Policy 11: Land Development Guidelines

SS8

Specification for Asphalt Surfacing

Table of Contents

1.0 General

1.1 This specification applies to the manufacture of asphalt, the preparation of substrata and the delivery, laying, compaction and finishing of asphalt.

Asphalt shall be a composite mixture of coarse and fine aggregate, mineral filler and bituminous binder proportioned and combined in an approved mixing plant to meet the requirements of this specification.

2.0 Acts, Regulations and Local Laws

2.1 The Contractor shall comply with all Acts, Local Laws and Regulations having jurisdiction over work under the Contract and shall be fully responsible for any breaches thereof.

3.0 Materials

3.1 **Coarse Aggregates**

The coarse aggregate shall consist of crushed stone particles retained on the 4.75mm sieve and shall have two (2) crushed faces. It shall be clean, hard, angular, durable and free of laminated particles, clay or clay balls or aggregations of fine materials, soil and vegetable matter.

The coarse aggregate properties shall conform with **Table** 1 herein.

Table 1

Property	Acceptance Limits	Test
Flakiness Index	35% maximum	Test **AS1141-15**
Wet Strength (10% Fines)	150 kN minimum	Test **AS1141-22**
Los Angeles Abrasion	30% maximum	Test **AS1141-23**
Polished Aggregate Friction Value (Wearing Courses)	45 minimum	Test **AS1141-40** and **AS1141-42**

3.2 **Fine Aggregate**

The fine fraction shall consist of all particles passing the 4.75mm sieve. It shall consist of natural sand and/or manufactured material from crushed stone. It shall be clean, hard, durable, moderately sharp and free from clay soil, organic or vegetable matter or aggregations of fine material.

3.3 **Mineral Filler**

Filler shall consist of natural sand particles and/or crushed rock or crushed gravel particles and/or mineral filler (added filler) of particle size smaller than 0.075mm.

The voids in dry compacted filler shall be not less than 38%.

3.4 **Binder**

The bitumen shall be a residual bitumen of Class 170 or Class 320, as nominated, complying with **AS2008**. The class of bitumen used shall depend on the mix type shown in **Table 3** and shall be as follows:

a) Type 1 mix – Class 170 or Class 320;

b) Type 2 mix – Class 170 or Class 320 may be used for Access Streets or Collector Streets in residential and rural residential precincts defined on **Standard Drawings 59201** and **59203**. Elsewhere, Class 320 shall be used;

c) Type 3 and 4 mixes – Class 320.

3.5 **Colour**

The use of colouring agents in asphalt surfacing is not encouraged and any intended use shall be approved in writing by the Superintendent.

4.0 Asphalt Mix Design

4.1 Design and Control Method

The Marshall method of design and testing shall be used for the quality and compaction control of the mixture.

4.2 Acceptance Design Standards

The mixture shall, when compacted by 50 blows each end of specimen, satisfy the requirements in **Table 2** herein.

Table 2

Marshall Test Parameter	Type 1 & 2 Mixes		Type 3 & 4 Mixes	
	Min.	Max.	Min.	Max.
Stability of mixes **AS2891**	4 kN	-	5 kN	-
Flow of mixes **AS2891**	2mm	4mm	2mm	4mm
Air voids in Laboratory compacted mix	2%	5%	3%	7%

4.3 Mix Grading

The grading limits for various types of mixes shall be as shown in **Table** 3 herein.

4.4 Bitumen Content

The bitumen content for each type of mixture shall be determined by the Marshall Design Method and shall be within the limits shown in **Table 3** herein.

Table 3

Sieve Size	Grading – Per Cent by Weight Passing			
	Type 1	Type 2	Type 3	Type 4
37.5mm	-	-	-	100
19.0mm	-	-	100	60-80
13.2mm	-	100	75-100	-
9.5mm	100	90-100	60-85	40-58
4.75mm	85-100	60-80	35-55	30-48
2.36mm	55-75	38-55	20-35	22-38
0.6mm	26-43	23-32	10-22	9-22
0.3mm	15-28	15-23	6-16	6-16
0.075mm	4-11	3-8	2-8	2-4
Bitumen Content	5.0% – 7.0%	4.5% – 6.5%	4.0% – 6.0%	3.0% – 5.0%

Notes:

1 ***Type 1 and Type 2 are surface courses. Type 1 may be used for footpaths and bikepaths. Type 2 shall be used for road surfaces.***

2 ***Type 3 is a base course and Type 4 is for deep lift asphalt.***

4.5 Job Mix Formula

Unless directed otherwise by the Superintendent, the proposed asphalt mix design is not required to be submitted for approval.

In circumstances where the Superintendent deems that Job Mix Formulas are to be provided by the Contractor, then the Contractor shall furnish the Superintendent with details, as required by the Superintendent, seven (7) days before laying of asphalt commences on Site.

5.0 Mixing Plant and Procedure

5.1 Mixing shall be undertaken in an approved batch, continuous or drum type manufacturing plant, in accordance with the requirement of **AS2150**.

5.2 The plant shall be the subject of a current licence issued by the **Division of Noise Abatement and Air Pollution Control** of the **Department of Environment and Heritage**, and shall be operated at all times so that the requirements of the **Clean Air Act** are met.

5.3 The Contractor shall maintain and operate a **NATA** registered laboratory at or near the mixing plant so as to ensure complete control over the paving mixture produced. Facilities shall be provided to enable the Superintendent to take samples of the mix or raw materials at any time.

6.0 Pavement Preparation

6.1 Asphalt surfacing shall not be commenced until the underlying pavement (either new pavement or existing asphalt surface) has been inspected and approved by the Superintendent.

6.2 **Existing Surfaces**

The pavement shall be thoroughly cleaned, by brooming or other approved means. All foreign matter adhering to the pavement shall be removed before any tack coating or asphalt spreading is carried out.

6.3 **New Work**

The pavement shall be dampened and then thoroughly broomed and any foreign material remaining on the pavement after brooming shall be removed by other means before any application of primer. The soil aggregate or crushed rock pavement should show a clean, coarse, tight, stony surface.

6.4 **Joining New Work to Existing Work**

Existing asphalt pavements shall be trimmed back to provide the following:

i) A vertical surface at the joint line against which the new asphalt is to be placed.

ii) A longitudinal taper such that the minimum layer thickness is not less than the depth of the new asphalt surfacing.

iii) Where a new asphalt surface is to butt to an existing surface, the existing surface shall be saw cut to provide a vertical face that is even in alignment. The joint is to be sealed with an approved bituminous crack sealant to prevent moisture ingress and protect the joint.

7.0 Priming

A primer or primer seal coat shall be applied to new work before any asphalt surfacing is carried out.

Priming shall be carried out at least 48 hours before the asphalt is applied.

The selection of the type, rate and temperature of application of the primer or primer seal shall take into consideration:

i) The permeability and absorption characteristics of the pavement.

ii) The type of material used in the pavement.

iii) The condition of the pavement surface.

iv) Whether or not the pavement will be open to traffic after priming.

v) The period of time before application of asphalt surfacing.

The primer used shall satisfy the requirements of **AS2157**.

Application rates for primer shall comply with **Table 4** herein.

Table 4

Type of Surface	Suitable Primer Grade	Application Rate
Low Porosity – extremely hard and dense after compaction; ring when struck with a heavy implement	AMC 00 or AMC 0 (low viscosity primers)	0.5 – 1.0 l/m^2
Medium Porosity – gravels with sandy silt binders, sound somewhat 'drummy' when struck with a heavy implement when compacted and dry	AMC 0 or AMC 1 (medium viscosity primers)	0.5 – 1.0 l/m^2
High Porosity – weak from textured appearance resultant from a deficiency of binding	AMC 1 or AMC 2 (high viscosity primers)	0.8 – 1.4 l/m^2

Priming shall not be carried out if:

a) the pavement is wet;

b) rain threatens;

c) the pavement or ambient temperature is less than 15°C.

Traffic shall **not** be permitted on the primed surface during the curing period unless a cover coat of coarse sand or fine screenings has been applied concurrently with the primer application and rolled into the surface. The application rate in **Table 4** herein shall be increased by 0.21/m^2 in such a case and the surface shall be broomed prior to application of asphalt surfacing.

Proper attention shall be given to ensuring that the edges (particularly along kerb and channel) are adequately primed to ensure bonding.

If the placing of asphalt is unduly delayed or the primed surface contaminated in any way the Superintendent may direct the application of a tack coat to all or part of the area.

Any overspray onto kerb and channel, medians, gully pits, etc. shall be removed prior to the commencement of the defects liability period.

8.0 Tack Coat

A tack coat shall be sprayed on the existing surface for resurfacing work. It is not required on a new primer or primer seal coat unless ordered by the Superintendent.

The whole of the area to be sheeted with asphalt shall be lightly and evenly tack-coated with a fine spray of approved bitumen emulsion. The application shall be equivalent to 0.3 – 0.5 litres of bitumen emulsion per square metre. Dilution with water may be required to facilitate spraying and permit uniform application.

The tack coat shall be allowed to 'break' (water separating from the bitumen) before the asphaltic surfacing is spread. Care must be taken to ensure that the longitudinal edges are adequately tack coated to secure satisfactory bonding along the edges.

All care shall be taken to prevent overspray onto kerb and channel or median kerbs. Any such overspray shall be removed prior to the commencement of the defects liability period.

9.0 Transport

The mixed material shall be discharged into motor trucks, the bodies of which have been lightly coated with limewater or soap solution, or other approved coating agent to permit easy discharge. The complete load shall be coated with heavy canvas (or equivalent) to minimise loss of heat during transit and prevent wetting by rain.

Where mixed material is to be transported in cold conditions, the Superintendent may direct that the bodies of all trucks be suitably insulated.

Each truck shall be fitted with an approved type of adjustable tailgate to allow proper control of the mix during discharge into the spreading device. All trucks shall be so arranged that there is minimal delay in the discharge of the load into the spreader.

Smaller capacity trucks may be used where surfacing work has to be carried out using small paving machines (i.e. footpaths or small constrained areas). The Superintendent may, at the Superintendent's absolute discretion, reject any load that has cooled in the truck to below 130°C.

When backing trucks against the spreader, care shall be taken not to jar the spreader out of its proper alignment. Delivery of the mix shall be at the uniform rate within the capacity of the spreading and compacting equipment. Transport shall be as expeditious as possible to minimise cooling of the mixture.

Unless approval is given by the Superintendent to other means of measurement, all truck loads of mix shall be weighed upon a certified weighbridge.

Unless approval is given otherwise by the Superintendent, laying shall only be carried out in daylight hours and delivery of asphalt to the Site shall be arranged accordingly. The last truck load on the job must arrive not later than one hour before sunset.

10.0 Laying of Asphalt Surfacing

Asphalt Surfacing shall not be laid until all base course test results have been approved by the Superintendent.

Spreading, except as agreed otherwise, shall be by an approved self-propelled machine, having an effective spreading capacity of not less than 400 tonnes of mix per 8 hour day for work on

roads of or suitable capacity for work on footpaths or in lightly constructed areas. It should include the following features:

- Means of pushing each motor truck during spreading.
- A receiving hopper into which motor trucks can discharge the mixed material.
- Distributing screws to place the material evenly in front of the screed plate, without segregation.
- Automatic tamping or vibrating devices.
- An adjustable screed capable of providing a smooth even surface free from tears or other blemishes, to a width of not less than 3.5 metres for work on roadways. Provision shall be made for easy adjustment to permit lesser widths of spread.
- An approved screed heating device.
- Effective steering, such that the mix can be laid to a true line.
- Means of adjusting depth of spread between 6mm and 100mm (compacted thickness).

On straight runs, the width of the mat laid by the spreader shall be such that the width to be hand placed shall not exceed 500mm on any one side of the spreader. At intersections and other irregular areas, the hand placing and raking shall be kept to a minimum.

The machine shall be so operated that material does not accumulate along the sides of the receiving hopper. Any mix (in or under the machine), which has become unworkable for any reason, shall be removed. Where the end of the spread material has cooled due to delay in laying or when resuming work after a planned stoppage, a transverse joint shall be formed by cutting the spread material to a vertical face before any fresh mix is spread.

In the event of faulty operation of the mechanical spreader causing irregularities in the spread material, works shall be suspended until the fault is rectified. If the irregularities are of a minor nature, and the surface has not cooled appreciably, it will be permissible to spread a thin layer of fresh mix by hand, level it with board rake and roll it quickly. Should the treatment fail to produce a surface of acceptable depth, then the defective surface shall be removed and fresh material shall be laid as previously described.

Mixing and placing asphalt will not be permitted when the surface of the road is wet, or is at a temperature less than 10^{o}C, or cold winds chill the mix to an extent that spreading and compaction are adversely affected.

The temperature of the mix when it is tipped into a spreader shall not be less than 130^{o}C, nor greater than 175^{o}C. Spreading shall proceed without undue delay, and initial rolling of the mix shall commence at a temperature of not less than 95^{o}C nor greater than 130^{o}C. It may be necessary to complete compaction at higher temperatures than 95^{o}C for thin layers (less than 50mm) in cold and windy conditions.

In the event of a breakdown of the spreader of any item of compaction equipment, all operations shall be suspended until replacement units are available. Any material not laid and compacted in accordance with this specification shall be removed and replaced by the Contractor at the Contractor's cost.

11.0 Compaction

Compaction of the mix shall be carried out using such equipment and techniques as are necessary to achieve the field density specified herein. A minimum requirement for compaction equipment shall be a twin drum vibrating roller having the following characteristics:

- Minimum dead weight – 6 tonnes;
- Minimum drum width – 1.4 metres;
- Vibrating frequency on both drums 2000 – 3000 hertz;
- Vibrating amplitude 0.4mm – 0.8mm.

If the street is not trafficked sufficiently during the asphalt laying operation or because of the apparent open texture of the rolled asphalt surfacing, the Superintendent may order a multi-tyre roller, with a minimum tyre pressure of 550kpa and a minimum load of 1 tonne for each tyre, be used as a finishing roller.

The transverse and longitudinal joints and edges shall be compacted first and rolling shall then proceed longitudinally at the sides and gradually progress towards the centre of the pavement, except on super-elevated curves, where the rolling shall begin on the low side and progress to the high side. Each traverse pass shall substantially overlap the previous traverse roller pass.

12.0 Testing

12.1 Unless otherwise specified the cost of all sampling and testing (including compaction control) shall be borne by the Contractor. The Contractor shall arrange for material qualities and compaction control testing of all asphalt materials, to be performed by a **NATA** accredited testing authority approved by the Superintendent. Testing shall be carried out in accordance with the appropriate test methods, sourced from either the **Australian Standard AS2891** or **Queensland Department of Main Roads**, **Materials Testing Manual**. The selection/application of test methods shall be made on a consistent basis. Inter-related tests shall be performed by the methods from the same Standard/Testing Manual.

12.2 **Acceptance/ Rejection Criteria – Quality**

The Contractor shall have test results for all materials used in the asphalt mix available at the asphalt plant for viewing by the Superintendent at any time. The Contractor shall be able to demonstrate that the test results match up with the batches of materials used and that the materials conform with the requirements of **Clause 3.0** herein.

Samples of the mixture shall be taken at the asphalt plant at the rate of:

a) 1 sample per 400 tonnes or part thereof product; or

b) 1 sample per job per day whichever is greater. Each sample shall be made up of not less than two (2) parts.

Tests on each part shall be carried out in accordance with the following standard test procedures to demonstrate conformity with the requirements of **Clause 4.0** herein:

i) Stability and Flow by either **AS2891.5** or **QDMR Test Method Q305**.

ii) Maximum Density by either **AS2891.7.1** or **QDMR Test Method Q307A**.

iii) Binder Content and Aggregate Grading by either **AS2891.3.1** or **QDMR Test Method Q308A**.

iv) Air Voids by either **AS2891.8** or **QDMR Test Method Q311**.

12.3 **Acceptance/ Rejection Criteria – Compaction**

Acceptance of compaction shall be based on a statistical analysis of density testing of the work in lots. Provided the mix is homogenous and placed in one layer under essentially uniform conditions, a test lot shall consist of all asphalt placed and compacted in one day.

Density testing will be carried out as soon as possible after final rolling and, where possible, prior to trafficking. Sites for density testing will be selected on an essentially random basis provided no site is selected within 150mm of a joint or free edge. Should it be necessary to conduct density testing later than two days after trafficking, the sites for testing shall be outside the trafficked wheel paths.

For each lot, the density of the compacted mix will be determined by nuclear gauge in accordance with **AS2891.14.1.1** or **QDMR Test Method Q314**. When the specified compacted layer thickness is less than 75mm, core sampling as per **AS2891.1** or **QDMR Test Methods Q302A** or **Q302B**, to determine the density of the compacted mix in accordance with **AS2891.9.1** or **QDMR Test Methods Q306A** or **Q306C** shall be used.

The compaction of the asphalt surfacing shall be assumed from the following characteristics:

a) For compliance testing a designated lot eight (8) positions are to be selected at random as directed by the Superintendent.

b) The required relative compaction for the various types of asphalt is:

- Type 1, 2 90%
- Type 3, 4 92%

Relative compaction is defined as the compacted density of asphalt in the field (**AS2891.9.1** or **QDMR Q306A** or **Q306C**) divided by the maximum density of the asphalt (**AS2891.7.1** or **QDMR Q307A**).

c) The lot will be accepted if of the eight (8) results, two or less fall below the required relative compaction.

OR

d) The Contractor may elect to carry out an additional five (5) tests and combine those results with the initial eight (8) tests. The designated lot will be rejected if four or more of the combined thirteen (13) tests fall below the required relative compaction.

13.0 Finish of Compacted Asphalt Surfacing

13.1 Level and Profile

The surface of all compacted asphalt shall be finished true to grade and profile with smooth joints and a neat finish around manholes and other road surface fittings.

Tolerance on design thickness	+10mm -5mm
Tolerance of 3m straight edge	+5mm -5mm
Tolerance of channel edge	+5mm -0mm

Notwithstanding thickness control the asphalt surface shall be free draining.

Due allowance may be made for the effect of geometric acceptance in the design where relevant.

13.2 Thickness

Measured cores cut for density testing shall have 4 out of 5 tests fall within tolerance. 1 out of 5 tests may fall less than 5mm outside tolerance.

This is the preferred method and shall be used unless approved otherwise by the Superintendent. If any doubts exist as to thickness of the compacted asphalt the Superintendent may order further tests.

13.3 Patching

Where patching has to be carried out by the Contractor, the area to be patched shall be determined by the Superintendent, squared neatly and the edges and the roadway tacked with emulsion.

Hot asphalt shall be then placed and neatly raked to an even thickness and left adequately proud, so that with compaction the existing surface and patch smoothly join without depressions or high spots.

14.0 Provision for Traffic

All necessary signs, barriers etc. required for the control and protection of traffic shall be provided, erected and maintained by the Contractor in accordance with the Manual of Traffic Control Devices (Queensland).

Special care shall be taken to ensure that vehicles and pedestrians are not sprayed with primer or tack coat material and that entry to areas treated with uncovered primer tack coat or hot paving mixture is prevented.

15.0 Stoppage of Work

The Superintendent may suspend all work if the Superintendent considers the work is not being carried out in accordance with this specification.

16.0 Measurement and Payment

16.1 Asphalt surfacing shall be measured and paid for in tonnes or square metres for the compacted thickness in place. The method to be adopted shall be as specified in the Contract Documents.

16.2 Measurement and Payment by Weight

Where specified that measurement and payment is by weight the following conditions shall apply:

i) **Measurement**

Asphalt shall be measured by weight in tonnes. Motor vehicles transporting the asphalt shall be weighed at a certified registered weighbridge or by other approved means and the quantity manufactured shall be taken as the net weight in the vehicle from the certified weighbridge docket.

The area of asphalt in each course, when required to establish average compacted thickness, shall be measured by the Superintendent or its representative who shall give reasonable notice to the Contractor of its intention to undertake the measurement. The Contractor shall, if it so desires or if it be so directed by the Superintendent, be present at and assist with the taking of measurements.

If the Contractor fails to attend the taking of measurements as notified by the Superintendent, the measurements taken by the Superintendent during the Contractor's absence shall be binding on the Contractor.

Payment will be made at the Scheduled Unit Rate per tonne of asphalt laid, which rate shall include full compensation for the transporting, placing and compacting the asphalt and for furnishing all equipment, plan, tools, labour and any expense necessary for the satisfactory completion of the asphalt surfacing in place in the Works as specified herein.

Payment for priming will be made at the Scheduled Unit Rate, which rate shall include full compensation for the supply, hauling and spraying of the cutback bitumen or bitumen emulsion and including all equipment, plant, tools, labour and any expenses necessary for the satisfactory completion of this item.

16.3 **Measurement and Payment by Area and Specified Thickness**

Where specified that measurement and payment is by area and specified thickness the following conditions shall apply:

i) Asphaltic surfacing shall be measured in square metres for the compacted thickness detailed on the drawings or shown in the Bill of Quantities (if part of the Contract) or as directed by the Superintendent.

ii) For all of the work covered by the specification, payment will be made in accordance with the relevant Bill Item (if part of the Contract) and/or the Lump Sum of the Contract generally and shall include full compensation for the testing, supplying, transporting, spreading and compacting the asphaltic, priming and/or tack coating, and including all plant, material, tolls, labour and any expenses necessary for the satisfactory completion of the Works.

17.0 Standards and Codes

17.1 This specification makes reference to the following Australian Standards and Queensland Department of Main Roads documents:

AS1141	**Methods for Sampling and Testing Aggregates**
AS2008	**Residual Bitumen for Pavements**
AS2150	**Hot Mix Asphalt**
AS2157	**Cutback Bitumen**
AS2357	**Mineral Fillers for Asphalt**
AS2891	**Methods of Sampling and Testing Asphalt**
QDMR	**Materials Testing Manual, Volumes 1 – 4, Third Edition 1978, including Amendment Sheet No. 26, June 1996**

17.2 In this specification Australian Standards are referred to only by their allocated AS number. The latest available edition at the date of close of Tenders shall be deemed to apply.