series of documents of significant relevance to the Bituminous Surfacing Specifications.

SECTION 2 - ASPHALT

R50.3 ASPHALT – GENERAL INFORMATION

The selection of an appropriate asphalt type and the corresponding specification conformance requirements will differ significantly depending on the end use requirements.

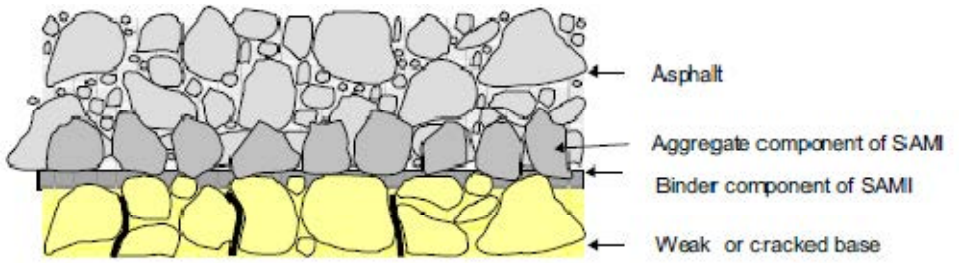
The selection of an appropriate asphalt mix size for various applications is important. The asphalt type and other specifics is the responsibility of the principal and will be provided in the project documentation.

The nominal size of an asphalt mix refers to the maximum particle size present in the mix.

Generally asphalt should be placed in layers with a compacted thickness of not less than ***2.5*** times the nominal size of the mix to ensure adequate compaction and the attainment of suitable surface properties. For heavy duty asphalt mixes, which typically have a coarser grading, a minimum of ***3*** times the nominal thickness is recommended.

A Strain Alleviating Membrane Interlayer (SAMI) is sometimes used to support an asphalt wearing surface.

Austroads Guide to Pavement Design Part 4K: Seals – Figure 3.10 Strain Alleviating Membrane Interlayer (SAMI)



Source: Austroads (2006a)

R50.4 AUSTROADS DESIGN METHOD

The design concept described in *Austroads Guide to Pavement Technology, Part 4B Asphalt, Appendix A Mix Design Procedures*, provides for a three level mix design procedure. Level 1 addresses the very important volumetric properties of a mix. Level 2 looks at mainly mechanical properties, such as modulus and creep together with some optional tests, while Level 3 is concerned with evaluating rut resistance.

The cost and resources required for mix design testing must be balanced against the circumstances in which the mix will be used and the consequences of early failure. For this reason, only a small amount of testing is required for light traffic mixes, and they are only required to undergo Level 1 (volumetric) testing. Medium and heavy traffic mixes undergo Level 1 and Level 2 testing, while very heavy mixes proceed through Levels 1, 2 and 3.

The design levels for different traffic categories are summarised in Table A6 of the Austroads Guide.

Austroads 2007 Part 4B Asphalt - Table A6 Appropriate level of mix design for traffic category

Traffic category	Design level	Laboratory compaction (cycles)
Light	1	50
Medium	2	80
Heavy	2	120
Very heavy	3	120 + 250

The binder type and design air voids appropriate to the specific traffic category applications are based upon the expected end use and performance requirements of the asphalt mix. Table A3 of the Austroads Guide summarises the selection of dense graded asphalt wearing courses.

Austroads 2007 Part 4B Asphalt - Table A3 Guide to the selection of dense graded asphalt.

Traffic category	**Laboratory compaction level**	**Typical* design air voids (%)**	**Binder (class / type)**	**Recommended use**
Light	50 cycles	4.0	170	Residential streets and car parks. Foot traffic
			320	Sometimes used for above in warmer climates.
Medium	80 cycles	4.0	170	Normal conditions and lower traffic ranges, particularly in cooler regions.
			320	Good general purpose mix for a wide range of applications.
Heavy	120 cycles	4.0	320	General purpose mix for heavily trafficked applications. Generally combined with use of polish resistant aggregates.
			600, Multigrade or PMB	High performance mixes for greater traffic loadings. Stiffer binders require strong, stiff base.
			320	Heavily trafficked intersections, slow moving traffic, requires coarse grading.
Very heavy	120 and 350 cycles	5.0	600, Multigrade or PMB	Special applications such as very heavily trafficked intersections, heavy duty industrial pavements, and aircraft hard standing. Requires coarse grading.

NOTE:
It is DIER's policy, as detailed in Standard Specification R55 Asphalt Placement, to have Class 170 bitumen binder for all applications unless specifically amended in the project specification at the direction of the Asset Management Section.

R50.5 DIER SPECIFICATION OF ASPHALT

There are three parts to the DIER specification of asphalt:

1. *The Project Specification* defines the specific requirements for the project;
2. *Standard Specification G7 Asphalt Production* includes materials, mix design, and production quality control for all asphalt types; and
3. *Standard Specification R55 Asphalt Placement* covers the properties required of asphalt, in composition and when placed. The particular design and test requirements for each asphalt type are defined in Standard Specification R55 'A' series Appendices.

Part 1 - *The Project Specification*, details the project specific details of the works including:

- the type of asphalt required, eg ac14, oga 10 etc;
- binder grade, eg class 170 bitumen, class 320 bitumen, polymer modified binder (pmb) etc;
- traffic category (light, medium, heavy, very heavy);
- test level (1, 2 or 3) with clarification of test type; and
- PAFV for wearing course asphalt.

Part 2 - *Standard Specification G7 Asphalt Production*, requires a minimum Polished Aggregate Friction Value (PAFV) of 48 for all wearing courses of asphalt. The contractor must be able to demonstrate that component materials used for asphalt production are sourced from a *Standard Specification G6 Production of Aggregate and Rock products* compliant quarry and that the component materials satisfy the specification requirements.

R50.6 SPECIFICATION R55 – CLIENT PROVIDED INFORMATION

***Client Provided Information to be included in the Project Specification*.**

Information Type	Specification Clause Reference
Traffic category	R55.1.5
AADT and HV%	R55.1.6
Site classification for traffic management	R55.1.6
Special events / considerations	R55.1.6
Roughness data (if payment adjustments apply)	R55.1.6
Asphalt type, Nominal size and Binder type	R55.1.6
Mix design requirements including traffic category and level 2 /and or level 3 tests	R55.1.6
Surface shape if other than Class 2 and Roughness measurement limits if other than R55.5.8	R55.1.6
Production and construction trial requirements	R55.1.6
Any limits on the amount of RAP	R55.1.6

R50.7 ASPHALT MIX DESIGN

The contractor is required to supply mix designs with supporting information in accordance with the requirements of *Standard Specification G7 Clause G7.3* and *Standard Specification R55 Appendix A1.*

A mix design shall be invalid after two (2) years or if there are changes to any of the components.

The mix design shall be appropriate to the traffic category as defined in the Project Specification. The designs shall be determined in accordance with the Austroads procedures or by the Marshall procedure (AS2891.5). In the event that the design procedure is not defined in the Project Specification, either of the above two design procedures may be adopted.

For the purposes of DIER specifications, the Marshall Design procedure involves all the steps of the Austroads Level 1 procedure, but using Marshall Compaction in place of gyratory compaction. The estimation of bitumen film thickness shall be included in both procedures.

Level 2 and/or Level 3 testing may be specified in the Project Specification for dense graded asphalt. While Level 2 and Level 3 tests do not form part of the job mix design criteria, the results shall be included in the Job Mix Design Report.

A mix design report shall be prepared for each product.

R50.8 ASPHALT MIX DESIGN PROCEDURES

The following is an extract from the *AUSTROADS Guide to Pavement Technology Part 4B Asphalt.*

The testing scheme shown in Figure A8 should be considered the core of the design procedure. It represents the minimum necessary to design a mix – the least cost option. Specifying authorities may require extra testing to be undertaken to determine, for example, the effect that a change in binder content will have on rutting and fatigue resistance.

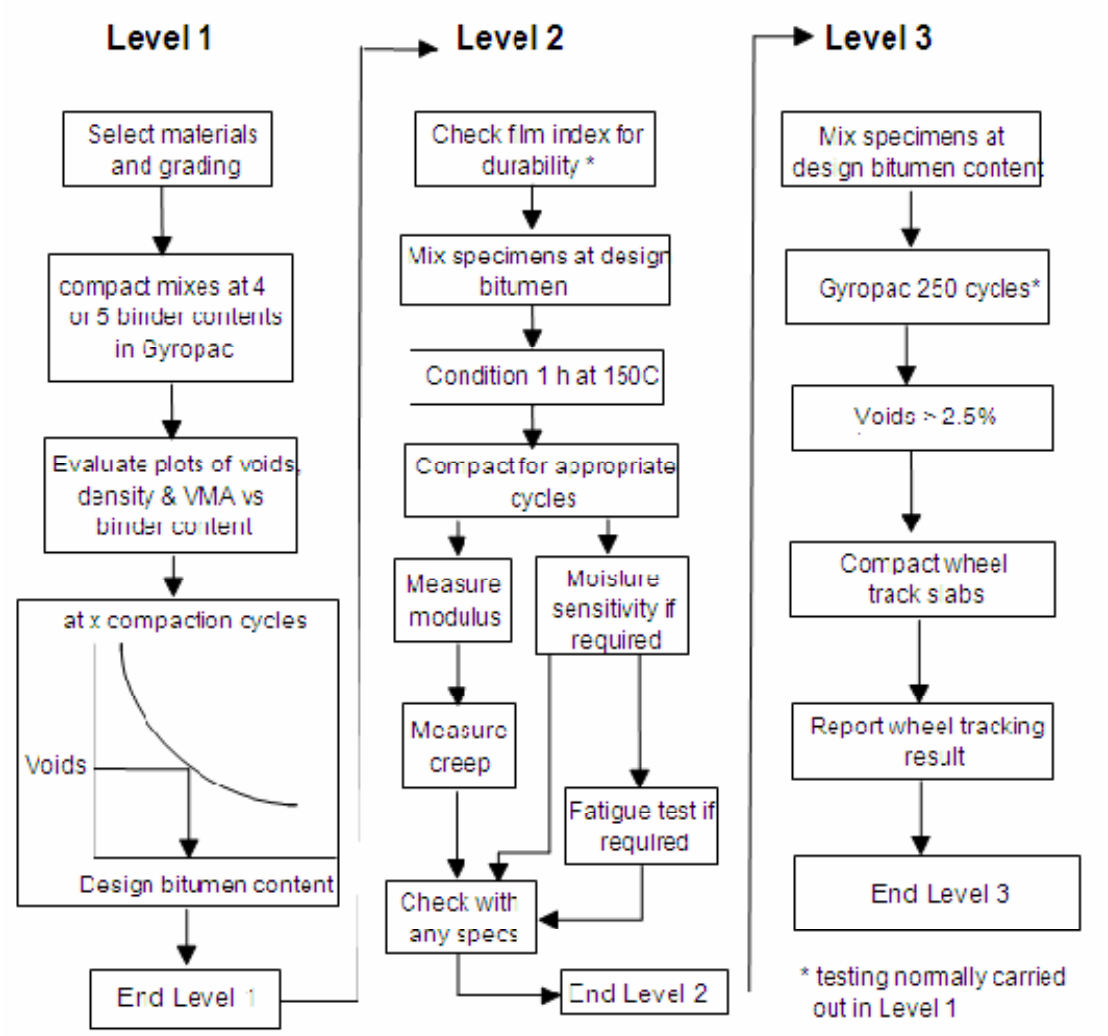


Figure A 8: Diagram of the asphalt mix design procedure

For DIER projects the following is required:

Test level 2

Level 2 Testing that is additional to Level 1

- film index (binder film thickness) – ref R55A1.3 last paragraph "all mixes shall be designed to have a minimum effective binder film thickness of 7.5 microns."
- creep
- modulus
- moisture susceptibility
- as per ENR55.3.4

Level 2 and Level 3 tests have no equivalent in the Marshall method. They include a range of "performance" directed tests including:

- modulus/stiffness
- fatigue
- creep

At this time there is insufficient experience with the "performance" tests to be able to apply them as criteria in a specification.

Test Level 3
Level 3 Testing that is additional to levels 1 and 2 is the measurement of the deformation resistance using the wheel tracking test.

This information is required to enable the Contractor to design a mix that is suitable to the specific site requirements.

R50.9 ASPHALT MIX DESIGN REPORT

Information to be provided in the Asphalt Mix Design Report is listed in *Standard Specification G7 Asphalt Production Table G7.3 Information to be included in the Asphalt Mix Design Report* with further explanations and examples in Appendix R50A.

Note:
Appendix R55D is not the complete mix design report; it only sets out the acceptance limits of the asphalt for the proposed works.

Table G7.3 Information to be included in the Asphalt Mix Design Report

1	Asphalt type, nominal size, design traffic category, mix design methodology, date of tests.
2	Details of constituent materials including aggregates, filler, binder, additives (if used) and source of materials.
3	The nominated grading, binder content, design air voids, effective binder film thickness and proportion of each component in the mix.
4	Test results verifying constituent material properties and test results of trial mixes made at varying binder contents to arrive at the design mix.
5	Test results, including graphs, of the all tests used to establish that the mix complies with the requirements of this Specification.
6	The following test results performed on a batch of each mix proposed to be used, and produced from the mixing plant from which the asphalt is to be supplied: • grading • binder content • maximum density • air voids at laboratory design compaction level • for dense graded asphalts in the Very Heavy traffic category, the Air Voids at 250 cycles of gyratory compaction
7	Results of any Level 2 or Level 3 tests.

Item numbers 1 and 2 and the first three requirements of item 3 are to be recorded on *Standard Specification R55 Asphalt placement, Appendix R55.D*.

All asphalt mix designs are to be provided to the Superintendent and Documents.RandT@dier.tas.gov.au (Asset Management) after acceptance by the Superintendent.

Appendix R55.D Job Mix Compliance and Control Limits

Contract Details:

Contract Name: Contract No:
Asphalt Supplier:
Company Name: Plant Location:
Job Mix Identification:
Asphalt Type: Nominal Size:
Mix Identification No: Mix Design Date:
Traffic Category:
Mix Design Methodology:

Constituent Materials

Binder Type/Class
Modifiers/Trade Name /%
Additives/Trade Name /%
Coarse Aggregate/rock type: Supplier/Source:
Fine Aggregate/rock type: Supplier/Source:
Filler/type: Supplier/Source:

Job Mix Limits

Sieve Size mm	**% Passing and % Bitumen**			
	Specified Target Range	Job Mix	Specified Tolerance	Job Acceptance Limits
37.5				
26.5				
19.0				
13.2				
9.5				
6.7				
4.75				
2.36				
1.18				
0.600				
0.300				
0.150				
0.075				
Binder Content %				

In Place Required Properties:

- specified course thickness mm:
- maximum Characteristic Air Voids:

Surface Shape Class

- permissible tolerance in surface shape mm:
- parallel to centreline
- transverse to centreline

Ride Quality Measurement; Required/ Not Required

Statement:

The constituent materials satisfy all the requirements of this specification.

All rock products come from a G6 complying source.

The proposed asphalt mix satisfies all the requirements of this particular specification.

All the Job Mix Design information required in Table R55.3.2 is attached.

Signed:

Date:

R50.10 DIER ASPHALT SPECIFICATION HOLD POINTS

The specification hold points are tabled below.

Ref	Description of Hold Point	Nominated Work not to proceed	Evidence of Compliance	Time for Release of Hold Point
R55.3	Provision of Mix Design and Samples	Production of asphalt	Mix Design and samples and Statement of Compliance of Job Mix	10 days
R55.4.3	Joint Inspection of Surface	Surface preparation	Documentation of defects and proposed repairs	2 days
R55.4.3	Removal of Thermoplastic Pavement Markings Trial	Removal of Thermoplastic Pavement Markings	Acceptance of removal method	2 days
R55.4.3	At completion of Surface Preparation	Placement of tack coat or waterproofing seal	Test results and documentation of surface preparation activities	2 days
R55.4.4	Completion of Production and Construction Trial	Placement of asphalt	Trial report	2 days
R55.5.1	In Place Properties of a Lot	The next lot or application of pavement marking	Measurements of levels, alignment, thickness, density and in-situ air voids	1 day
R55.7	Completed Works Report (R55.6.8) & Progress Payment Claim	Progress Payment	Completed Works Report & Progress Payment Claim	28 days

SECTION 3 – SPRAYED BITUMINOUS SURFACING

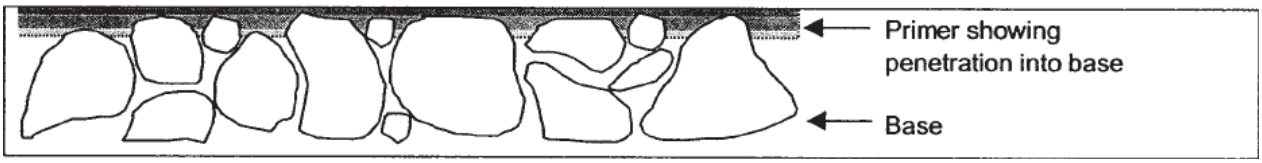
R50.11 GENERAL INFORMATION

Sprayed seals are the most common surfacing treatment in Australia comprising about 90% of the total Australian sealed road network. Bituminous sprayed treatments are broadly separated into two main types;

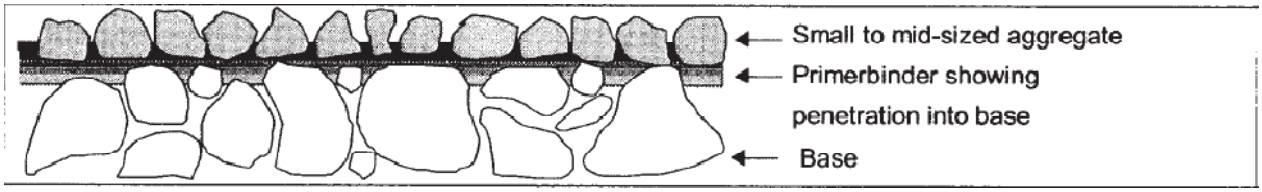
- initial treatments on new pavements, and
- reseals over existing bituminous surfacings.

Initial treatments on new pavements are typically a prime and seal or a primerseal followed by a final seal usually applied between one and two years after the initial treatment. A prime consists of the application of a suitable viscosity primer to the prepared pavement as a preliminary treatment to the application of a seal or asphalt surfacing. Primerseals were originally developed as an alternative to a prime and seal when it was not practical to prime, such as in cold or damp conditions.

Austroads Guide to Pavement Design Part 4K: Seals - Figure 3.1 Prime

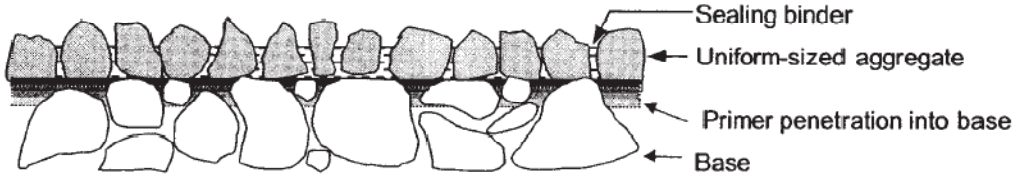


Austroads Guide to Pavement Design Part 4K: Seals - Figure 3.2 Primerseal

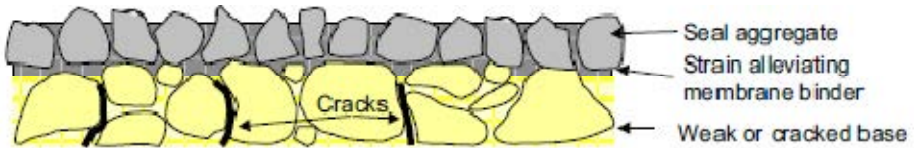


The most common form of reseals is the single application of binder and single application of aggregate, termed a single/single seal. The design of rates of application of binder and aggregate for single/single seals forms the basis of the design procedures for all other sprayed seal types including modified binders or multiple applications of binder and aggregate.

Austroads Guide to Pavement Design Part 4K: Seals - Figure 3.4 Single/Single Seal

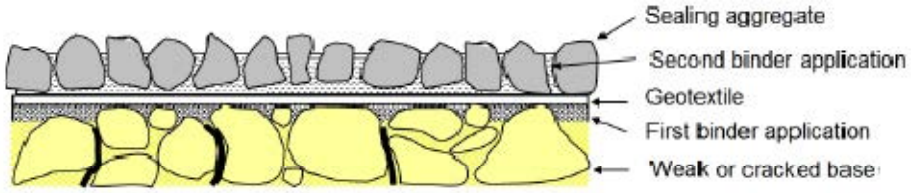


Austroads Guide to Pavement Design Part 4K: Seals – Figure 3.9 Strain Alleviating Membrane (SAM)



Source: Austroads (2006a)

Austroads Guide to Pavement Design Part 4K: Seals – Figure 3.12 Geotextile Reinforced Seal



Source: Austroads (2006a)

From a Contract Administrators perspective, the important elements for sprayed sealing works can be broadly categorised as:

- selection of surfacing type/sprayed seal type
- selection of component materials
- design of rates of application of aggregate and binder
- quality of materials
- field procedures
- monitoring of performance

R50.12 AUSTROADS DESIGN METHOD

The Austroads sprayed seal design method was revised in 2006 with the aim to improve the reliability of the design method. To design suitable rates of application of binder and aggregate for the service conditions, it is essential that, as a first step, an appropriate treatment is selected. Failure to do so may result in a treatment that cannot provide the surfacing characteristics and performance expected.

The importance of traffic and the average least dimension (ALD) of the aggregate is paramount in the design process. The life of a sprayed seal is highly dependent on the quality of the granular base materials and the standard of surface preparation of pavements prior to sealing.

Selection of the right surfacing type for the site conditions is critical for successful outcomes to be achieved. Guidance on selection of treatment type and materials is provided in the *Austroads Guide to Pavement Technology* series in particular the Austroads (2006), Update of the Austroads Sprayed Seal Design Method.

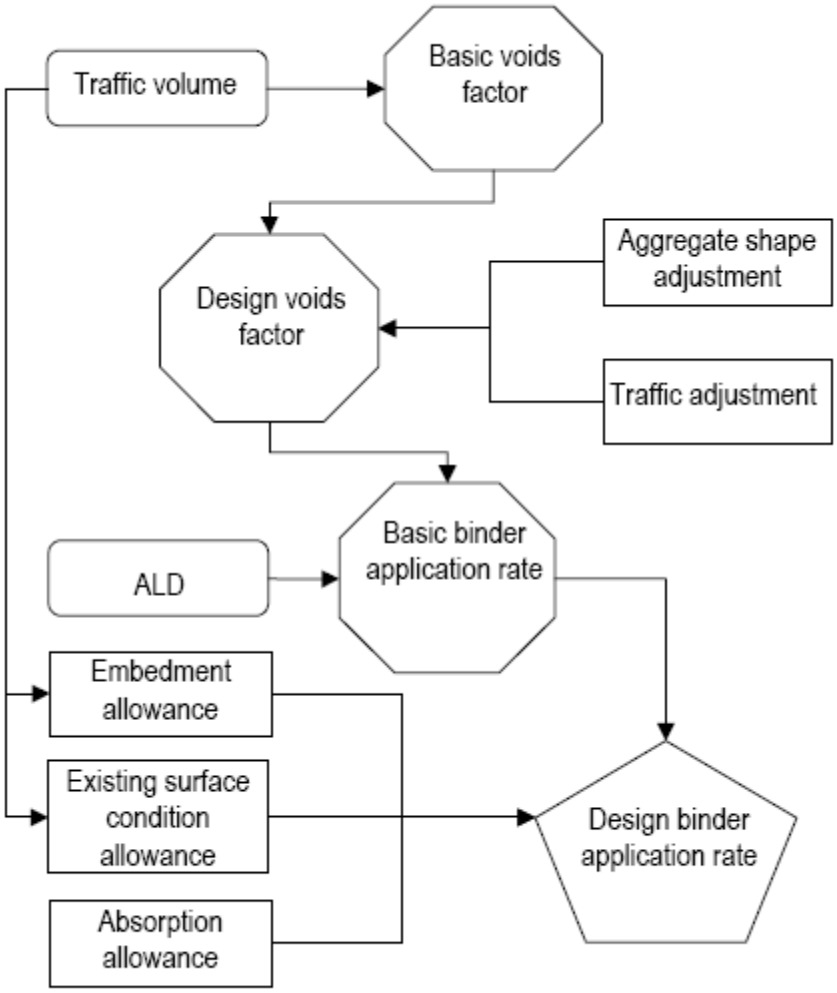
The Austroads design philosophy applies principally to the design of the most common type of sprayed seal, the single/single seal using conventional bitumen as the binder. Assumptions used in the design of single/single seals are:

- aggregate is single sized and appropriate quality
- average least dimension (ALD) must be representative of the aggregate being used
- design traffic volume is expressed in vehicles/lane/day (v/l/d) and based on Average Annual Daily Traffic (AADT)
- aggregate is spread in a uniform layer of one stone thickness, with particles in continuous, partly interlocked contact and the least dimension near vertical
- there is no separate allowance to be made for whip-off in the design spread rate
- aggregate spread rate determines the inter-aggregate void space in the seal layer, and hence the amount of binder required. failure to achieve, within practical limits, the design aggregate spread rate will result in the design binder application rate being incorrect
- a single layer of aggregate particles settles with, typically, 40 – 60% voids after orientation and packing of the aggregate by rolling and trafficking
- binder rise should be a minimum of about 35 – 40% up the height of the aggregate particle after initial rolling, increasing to between 50 – 60% (i.e., 1/2 - 2/3) about two years after construction
- aggregate particles may penetrate (embed) into the base
- reseals interlock with the existing surfacing
- binder may be absorbed into the base and, sometimes, by the aggregate
- the proportion of voids to be filled with binder may be varied to optimise requirements such as surface texture, maximum seal life, and for specific applications such as non-traffic areas. a minimum texture is generally required for skid resistance
- preliminary treatments such as primes and primerseals have been correctly designed and applied. if this has not been achieved, remedial work should be undertaken prior to, and well in advance of, the commencement of sealing
- all application rates determined by this method are expressed in L/m^2 of residual binder at the standard reference temperature of 15^0C.

Sprayed seals are a system, and sealing trials and subsequent work have shown that the design of the rates of application of binder and aggregate spread rates are both of major importance in achieving a satisfactory performance for the service conditions.

A general schematic of the process for determination of binder application rates for single/single seals is shown in below.

Austroads 2006 Update of the Austroads Sprayed Seal Design Method - Figure 1.3



R50.13 CALCULATION OF DESIGN TRAFFIC

Accurate traffic volumes are an essential requirement for the determination of appropriate rates of application of binder. The traffic volume should be expressed in terms of the total number of vehicles, and the composition in terms of light and heavy vehicles (heavy vehicles are those over 3.5 tonne gross mass)

Design Traffic, when determined from AADT, must take into account the following:

- the number of carriageways (generally single or dual)
- the direction of traffic (one-way or two-way)
- number of lanes
- percentage of the total traffic travelling in each lane

Design Traffic should be the best estimate of traffic using each lane. For general references in the Austroads Guide the following descriptions apply:

- very low; $\leq$ 200 v/l/d
- low; 201 – 750 v/l/d

- medium; 751 – 2000 v/l/d
- high; >2000 v/l/d

Austroads 2006 Update of the Austroads Sprayed Seal Design Method - Table 1.1 Estimation of Design Traffic from AADT for single carriageways

Width of seal (m)	Estimated Design Traffic (v/l/d)	Comment	
3.7 - 5.6	AADT	Seal width is considered too narrow for 2 lanes	
6.2 - 7.4	½ × AADT	Traffic is considered to predominantly travel in distinct lanes on seals of this width, especially if the centre line and/or lanes are line marked	
Sealed shoulders, parking lanes, identified by edge line marking to be separate from the traffic lanes	adopt < 50	If not line marked, some of the traffic may wander onto the shoulder and < 50 v/l/d may not be appropriate. If in doubt, a traffic count should be conducted.	
Overtaking lanes (in one direction)		Determine % of HV for each lane as a proportion of the total traffic volume in that lane.	If in doubt, arrange a traffic count for each lane
left hand lane (3.7m)	60–80% of ½ × AADT		
right hand lane (3.7 m)	20–40% of ½ × AADT		
Single lane in opposite direction	½ × AADT	%HV same as in AADT	
On and off ramps on freeways or urban road systems	Traffic volumes (AADT) before and past the ramp, may provide a good indication of AADT on ramp. Otherwise, arrange a traffic count. Traffic volume on the road connected to the ramp may also provide additional useful information to determine AADT on the ramp.		
Service roads to major roads	For one-way traffic, the Design Traffic is equal to the AADT For two way traffic use ½ AADT	AADT refers to traffic using the service road only. If not available arrange a traffic count..	

Austroads 2006 Update of the Austroads Sprayed Seal Design Method - Table 1.2 Estimation of Design Traffic from AADT for dual carriageways

Lane (assumed 3.7m wide)	Estimated Design Traffic (v/l/d)	Comments	
Multi lane, heavily trafficked	½ AADT divided by the number of lanes in the carriageway OR ½ AADT x % traffic in each lane	These roads are usually in urban areas or linking major centres. Traffic volume is often > 2000 v/l/d in all lanes but the % heavy vehicles may vary between lanes.	
2 lane carriageway			
left hand (outer) lane	60 to 80% of ½ AADT	60% for urban / 80% for rural	Each carriageway = ½ AADT
right hand (inner) lane	40 to 20% of ½ AADT	40% for urban / 20% for rural	
Sealed shoulders, Parking lanes identified by edge line marking to be separate from the traffic lanes	adopt < 50	On some busy roads, trucks may tend to travel partially on the shoulder, and this must be taken into account. A traffic count should be conducted, and/or traffic pattern determined.	
Where two lanes merge into one (at end of a duplicated section)	½ AADT	Merged traffic is ½ AADT, but design of binder application rates and layout of sprayer runs within the merge area require particular care.	
Off and on ramps	% of ½ x AADT	If actual traffic counts are not available for ramps, traffic on the side road, before and past the ramp, may provide an indication of the traffic volume using the ramp.	

R50.14 LARGE HEAVY VEHICLES (LHV)

Large heavy vehicles include B-Doubles and other heavy truck/trailer combinations with seven or more axles. As an interim measure for the current seal design method, it has been agreed to determine a design traffic volume and proportion of heavy vehicles based on the following:

$$Equivalent\ Heavy\ Vehicles\ (EHV)\% = HV\% + LHV\% \times 3$$

where:

HV and LHV are as obtained from annual traffic count or on-site counts.

The value of EHV calculated by this procedure is used solely for the determination of adjustments to the basic voids factor for the effects of traffic (Table 2.2) and does not alter the design traffic volume.

R50.15 DIER STANDARD SPECIFICATION R51 SPRAYED BITUMINOUS SURFACINGS

Standard Specification R51 Sprayed Bituminous Surfacing sets out the requirements for prime and seals, primerseals and reseals.
The specification covers:

- supply and quality of materials
- bituminous surfacing designs
- standards of workmanship including the Contract Management Plan
- records
- required evidence of compliance
- payment

The objectives of the specification are to:

- ensure that the surfacing is appropriately designed and constructed in order to produce a serviceable product compatible with the underlying surface and the expected future traffic

- avoid the unnecessary specification of work practices. The Contractor is required to propose defined work practices for the project in the Contract Management Plan consistent with recognised contemporary best practice, and to undertake the works accordingly
- ensure the safety of road users and construction personnel during the surfacing operations as well as to prevent damage to road infrastructure arising from the operations.

R50.16 PROJECT SPECIFIC REQUIREMENTS

The required features and properties are to be defined in the Project Specification. These include:

- type of surfacing in the following treatment categories
  - prime and seal
  - primerseal
  - reseal
- required features of the surfacing including
  - aggregate size
  - binder type
  - number of applications of binder and aggregate
  - special properties of the aggregate or binder, such as polished aggregate friction value (PAFV) and binder grade
  - geotextile reseal
  - nominal binder application rates for tender purposes

The Project Specification includes client supplied information concerning:

- location of the works sites, traffic AADT and commercial vehicles content (Annexure C)
- site classification for traffic management (G2.6)
- special events consideration (G1.20) which may effect the or disrupt the sealing operations.

Standard Specification R51 Annexure C – Project Specific Details – Sheet 1 Seal Information

SITE	ROAD			LOCATION								SURFACE TREATMENT					
No	Category	No.	Name	Start Lk	Ch	End Lk	Ch	Width	Lgth	Area	Cwy	Old Surf	New Surf	AC Depth	Agg Size	Binder Modifier	Asphalt Category

DIER Specification R51 Annexure C – Project Specific Details – Sheet 2 Traffic Data and Nominated Binder Information

SITE	ROAD			Count Site No.	Count Site Description	Count Site Link Reference	AADT	AADT year	%HV	%LHV	Cwy	Traffic Category*	NOMINATED BINDER	
No	Category	No.	Name										APPLICATION RATE FOR TENDER (L/m^2 @ 15 °C)	Critical Site#

DIER Specification R51 Annexure B – Nomination of Aggregate Form

Nomination of Aggregate Form

Contract No :	Contractor:	Sealing Contractor
Aggregate Source:		
Quarry Name:	Location:	Rock Type:

PROPERTIES OF STONE –Assigned Values

Property	LAST FIVE TEST RESULTS	ASSIGNED VALUE	Test report Dates	
			1st Test report	Last test report
Wet strength KN				
WDSV %				
PAFV				
Flakiness Index; 14mm				
10mm				
7mm				
ALD mm; 14mm				
10mm				
7mm				

GRADING- Latest Test Result

a) Nominal Size 14mm

Tested by:	Report Date:	Report No:	Grading % passing sieve (mm)								
			19	13.2	9.5	6.7	4.75	3.35	2.36	1.7	0.600

b) Nominal Size (mm) – (10mm)

c) Nominal Size (mm) – (7mm)

RESISTANCE TO STRIPPING

Tested by:	Report Date:	Report No:	Name of Additive	% of additive required

BULK DENSITY of Aggregate t/m^3:

Signed:	Date:

R50.17 AGGREGATES

All aggregates shall be precoated and free from water and adhered dust. Aggregates shall be sourced from a quarry complying with Specification G6 Production of Rock Products. The aggregates shall comply with AS2758.2 with the following clarification:

DIER Specification R51 - Table R51.5.4 Aggregate Properties

Aggregate Properties	Rock Type	
	Igneous	**Non Igneous**
Durability Assessment	Wet, Wet/Dry	LA & Unsound Stone (AS2758.2 Clause 9.4)
Durability Limit	100kN, 35%	AS2758.2 Class A, Tables 5 & 6
Flakiness Index (maximum)	35%	35%
PAFV (minimum)	48	48
Particle size distribution	AS 2758.2 Tables 1, 2 & 3	AS 2758.2 Tables 1, 2 & 3
Resistance to Stripping	AS 2758.2 Clause 11	AS 2758.2 Clause 11

Clause R51.5.5 requires the Contractor, at least ten (10) working days prior to the intended use of an aggregate i.e. with the seal design, to supply to the Superintendent the following:

- an updated nomination of aggregates form (Annexure R51B)
- test results for the specific material to be used
- a representative sample (2kg) of each nominated aggregate in a clearly labeled bag
- identification of the particular sites where the aggregate is to be used.

The Contractor is also required to submit the other information listed in accordance with the time frames nominated prior to the intended date of the commencement of sealing.

R50.18 SURFACE PREPARATION

Clause R51.7 sets out requirements for surface preparation including a joint inspection of the surface during which defects and repairs will be identified. Surface preparation also includes the removal of thermoplastic pavement markings. The Contractor is to provide details of the proposed method of removal followed by a site trial. For sprayed bituminous resurfacing sites removal by grinding/planning with a vertical motion or milling will generally damage the surface. Grinding/planning with a horizontal motion may not.

Temporary pavement markers are required. Where existing thermoplastic markings have been removed, temporary pavement markers are to be installed on the same day.

R50.19 STANDARDS OF WORK

There are a number of performance measures identified under clause R51.8 particularly rolling. The Austroads Guide to Pavement Technology Part 8 Pavement Construction, clause 8.3.4 Sealing-Rolling provides measures on the effectiveness and performance of rolling operations.

Other requirements include:

- maximum time limit for removal of loose aggregate
- loose aggregate remaining after removal and
- maximum time limit for the application of pavement markings.

R50.20 RECORDS

Clause R51.9 details requirements for records to be provided including those prior to sealing supporting the seal design, the daily spraying report and the completed works reports that are to be provided to the Superintendent and Documents.RandT@dier.tas.gov.au (Asset Management) after acceptance by the Superintendent. The Superintendent is to ensure copies are also provided to the DIER Project Manager, the relevant DIER Regional Network Manager (Maintenance) and the DIER Project Manager for the Reseal Programme.

R50.21 HOLD POINTS

Hold Points identified in Specification R51 *are listed in Table R51.6 Hold Points*

Table R51.6 Hold Points

Ref	Description of Hold Point	Nominated Work not to proceed	Evidence of Compliance	Time for Release of Hold Point
R51.4	Submission of Contract Management Plan	All work	Contract Management Plan	As nominated in the Conditions of Contract Annexure Part A or 10 days prior to surfacing operations where the surfacing is a sub element of a contract.
R51.5.3	Evidence of Compliance of Bituminous Materials	All works	Test results	5 days
R51.5.5	Nomination of Aggregates	Delivery of aggregate to site	Test results for the specific material to be used and updated form **Annexure B**	5 days
R51.6	Seal Design	Delivery of aggregate to site and Placement of surfacing	Fully documented seal design	10 days
R51.7	Joint Inspection of Surface	Surface preparation	Documentation of defects and proposed repairs	2 days
R51.7.8	Removal of Thermoplastic Pavement Markings Trial	Removal of Thermoplastic Pavement Markings	Acceptance of removal method	2 days

R51.7	Surface Preparation including Removal of Thermoplastic Pavement Markings	Placement of surfacing	Acceptance of Surface Preparation Works including removal of Thermoplastic Pavement Markings	2 days
R51.8	Standards of Work	Progress Payment	Demonstrated compliance, Wearing Surface Record	28 days
R51.9 & R51.11	Bituminous Surfacing Specific Contracts - Completed Works Report	Progress Payment	Report	5 days

APPENDIX R50A –CHECK LISTS

This section aims to provide users with a simple checklist for assessing compliance with the Specifications. It does not remove in any way any of the requirements described in the Specifications.

The checklist can be used as a documented record of Specification compliance and used to identify and initiate corrective actions for deficiencies identified.

General

1 Document Review

Are the requirements for each of the following items documented and have they been sighted?

- to indicate check has been made or information obtained Yes / No
- to indicate check is non-conforming or not applicable Yes / No
- to indicate check has not been performed Yes / No

Where an element is non-conforming complete the summary at the end of the checklist.

2 Job Details

Reference: R51.2.2 – Project Specific Requirements

3 Location Referencing

(Road Name, Road No. Link No. CWY, Lane Ref, Start Chainage, End Chainage)

- Is the site description adequately defined? Yes / No

4 Operations Review and Site Inspections

Site inspection can provide the opportunity to measure compliance with specification requirements. The number of specification requirements audited will depend on the time available to be spent on site. A site inspection may be used to observe and audit the operations in a number of ways. It can range between covering the full list of activities undertaken in a single shift from commencement of works to completion of the days' activities including aftercare requirements to an inspection of any single or combination of requirements.

5 Responsibilities

- Has the Contractors Authorised Representative been defined? Yes / No
- Has a site induction been performed? Yes / No

6 Safety Management

- Is an approved Traffic Management Plan (TMP) available on site? Yes / No
- Is the TMP being effectively implemented? Yes / No
- Are OH&S requirements adequately described in the Contract Management Plan (CMP)? Yes / No
- Are the requirements being fulfilled on site? Yes / No

7 Environmental Management

- Is an approved Environmental Management Plan available on site? Yes / No

- Is the Plan being effectively implemented? Yes / No
- Are Environmental Management requirements adequately described in the CMP? Yes / No
- Are the requirements being fulfilled on site? Yes / No

8 Site Management

- Is the Plant & Equipment on site appropriate and suitable for use? Yes / No
- Have Plant & Equipment checklists been completed? Yes / No
- Is the TMP being effectively implemented on site? Yes / No

9 Process Management

- Is the job layout defined and Job Lots identified? Yes / No
- Are weather conditions suitable for undertaking the works? Yes / No
- Have Ground and Air temperatures been recorded? Yes / No

10 After Care

- Is the TMP being effectively implemented on site? Yes / No
- Are signs and other controls suitable and adequate for the conditions? Yes / No
- Have temporary markers been satisfactorily installed? Yes / No
- Has the Contractor identified how the site will be maintained outside of normal working hours and the frequency of inspections? Yes / No
- Does the TMP ensure adequate protection to the newly constructed surface? Yes / No

11 Identification of Non Complying Attributes

Where a non-conformance is identified a Corrective Action Request should be initiated. The Corrective Action Request should detail the following;

- Date of Review or Inspection
- Contract Number
- Contractor Responsible
- Job Specifics, project number or reference, location details etc
- Name of Inspector or Auditor
- Nature of non-conformance
- Timeframe for implementation of the corrective action

G7 and R55 Asphalt Production and Placement

12 Asphalt Mix Design Report Information

The following tables and graphs are provided as examples of the additional information required under clause G7.3.

Constituent Materials – Particle size distribution (Grading) and aggregate properties

Component	**20mm**	**14mm**	**10mm**	**7mm**	**C/Dust**	**F/Sand**	**Filler**
Sample Method							
Test Method							
Sieve Size	% Passing						
26.5mm							
19.0mm							
13.2mm							
9.5mm							
6.7mm							
4.75mm							
2.36mm							
1.18mm							
600µm							
300µm							
150µm							
75µm							
Flakiness Index							
Dry Strength (kN)							
Wet Strength (kN)							
Wt/Dry Variation %							
Plasticity Index %							
Fractured Face %							
Particle Density							
SSD (t/m^3)							
Water Absorption %							

Constituent materials – Mix Composition and component proportions of aggregates

Component	Source	Proportion of mix (%)
20mm		
14mm		
10mm		
7mm		
C/Dust		
Sand		
Filler		

Constituent Materials – Combined Grading

Sieve Size (mm)	26.5	19.0	13.2	9.5	6.7	4.75	2.36	1.18	0.6	0.3	0.15	.075
Combined grading												
Grading Limits												
Nominated Grading												

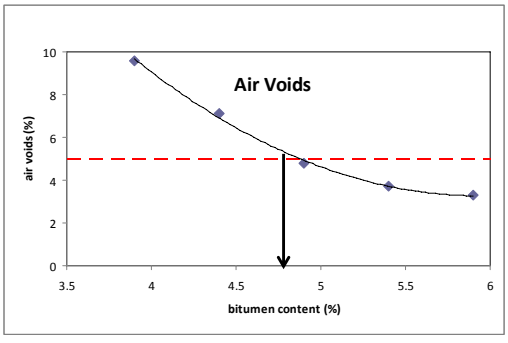
Asphalt Mix Design – volumetrics and Marshall properties

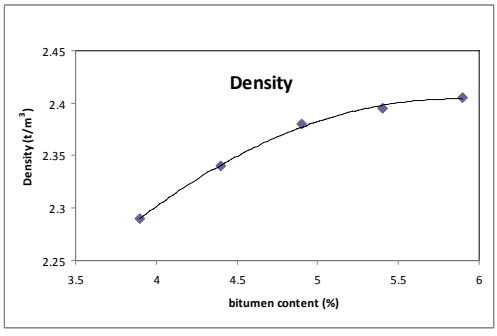
	Trial 1 BC %	Trial 2 BC %	Trial 3 BC %	Trial 4 BC %	Trial 5 BC %	R55 Spec Limits	Nominated Mix Properties
Binder Content (%)							
Temp (^{O}C)							
Max Density (t/m^3)							
Bulk Density (t/m^3)							
Air Voids (%)							
Bulk Density Combined Aggregate (t/m^3)							
Binder Absorbed (%)							
Effective Binder (%)							
Maximum Theoretical Density (t/m^3)							
Voids in Mineral Aggregate (%)							
Stability (kN)							
Flow (mm)							
Binder Film Thickness (µm)							

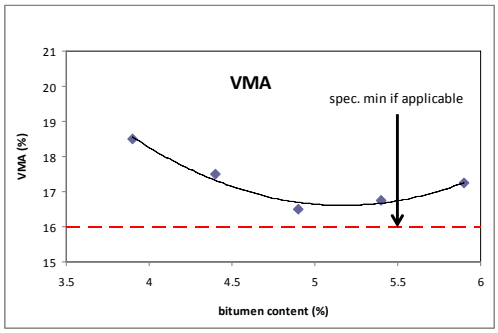
Asphalt Mix Design – Austroads Method including optional tests

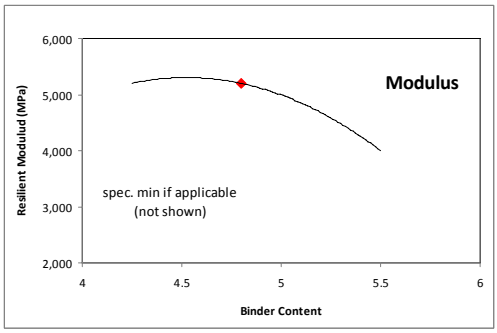
	Target BC %	**Target (-0.05) BC %**	**Target (+0.05) BC %**	**R55 Spec Limits**	**Nominated Mix Properties**
Binder Content (%)					
Temp (^{O}C)					
Max Density (t/m^3)					
Bulk Density (t/m^3)					
Air Voids (%)					
Bulk Density Combined Aggregate (t/m^3)					
Binder Absorbed (%)					
Effective Binder (%)					
Maximum Theoretical Density (t/m^3)					
Voids in Mineral Aggregate (%)					
Binder Film Thickness (µm)					
Modulus (MPa)					
Creep (Minimum slope (ue/cycle)					
Moisture Sensitivity Tensile Strength Ratio (%)					
Fatigue Life (cycles)					
Air Voids @ 250 cycles (%)					
Wheel tracking depth (mm)					

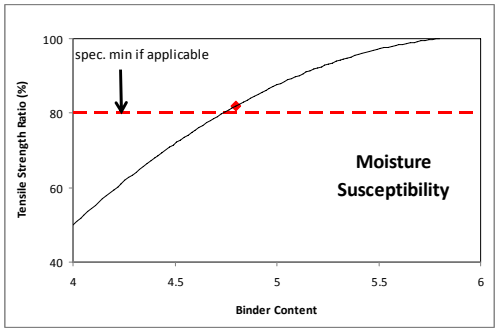
Asphalt Mix Design – typical performance graphs (Austroads example only)

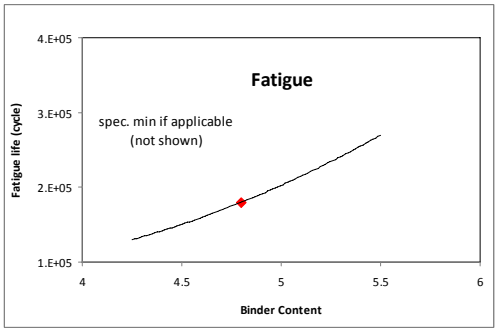


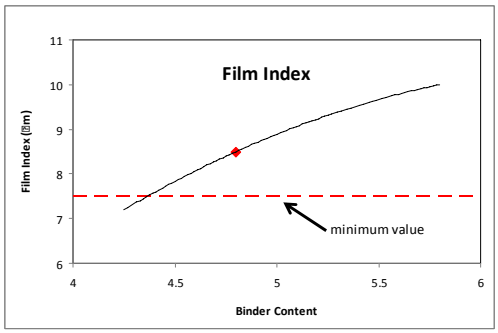


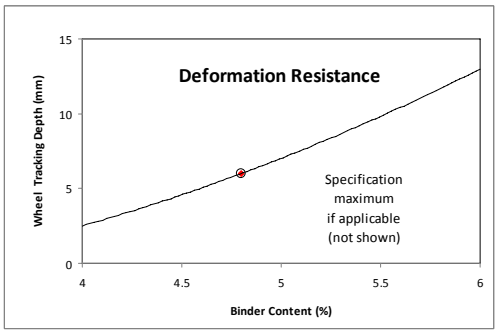












R51 – Sprayed Bituminous Surfacings

13 Type Of Seal Proposed

Reference: Annexure A1 Prime and Seals
Reference: Annexure A2 Primerseals
Reference: Annexure A3 Reseals
Reference: Annexure B Nomination of Aggregate Form

- Is the aggregate size proposed as per the contract documents? Size=___ mm
- Is the binder type proposed as per the contract documents?

  Binder Type =____
- Is the aggregate Average Least Dimension (ALD) recorded? ALD=__ mm
- Is the aggregate Grading (PSD) recorded? Yes / No
- Is the aggregate Flakiness Index (FI) recorded? F.I=___ mm
- Is the aggregate Polished Aggregate Friction Value recorded? PAFV= ____

- Is the aggregate Resistance to Stripping recorded? Yes / No

14 Seal Designs

- Has the Seal Design been approved? Yes / No
- Is the existing surface type defined? Existing Surface (AC or Seal) Nom Size __mm
- Have Job Lots been defined? Yes / No
- Have Texture Depths been defined for each Job Lot? Yes / No
- Have traffic volumes (AADT Lane and % EVH) been defined per Lot? Yes / No
- Have Binder application allowances been defined for each Job Lot? Yes / No
- Have Design Binder Application rates been defined for each Job Lot? Yes / No
- Have Design Aggregate Application rates been defined for each Job Lot? Yes / No

15 Aggregate

- Is the Aggregate Stockpile site appropriate and suitable for use? Yes / No
- Has the stockpiled aggregate ALD been confirmed and documented? Yes / No
- Is the aggregate suitably precoated? Yes / No
- Does the aggregate appear to be suitably clean and free of dust? Yes / No
- Is the aggregate dry? Yes / No

16 Binder

- Is the binder type as per the contract requirements? Yes / No
- Are binder temperature controls adequate? Yes / No
- Is the binder in the Sprayer within the correct specified temperature range? Yes / No
- Has the proportions of Cutter incorporated into the binder been recorded? Yes / No
- Is the proportion of Cutter suitable to the prevailing weather conditions? Yes / No
- Is the Bitumen Transfer site appropriate and suitable for use? Yes / No

17 Spray Sealing

- Is the sprayed binder application rate in conformance with the target rate? Yes / No
- Is the applied aggregate application rate in conformance with the target rate? Yes / No
- Is the applied aggregate rolling rate in conformance with the target rate? Yes / No
- Is the TMP being effectively implemented on site? Yes / No

- Is the Sprayer Report being completed to ensure capture of all relevant information? Yes / No

APPENDIX R50B - GLOSSARY OF TERMS - BITUMINOUS OPERATIONS

This Specification lists the terms and their definitions used in Bituminous Operations.

AADT
The annual average daily traffic volume across all lanes and carriageways.

Abrasion
The wearing away of a surface by mechanical action.

Absorption
The penetration of binder into an aggregate or base.

Adhesion
The action by means of which a bitumen binder sticks to the surface of an aggregate.

Adhesion agent (Anti-stripping Agent)
An additive used for the purpose of improving the adhesion between a bituminous binder and the aggregate.

Aggregate
Material having a nominal size of not less than 5 mm and which complies with the specified ***particle size distribution*** requirements. It may be produced from rock, gravel, metallurgical slag or artificial stone.

Aggregate retention
Long term cohesion and retention of aggregate after adhesion is established.

Aggregate spread rate
The rate of application of sealing aggregate, expressed in square metres per cubic metre (m^2/m^3) of aggregate applied at the loose bulk density in the truck or heap.

Anionic bitumen emulsion
A type of bitumen emulsion in which the suspended ***bitumen or binder*** particles are negatively charged.

Asphalt
A mixture of bituminous binder and aggregate with or without mineral filler produced hot in a mixing plant. It is delivered, spread and compacted while hot.

Asphaltic concrete

A dense, continuously graded mixture of coarse and fine aggregates, mineral filler and bitumen produced hot in a mixing plant. It is delivered, spread and compacted while hot.

Binder
A bituminous material used for the purpose of holding aggregate particles together as a coherent mass. 2. A manufactured material used in small amounts in stabilisation to change the properties of the existing material. 3. A bituminous

material used for waterproofing the surface and holding an aggregate layer to the base.

Binder Allowance

An allowance used to modify the basic binder application rate to account for existing surface texture, traffic, grade, absorption by base and/or aggregate and for embedment.

Binder application rate

The rate of application of a bituminous binder expressed in litres per square metre (L/m^2) at a given temperature, and including, where applicable, the polymer or scrap rubber additive. In specifications, the binder application rate is expressed in L/m^2 at 15^0C. In stabilisation, the rate of binder applied to the untreated material in terms of kg/m² or percentage by mass of the road material.

Bitumen

A very viscous liquid or a solid, consisting essentially of hydrocarbons and their derivatives, which are soluble in carbon disulphide. It is substantially non-volatile and softens gradually when heated. It possesses waterproofing and adhesive properties. It is obtained from native asphalt or by processing the residue from the refining of naturally occurring crude petroleum.

Bitumen emulsion

A liquid product in which a substantial amount of bitumen (with which some oil may be mixed) is suspended in a finely divided condition in water, or vice versa, by means of emulsifying and stabilising agents.

Bitumen Emulsion Breaking

The separation of a bitumen emulsion into free bitumen and water. The process is accompanies by a colour change from brown to black.

Bituminous

Having physical properties similar to those of bitumen, or containing substances having such properties. This may include polymeric materials, both synthetic and natural.

Bituminous Slurry

A mixture of bitumen emulsion binder (with or without a polymer modifier), mineral aggregate, mineral filler, additives and water properly proportioned to form a slurry which is spread evenly on the road surface.

Bleeding

2. A surface condition in which an excess of free binder completely covers the aggregate. It results from the upward migration of the binder, due to a combination of traffic action, warm temperatures and other factors. It leads to a loss of surface texture. 2. The escape of water from freshly placed concrete to the surface or the escape of mortar through small gaps in the containing formwork.

Blind (v)

To spread a thin layer of suitable material to absorb excess binder or to assist in remedying a slippery or loose condition, or to fill excess surface voids.

Block copolymer

This refers to the physical structure of some polymers such as SBS, which have a rigid (styrene) end block or segment of monomer units attached to an elastomeric (butadiene) segment or chain of monomer units. The ability of the rigid end blocks to cross link or associate gives SBS the unique ability to form elastomeric structures in bitumen.

Bond (n)

The property of mechanical interlock between particles arising from their shape and disposition relative to each other.

Break

Coagulation of emulsified binder droplets to form a continuous binder phase.

Break (of a Bitumen Emulsion)

The separation of the bitumen emulsion into free bitumen and water, which occurs as a result of a coagulation of the dispersed bitumen droplets to form a continuous phase.

Cationic bitumen emulsion

A type of bitumen emulsion in which the suspended ***bitumen or binder*** particles are positively charged.

Cheesy State

The transition state of a sealing emulsion in the period from initial break to final cure. The binder exhibits a consistency like that of cheese and has poor stone retention properties during this period.

Coarse Aggregate

A general term for aggregate substantially retained on a 4.75mm sieve.

Cohesion

The ability of a material to resist by means of internal forces of attraction the separation of its constituent particles.

Cold mix

A mixture of bituminous binder, graded coarse and fine aggregate, with or without mineral filler, produced warm or cold in a mixing plant. It is delivered in a workable condition for stockpiling and ultimate spreading and compaction.

Component Materials (Bituminous Slurry)

Those materials such as bituminous emulsion, mineral aggregate, mineral filler, additives and water which constitute bituminous slurry.

Copolymer

Polymer formed from the reaction of more than one species of monomer.

Corrective Course

See Regulating course.

Cracking

A pavement defect signified by vertical spitting of the pavement material due to the action of traffic loading, environmental stress or material characteristics it is

usually identified as visible discontinuities at the surface, not necessarily extending through the entire thickness of a member or pavement.

Crusher Dust

The dust or fines, usually 2 to 4mm in size, produced by the crushing of gravel or rock

Cure

The increase in cohesive strength of a bituminous binder following application in emulsified form, usually due to progressive loss of water and other volatile materials following emulsion break.

Cutback bitumen

Bitumen to which cutter oil (kerosene) has been added to achieve a temporary reduction in viscosity.

Cutter oil

A light petroleum distillate added to bitumen to temporarily reduce its viscosity and is lost by evaporation. Used to wet the aggregate. Kerosene is a common cutter in sprayed seals.

Dense graded asphalt

See asphaltic concrete.

Elastomer

A material, usually synthetic, having elastic properties akin to rubber.

Emulsifying (Stabilising) Agent

A chemical which aids in the dispersion of bitumen particles in water or vice versa.

EVA

Ethylene Vinyl Acetate

Fast Curing Prime

Bituminous binder cutback with a solvent which exhibits rapid loss.

Fatigue

The deterioration of a pavement or other structure caused by the action of repeated loads. Contributing factors are a weak subgrade or embankment, inadequate pavement thickness, base course saturation, excessive loading, poor quality surfacing and delimitation.

Fatigue crack

A visible crack in the wearing course resulting from the action of repeated loads.

Fatty Surface

A surface containing an excess of bituminous binder which becomes soft in hot weather.

Filler

A fine material, the majority of which passes a 0.075 mm sieve, derived from aggregate or other similar granular material and commonly used in slurry sealing and asphalt.

Fine Aggregate

A general term for aggregate that substancially passes the 4.75mm sieve. Mostly composed of sand.

Flushed

A surface condition in which the binder is near the uppermost surfaces of the aggregate particles. The uppermost surfaces of the aggregate are still visible, but there is minimal surface texture (ie. <1 mm)

Flux Oil

A petroleum distillate added to bitumen to produce a long term reduction in its viscosity.

Foamed bitumen

Hot bitumen greatly expanded in volume by the introduction of saturated steam or water.

Gap graded material

Graded material in which one or more of the intermediate sizes are absent.

Glass transition temperature

Temperature at which polymer materials undergo marked changes in molecular configuration and physical properties (eg. from brittle to rubbery and vice versa).

Grading

The quantities of the various particle sizes present in a mineral aggregate, expressed as a percentage of the whole, found by the use of a sieve.

Green Strength

Cohesive strength developed in the binder at any time between application and complete cure.

Grit

Fine sharp aggregate or coarse sand; fine screenings substantially free from dust, usually passing a 4.75 mm sieve.

High Float Emulsion

An Anionic emulsion which has a quality, imparted by the addition of the certain chemicals, that permits a thicker binder film on the aggregate particles with minimum probability of drainage.

Inverted Emulsion

A type of bitumen emulsion in which water is suspended in a finely dispersed state in bitumen.

Isotropic

Having equal properties in all directions.

Lot

Lots shall be sections having:

- homogenous properties of surface type. texture, visual conditions etc.
- uniform traffic conditions.

A lot may have identifiable changes in properties across a lane but shall generally have uniformity in properties along the lane.

Mastic asphalt

An intimate mixture of fine mineral matter with bitumen which is spread hot by means of floats on a suitable foundation.

Matrix

A mixture of binding material and fine aggregate in which large aggregate is embedded or held in place.

Microsurfacing

Bituminous slurry surfacing, usually containing polymer modified binder which is capable of being spread in variably thick layers for rut-filling and correction courses and for wearing course applications where good surface texture is required to be maintained throughout the service life.

Mix Design

The design proportion of component materials comprising the bituminous product.

Molecular structure (PMB)

Physical form that the polymer chains take up relative to each other.

Multigrade

A bituminous binder which at high pavement service temperatures shows good resistance to flow but at low service temperatures does not show the high stiffness leading to brittleness as experienced with conventional binder.

Nominal Size

A designation for a mix, or an aggregate chosen to give an indication of the largest size aggregate particles present.

Non Ionic Emulsion

A type of bitumen emulsion in which the suspended bitumen particles have no electrical charge.

Oil (Cutter and Flux)

Hydrocarbon oil derived from the refining of crude petroleum oil and which is used to reduce the viscosity of residual bitumen.

Open graded asphalt

A bituminous mix using aggregate containing only small amounts of fine material, and providing a high percentage of air voids.

Open graded asphalt mix

See open graded asphalt.

Paving machine (paver)

An item of mobile equipment used to lay asphalt on a pavement to close longitudinal and transverse level tolerances. The paver's screed gives some initial compaction of the asphalt by means of vibration, vertical tamping or a combination of both.

Paving Unit for Bituminous Slurry

A purpose built continuous flow mixing unit which is capable of accurately metering each individual component material into a mixer which thoroughly blends these materials to form a homogeneous bituminous slurry and transfers the bituminous slurry into a spreader box for application to the pavement surface.

Plastic flow

Irreversible deformation due to an applied stress.

Plastomer

Polymers loosely classified as plastomers may possess some elastomeric properties but predominantly exhibit plastic flow properties under high strain conditions at ambient temperatures. Some examples include polyethylene, atactic polypropylene and ethylene vinyl acetate.

Polished aggregate friction value (PAFV)

A measure, indicated on a scale of 0 to 100, of the resistance of an aggregate to polishing under the action of traffic as determined in standard laboratory tests.

Polymer

A large, predominantly hydrocarbon, molecule built up from a very large number of chemical units linked together in a chain. These chemical units may comprise identical segments (producing a homo polymer) or a combination of two or more different segments (producing a copolymer).

Polymer modified binder (PMB)

A binder consisting of polymeric materials dispersed in bitumen with enhanced binder performance for particular applications.

Precoating

The coating of an aggregate with an oil, water or bituminous based material, with or without an adhesion agent, to wet the dust and improve the subsequent adhesion of bituminous material.

Prime

An application of a primer to a prepared base, without cover aggregate, to provide penetration of the surface, temporary waterproofing and to obtain a bond between the pavement and the subsequent seal or asphalt. It is a preliminary treatment to a more permanent bituminous surfacing.

Primer

A bituminous material of low viscosity and low surface tension used in priming. Its purpose is to bind the top 5 mm of the pavement prior to application of a sprayed seal.

Primer-binder

A material more viscous than a primer and required to act both as a primer and binder.

Process oil

A petroleum derived oil produced for purposes other than lubrication, eg. tyre rubber compounding.

Profile

The shape of a pavement surface measured in a vertical plane.

Profile index
The total of vertical deviations greater than ±2.5 mm from the average profile.

Quick-set quick-traffic system (Slurry)
A bitumen emulsion based slurry system (usually Cationic) that allows early opening of the slurry surfacing to traffic; normally less than one hour after placement.

Ravelling
The loosening of aggregate particles forming the wearing surface of a pavement.

Reclaimed Asphalt Pavement (RAP)
The material reclaimed from an asphalt pavement by various means including cold-milling, grader, backhoe, jackpick or other methods.

Road Pavement Stabilisation
The modification of any natural or prepared material to improve or maintain its load carrying capacity.

Reflection cracking
A visible crack in the pavement surfacing resulting from the movement associated with cracks in the underlying pavement layer.

Regulating course
A layer of variable thickness applied to a pavement to correct the shape and improve the riding qualities preparatory to resurfacing.

Resheet
To recondition by adding a new layer of material, generally asphalt.

Residual bitumen
Bituminous material obtained by processing the residue from the refining of crude petroleum.

Resurfacing
To improve a pavement surface by the addition of a new wearing course.

Roughness
The assessment of the irregularities in the longitudinal profile of a road in terms of the displacement of a standard test vehicle relative to the axle as the vehicle travels over the surface at a standard speed.

Run
The area of pavement selected for coverage with bituminous slurry during single continuous operation of the sprayer, profiler, stabilizer or paver. The area of pavement selected for coverage with bituminous slurry during a single continuous operation of the paving unit.

Rut-filling
The placing of microsurfacing in wheelpath ruts in layered construction using a purpose built spreader box.

Rutting

The longitudinal vertical deformation of a pavement surface in a wheel path, measured relative to a straightedge placed at right angles to the traffic flow and across the wheel path.

Sand

Natural

A fine aggregate which is the product of rock weathering, generally siliceous and free from applicable quantities of clay or silt.

Crushed

A fine aggregate which is produced by the crushing of rock.

Sand asphalt

A mixture of bitumen and well-graded sand, with or without a filler, which is usually mixed, spread and compacted while hot.

Scrap Rubber

Rubber particles manufactured from waste rubber products such as vehicle tyres and graded to conform to a specified size range.

Scrap Rubber Modified Binder

A two phase system of scrap rubber particles dispersed in bitumen where the particles are partially digested and partially swollen by the absorption of bitumen oils.

Screed (n)

1. That part at the rear of a paver which strikes-off and levels the asphalt mix to grade and slope and imparts initial compaction to the asphalt mix be means of vibration or tamping or a combination of both.

2. A strip of wood or metal which is moved by hand to strike off or finish a surface to a required shape or texture.

Screed (v)

The operation of forming a surface by the use of screeds.

Screen

A large sieve used in industrial processes and usually mechanically operated. The sieving surface may be either flat or cylindrical in form.

Seal

A thin surface layer of bituminous material into which aggregate has been incorporated.

Double / double seal

A seal consisting of two applications of binder each followed by an application of aggregate.

Enrichment seal

A light application of a bituminous material to an existing bituminous surface to increase the binder content at the surface. May be given a light cover of small aggregate.

Fog seal (Fog coat)
A very light seal without aggregate cover.

Primerseal
The application of a primerbinder and aggregate to a newly constructed or reconstructed prepared pavement surface, to hold that surface until a more permanent surface can be applied.

Reseal
A maintenance seal on an existing bituminous surface.

Rubber seal
A sprayed seal where the binder consists of bitumen modified by the incorporation of natural, synthetic or finely divided reclaimed rubber.

Single seal
A seal coat made up of one application of binder and aggregate.

Slurry seal
A road surface treatment consisting of a thin layer of a mixture of bitumen emulsion, water and fine aggregate applied to a surfacing in the form of a slurry.

Spray seal
A pavement surface treatment consisting of a sprayed film of bituminous binder covered with mineral aggregates.

Winter seal
A primerseal with 1% of adhesion agent. Used as a temporary seal where climatic conditions are unsuitable for a normal seal.

Segregation
Separation of the coarse aggregate from the matrix of a graded material such as crushed rock, asphalt and concrete. Separation of the cement water paste from an aggregate in concrete.

Sieve
A small box or tray whose base is made of woven wire or similar material, or of perforated metal plate, having apertures of defined shapes and sizes used for separating small granular samples into their constituent sizes.

Skid / Shear Resistance
The frictional relationship between a pavement surface and vehicle tyres during braking or cornering maneuvers. Normally measured on wet surfaces, it varies with the speed and the value of the 'slip' adopted.

Slurry
A stable suspension of aggregate filler in a less dense, liquid bitumen emulsion.

Soundness
The ability of an aggregate to withstand deterioration due to environmental conditions.

Sprayer

A truck mounted bitumen tank with heating unit and calibrated spray bar used to spray a regulated amount of bituminous fluid onto the pavement.

Spreader Box (Aggregate)

A calibrated device, attached to the aggregate trucks, used to spread a uniform distribution of aggregate onto the binder.

Spreader Box (Slurry)

A device which is capable of producing a uniform bituminous slurry surface equipped with either a flexible or rigid rear strike-off screed.

Stabilise

To modify any natural or prepared material to improve or maintain its load carrying capacity.

Stability

Asphalt

The ability of asphalt to resist deformation under load.

Emulsion

The resistance to separation of the dispersed phase from the continuous phase.

Marshall

The maximum load in Newtons of an asphalt mix when compacted and tested under specified conditions for the Marshall test.

Standard axle load

A load of 80kN (8.2t) applied over a single axle with dual tyres at each end.

Strain Alleviating Membrane (SAM)

A sprayed seal with the binder containing a relatively large concentration of rubber or polymer modifier. It is used to absorb strains that occur in a road pavement and thereby reduce reflection cracking.

Strain Alleviating Membrane Interlayer (SAMI)

Similar to a SAM, but provided as an Interlayer before placing an asphalt overlay.

Stripping

Of a Pavement

The loss of aggregate from a sprayed seal, caused by the action of traffic.

Of a Binder

The separation of the binder film from the surface of aggregate, usually in the presence of water.

Surface course

See Wearing course.

Surfacing

That part of a pavement specifically designed to resist abrasion from traffic and to prevent the entry of water. It may be either a sprayed seal, an asphalt layer or other material.

Tack coat

A light application of a bituminous material without cover aggregate, to a prepared base as a preliminary treatment to promote surface adhesion, without penetration of the pavement surface.

Temperature susceptibility

The change in material property with temperature eg. a high temperature susceptibility indicates a large change in viscosity with temperature. Normally a low change (low temperature susceptibility) is desirable at service temperatures.

Tests

There are several testing procedures used to measure various properties of asphalt and bitumen. The main tests are:

Ductility test

A test for bituminous binders which measures the extent to which a test piece can be elongated under specified test conditions without breaking.

Hubbard-Field method

A laboratory design procedure for measuring the stability and voids of asphalt mixes containing aggregate up to 40 mm in size.

Hveem method

A laboratory design procedure for the stability of asphalt.

Marshall test

A method of ensuring adequate stability, voids and durability of an asphalt mix design. Measures strength when hot, and deformation.

Penetration test (bitumen)

The vertical distance (in millimetres) that a standard needle penetrates a bituminous material under specified conditions of load, time and temperature. (Note: The classification of bitumen on the basis of achieved penetration has now been superseded by classification on the basis of its viscosity as measured under specified conditions).

Sand equivalent test

An empirical measure of the quantity and type of fines in the fraction of an aggregate or soil which passes a 4.75 mm sieve.

Settlement test

A test of the quality of an emulsion of bitumen, made by observing the quantity of bitumen deposited from the emulsion in a given time under specified conditions.

Triaxial test

A test to determine the stress-strain properties of a pavement material in which a cylindrical specimen of the material is subjected to a three dimensional stress system, and the axial strain is related to the applied stresses.

Viscosity

A measure of the consistency or resistance to flow of a material.

Tolerable deflection

The maximum acceptable deflection under a specified load which a given pavement may exhibit if the pavement is to achieve a specified number of load repetitions satisfactorily.

Traffic Time

the time between laying a slurry and when slow moving traffic (<40 km/hr) can be allowed onto the mix without causing permanent damage.

Viscoelasticity

The combined viscous and elastic response of a material to an applied stress.

Viscosity

The property by which a material resists deformation increasingly with increasing rate of deformation ie. the internal friction due to molecular cohesion in fluids.

Voids

The spaces within the bulk of material not occupied by solid matter.

Void Content

The ratio of the volume of voids to the total volume of the material, expressed as a percentage.

Voids in mineral aggregate (VMA)

The intergranular void space in a compacted mix when the volume of aggregate is calculated from the bulk density of the aggregate determined under standard test conditions.

Waterproofing

The process of rendering surfaces or materials impervious to water.

Wearing course

That part of a pavement upon which the traffic travels. 2. The part of the pavement specifically designed to resist abrasion from traffic and to minimise the entry of water.

TRAFFIC & INFRASTRUCTURE
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