Technical Specification

Transport and Main Roads Specifications
MRTS30 Asphalt Pavements

March 2024

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1 Introduction

1.1 Overview

This Technical Specification sets out the requirements for asphalt used in road pavements and includes the following asphalt types:

- Medium duty dense graded asphalt (AC7M, AC10M, AC14M and AC20M)
- Heavy duty dense graded asphalt (AC7H, AC10H, AC14H and AC20H)
- Open graded asphalt (OG10 and OG14), and
- Stone mastic asphalt (SMA10 and SMA14).

More sustainable asphalt and lower emissions

This Technical Specification requires asphalt mixes to contain a warm mix asphalt additive to enable these mixes to be produced at a lower temperature than has historically been required (in previous versions of this Technical specification). This temperature reduction should help lower emissions and improve sustainability outcomes while still achieving a conforming product.

The term “dense graded asphalt” is used throughout this Technical Specification to refer to both medium duty and heavy duty dense graded asphalt and may contain Reclaimed Asphalt Pavement (RAP) material.

Guidance[1] on the selection of binder grade for use in dense graded asphalt is provided in the table below.

Application	Traffic Volume (Average Daily ESAs in the Design Lane in the Year of Opening)		Typical Binders
	Free Flowing	High Shear[2]	
Surfacing layer	< 1000	< 300	C320
	< 3000	< 1000	M1000[3]
	All	All	A15E[4]
Layer below surfacing	< 3000	< 1000	C320
	All	< 3000	C600, M1000
	All	All	A15E[4]
Layers covered by at least two layers of asphalt	All	< 3000	C320
	All	All	C600, M1000, A15E[4]

[1] This table has been developed to assist designers in selecting binders to optimise performance outcomes on projects. Mixes may be used outside these parameters and still provide acceptable long-term performance.

[2] High shear areas include signalised intersections and approaches, roundabouts and approaches, and other areas with very slow moving heavy vehicles. For bus stops, busways and bus-only lanes, specialist advice should be sought from the Principal Engineer (Asphalt and Surfacings).

[3] M1000 typically has a shorter oxidation life than C320 and A15E binders. More frequent resurfacing should be anticipated where M1000 binder is used in surfacing layers.

[4] A15E binder is typically used in situations where enhanced deformation and/or fatigue resistance is desired.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements* and other Technical Specifications as appropriate.

This Technical Specification forms part of the Transport and Main Roads Specifications Manual.

For projects that utilise this Technical Specification, the following personnel should have completed and have a certificate of attainment for the Australian flexible Pavements Association (AfPA) course "ASA407A *Administration of Specifications* - MRTS30 *Asphalt Pavements*":

- Contractor's and Prequalified Asphalt Contractor's (PAC) Project Manager(s), Engineer(s) and Site Supervisor(s) for the asphalt works
- Administrator, and Inspector.

The Administrator should implement an audit and surveillance plan. Typically, a minimum of 10% of asphalt lots should be audited on the department's projects. An increased or reduced frequency may apply based on the PAC's historical performance and the project's risk profile.

This Technical Specification is based on the principles outlined in Austroads *Guide to Pavement Technology Part 4B: Asphalt*. The Austroads Guide should be used by PACs and Administrators, in conjunction with the material from the above mentioned AfPA course and Austroads Pavement Work Tips, as the first point of reference.

Administrators can seek further advice on interpretation of this Technical Specification from the Principal Engineer (Asphalt and Surfacings).

1.2 Performance requirements

The asphalt must not ravel, rut, shove, strip or bleed for the first 24 months after the Date of Practical Completion, and the surface of the asphalt must comply with the surface shape requirements specified in Table 9.5.2 for the first 12 months after the Date of Practical Completion.

The requirements of Clause 1.2 are based on the assumption that the asphalt works will be completed shortly before the date of practical completion. Adjustment to these requirements may be required for other scenarios.

2 Definitions of terms

The terms used in this Technical Specification are defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*, Table 2 of this Technical Specification and AGPT04B-14.

Table 2 – Definition of terms

Term	Definition
Asphalt mix design registrar	Person(s) nominated by the Deputy Chief Engineer (Pavements, Materials and Geotechnical) to register asphalt mix designs for use on Department of Transport and Main Roads projects.
Prequalified asphalt contractor (PAC)	An entity prequalified, in accordance with the requirements of the *Transport Infrastructure Project Delivery System Manual*, to supply (i.e., manufacturing and/or paving only) asphalt to Department of Transport and Main Roads projects. The prequalification category applicable to a project is specified in the Contract.
Registered mix design	The mix design, of a particular nominal size of asphalt, which has been submitted by a manufacturer and registered by the Department of Transport and Main Roads.

3 Referenced documents

Table 3 lists the documents referenced in this Technical Specification.

Table 3 – Referenced documents

Reference	Title
–	*Reclaimed Asphalt Pavement (RAP) Management Plan,* Australian Flexible Pavement Association
Advisory Note 7	*Guide to the selection, heating and storage of binders for sprayed sealing and hot mix asphalt*

Reference	Title
AG:PT/T220	*Sample preparation - Compaction of asphalt slabs suitable for characterisation*
AG:PT/T234	*Asphalt binder content (ignition oven method)*
AG:PT/T235	*Asphalt binder drain-off*
AG:PT/T236	*Asphalt particle loss*
AG:PT/T237	*Binder film index*
AGPT/T193	*Design of bituminous binder blends to a specified viscosity value*
AGPT04B-14	*Guide to pavement technology Part 4B: Asphalt*
AP-PWT13	*Temperature characteristics of binders in asphalt*
AP-PWT15	*Asphalt production process control*
AP-PWT30	*Asphalt shape correction*
AP-PWT51	*Asphalt tack coating*
AS 1160	*Bituminous emulsions for the construction and maintenance of pavements*
AS 2150	*Asphalt – A guide to good practice*
ATM 192	*Characterisation of the viscosity of reclaimed asphalt pavement (RAP) binder using the dynamic shear rheometer (DSR)*
ATM 231	*Deformation resistance of asphalt mixtures by the wheel tracking test*
ATM 232	*Stripping potential of asphalt - Tensile strength ratio*
ATM 250	*Modified surface texture depth (pestle method)*
MRTS01	*Introduction to Technical Specifications*
MRTS02	*Provision of Traffic*
MRTS17	*Bitumen and Multigrade Bitumen*
MRTS18	*Polymer Modified Binder (including Crumb Rubber)*
MRTS50	*Specific Quality System Requirements*
MRTS56	*Construction Surveying*
MRTS84	*Deck Wearing Surface*
MRTS101	*Aggregates for Asphalt*
MRTS102	*Reclaimed Asphalt Pavement Material*
MRTS103	*Fillers for Asphalt*
NGTM	*Nuclear Gauge Testing Manual,* Transport and Main Roads
Pavement Design Supplement	*Pavement Design Supplement: Supplement to 'Part 2: Pavement Structural Design' of the Austroads Guide to Pavement Technology*, Transport and Main Roads
RC 900.07	*Test Method: Calibration of Nuclear Thin-Layer Density Gauge Using Standard Blocks*, Department of Transport and Planning
TIPDS Manual	*Transport Infrastructure Project Delivery System Manual,* Transport and Main Roads
TN148	*Asphalt Mix Design Registration,* Transport and Main Roads
TN183	*Use of High Percentage of Reclaimed Asphalt Pavement (RAP) Material in Dense Graded Asphalt,* Transport and Main Roads

4 Standard test methods

The standard test methods given in Table 4 shall be used in this Technical Specification.

Further details of test numbers and test descriptions are given in Clause 4 of MRTS01 *Introduction to Technical Specifications*.

Table 4 – Standard test methods

Property to be Tested	Test Method No.
General	
Calculation of characteristic value of a lot	AS 2891.14.15 or Q020
Selection of sampling or test sites	AS 1289.1.4.2
Aggregate	
Particle size distribution	AS 1141.11.1
Filler	
Methylene blue value	AS 1141.66
Voids in dry compacted filler	AS 1141.17
Asphalt	
Air voids content of compacted asphalt	Q311, AS/NZS 2891.8, AS/NZS 2891.14.5
Asphalt binder drain-off	AG:PT/T235
Asphalt particle loss	AG:PT/T236
Binder content and aggregate grading	AS/NZS 2891.3.1, Q308A or AG:PT/T234
Binder film index	AS/NZS 2891.8, AG:PT/T237 or Q317
Compacted density / field density	AS/NZS 2891.9.2, AS/NZS 2891.9.3, Q306C, Q306E or AS/NZS 2891.14.2
Compaction of asphalt slabs	AG:PT/T220
Compaction of asphalt test specimens (using a gyratory compactor)	AS/NZS 2891.2.2
Compaction of asphalt test specimens (using a Marshall compactor)	Q305
Design of bituminous binder blends to a specified viscosity value	AGPT/T193
Deformation resistance	ATM 231
Degree of particle coating	AS/NZS 2891.11
Effective binder volume	AS/NZS 2891.8 or Q311
Equivalent compaction temperature for warm mix asphalt	Q323
Fixed binder fraction	Q321
Marshall stability, flow and stiffness	Q305
Maximum density	AS/NZS 2891.7.1
Mix volume ratio	Q318
Moisture content of bituminous mixes	AS/NZS 2891.10

Property to be Tested	Test Method No.
Proof rolling	Q723
Resilient modulus	AS/NZS 2891.13.1
Road roughness (Surface evenness)	Q708B, Q708C or Q708D
Sampling of compacted asphalt – coring	AS 2891.1.2
Sampling loose asphalt mix	AS/NZS 2891.1.1
Tensile strength and tensile strength ratio	ATM 232
Texture depth	ATM 250
Three metre straightedge	Q712
Viscosity of RAP binder	ATM 192

4.1 Supplementary requirements for the standard test methods in Table 4

4.1.1 AS 1289.1.4.2

For compaction lots when exclusions have not been specified, exclude any parts of the lot or sub-lot which are within 200 mm of any top edge or construction joint.

4.1.2 AG:PT/T234

Where testing is performed in accordance with Austroads Test Method AG:PT/T234, asphalt binder content (ignition oven method), add the following note to Clause 3a. "For certain heat sources, for example, infrared, an ignition oven temperature lower than 540°C may be applicable".

4.1.3 AS/NZS 2891.9.2

Where testing is performed in accordance with Test Method AS/NZS 2891.9.2, the thickness of each specimen shall be reported in addition to the bulk density and water absorption.

Notwithstanding the requirements of Section 1 of AS/NZS 2891.9.2, this test method can also be used for dense graded asphalt with a water absorption exceeding 2% by volume.

4.1.4 Q306E and AS/NZS 2891.14.2

Requirements for the determination of asphalt density bias and checking of the asphalt density bias are specified in Clause 9.2.2. Calibration of thin-layer nuclear gauges shall be performed in accordance with test method AS/NZS 2891.14.3 or RC 900.07.

4.1.5 ATM 231

For SMA10 and SMA14 mixes, test specimens shall be compacted to an air voids content of 3.0% to 5.0%.

4.1.6 AS/NZS 2891.2.2, Q305 and ATM 232

When using AS/NZS 2891.2.2 and ATM-232, the laboratory compaction temperature nominated in Q305 must be used.

Use of a mix compaction temperature that is different to that nominated in Q305 requires approval by the Asphalt Mix Design Registrar prior to use and it must be stated on the asphalt mix design certificate and all test reports.

4.1.7 ATM 232

The freeze / thaw moisture conditioning of specimens detailed in Section 5.2 of ATM 232 is mandatory.

5 Quality system requirements

5.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are stated in Clause 5.2 of MRTS01 *Introduction to Technical Specifications*.

The Hold Points, Witness Points and Milestones applicable to this Technical Specification are summarised in Table 5.1.

Table 5.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
5.2			Submission of Asphalt Quality Plan (7 days)
7.2.5	1. Recommencement of production after nonconforming Tensile Strength Ratio		
7.3.3			Submission of Asphalt Mix Design Certificate (7 days)
7.4.1	2. Incorporation of asphalt into the Works 3. Acceptance of a nonconforming or nonstandard mix design for incorporation into the Works		
8.2.2	4. Approval to place asphalt over weak substrate	1. Proof rolling of substrate	
8.2.3		2. Mark out of cracks to be filled	
8.2.4		3. Marking out the areas on which strain alleviating fabric strips are to be applied	
8.6.2	5. Approval to place asphalt at a nonconforming layer thickness		
8.7	6. Approval to place asphalt at a nonconforming pavement temperature		
8.11	7. Placing of the nominated mix (after placement trial)		

5.2 Asphalt quality plan

The Contractor must develop an Asphalt Quality Plan (AQP) for the asphalt work in accordance with the requirements of Clause 5 of MRTS50 *Specific Quality System Requirements*. In addition to these requirements, the plan must include the documents shown in Table 5.2. The AQP must be submitted to the Administrator for consideration at least seven days prior to work commencing and must be implemented. **Milestone**

It is anticipated that the initial submission of the AQP will establish the structure for asphalt works for the remainder of the Contract. However, it is expected that ongoing updates to the AQP will be required to reflect changes in the work methodology that are associated with progress of the works under the Contract.

In this sense, the AQP is considered to be a 'living' document.

Table 5.2 – Asphalt quality plan (AQP) requirements

Clause	Planning Documents
5.4 & 5.6	Inspection and test plan (ITP), including methods and frequencies of sampling, methods and frequencies of testing, verification checklists, and timeframe for submission of test results
MRTS50 Clause 7	Asphalt materials - for each constituent material, lot / stockpile size, method of defining each lot and allocating a unique lot number
7.1	Procurement, handling and storage of each constituent material
	Nominated particle size distribution and tolerances for each constituent aggregate
7.1.6	Process control procedures for dense graded asphalt mixes containing > 15% RAP
7.3	Development, certification and registration of the nominated mix design
MRTS50 Clause 7	Asphalt production – for each nominated mix, the method of defining each lot and allocating a unique lot number
7.4	Calibration of the asphalt manufacturing plant, including all weigh scales, flowmeters and thermometers
	Process control, including plant operating instructions, key temperature targets and records, and responses to process control charts
	Acquisition, storage and handling of binder, including identification and prevention of segregation and/or contamination
	Control of plant feed proportions, including regular checks on grading and moisture content
	Daily asphalt manufacturing plan to ensure timely and uninterrupted progress on site
7.5	Loading, delivery and unloading procedures that maintain adequate mix temperature and do not interrupt progress of the paving train
MRTS50 Clause 7	Asphalt placement - for each paving and related activity, the method of defining each lot (including length, width, area and location) and allocating a unique lot number

Clause	Planning Documents
8	Process control for surface preparation, tack coating, placing, joint construction, compaction and clean-up, including plant operating instructions, key temperature targets and records, patterns for paving and compaction operations, and process monitoring
8.3	Allocation of appropriate plant and equipment, including backup in case of breakdown
8.3	Compaction procedure and the factors affecting / determining rolling patterns
8.6.2	Work method for placing corrective courses and tie-ins in nonconforming thicknesses (where applicable)
8.7	Measurement and recording of pavement temperatures and weather conditions
8.8	Paving and compaction temperatures
8.9	Bituminous emulsion grade and application rate for tack coat
8.10	Construction joints
8.11	Design, execution and quality verification of a placement trial
9.4	Requirements for course thickness

5.3 Conformance requirements

The conformance requirements which apply to asphalt lots covered by this Technical Specification are summarised in Clauses 7.1, 7.2 and 9.

The Contractor shall verify conformance with this Technical Specification by sampling and testing and providing records of process control.

5.4 Compliance testing

5.4.1 General

Compliance testing shall be carried out for each lot.

The Contractor is responsible for performing sufficient tests to ensure that the asphalt complies with this Technical Specification and requirements of the Contract.

However, the Contractor's testing program shall be such that the testing frequencies and number of tests are not less than those specified in Tables 5.4.1(a), 5.4.1(b), 5.4.1(c) and 5.4.1(d).

Minimum testing frequencies for constituent materials are nominated in the relevant constituent material specification (i.e., MRTS17 *Bitumen and Multigrade Bitumen*, MRTS18 *Polymer Modified Binder (including Crumb Rubber)*, MRTS101 *Aggregates for Asphalt*, MRTS102 *Reclaimed Asphalt Pavement Material* and MRTS103 *Fillers for Asphalt*).

Table 5.4.1(a) – Minimum frequency for sampling and testing asphalt

Quantity of Asphalt Supplied in each Shift (tonnes)	Minimum Testing Frequency	Minimum Number of Tests
≤ 10	–	0[1]
11 – 20	–	1[2]
21 – 100	–	1
101 – 500	–	2[3]

Quantity of Asphalt Supplied in each Shift (tonnes)	Minimum Testing Frequency	Minimum Number of Tests
501 – 1000	1 per 250 tonnes	3
1001 – 2100	1 per 350 tonnes	5
> 2100	1 per 500 tonnes	6

Notes:

[1] Unless otherwise ordered by the Administrator, testing is not required.

[2] Testing for air voids in laboratory compacted specimens is not required unless the binder content and grading results for the mix do not comply with the job mix limits or testing is ordered by the Administrator.

[3] The first sample shall be taken from within the first 40% of asphalt produced and the second sample from within the last 40% of asphalt produced for the lot.

Table 5.4.1(b) – Asphalt production

Clause	Property	Test Method / Procedure	Minimum Testing Frequency
7.1.5	Filler in asphalt – Voids in dry compacted filler (combined filler)	AS/NZS 1141.17	Monthly for each mix design
7.1.5	Filler in asphalt - Methylene blue value for the combined filler (excluding hydrated lime)	AS 1141.66	Monthly for each mix design that contains materials which have a methylene blue value > 10 mg/g and ≤ 18 mg/g. Three monthly for each mix design that contains materials which have a methylene blue value ≤ 10 mg/g
7.1.5	Filler in asphalt - Methylene blue value for the combined filler	AS 1141.66	Monthly for mix designs that contain materials which have a methylene blue value for the combined filler (excluding hydrated lime) > 10 mg/g
7.2.1.1 and 7.4.3.2	Combined particle size distribution	Q308A, AS/NZS 2891.3.1 or AG:PT/T234	As per Table 5.4.1(a)
7.2.1.2 and 7.4.3.2	Binder content (by mass)	Q308A, AS/NZS 2891.3.1 or AG:PT/T234	As per Table 5.4.1(a)
7.4.3.2	Maximum density	AS/NZS 2891.7.1	As per Table 5.4.1(a)
7.2.2	Air voids in laboratory compacted specimens: 120 cycles gyratory compaction or	AS/NZS 2891.2.2, AS/NZS 2891.7.1, AS/NZS 2891.9.2 and Q311 or AS/NZS 2891.8	As per Table 5.4.1(a)
	50 blows per face Marshall compaction (Dense graded asphalt only)	Q305, AS/NZS 2891.7.1, AS/NZS 2891.9.2 and Q311 or AS/NZS 2891.8	

Clause	Property	Test Method / Procedure	Minimum Testing Frequency
7.2.2	Air voids in laboratory compacted specimens1: 350 cycles gyratory compaction (Heavy duty dense graded asphalt only - where conformance with the requirements of Table 7.2.2 is assessed using gyratory compaction)	AS/NZS 2891.2.2, AS/NZS 2891.7.1, AS/NZS 2891.9.2, and Q311 or AS/NZS 2891.8	1 per lot
7.2.2	Air voids in laboratory compacted specimens (Stone mastic asphalt only)	Q305, AS/NZS 2891.7.1, AS/NZS 2891.9.2 or Q306C and Q311 or AS/NZS 2891.8	As per Table 5.4.1(a)
7.2.2	Air voids in laboratory compacted specimens (Open graded asphalt only)	Q305, AS/NZS 2891.7.1, AS/NZS 2891.9.3 and Q311 or AS/NZS 2891.8	As per Table 5.4.1(a)
7.2.5	Tensile strength ratio (Dense graded asphalt only)	ATM 232	For each mix design and plant combination, once as part of the first lot incorporated into the Works and every 5000 tonnes thereafter[2,3]
7.2.7	Deformation resistance (Heavy duty dense graded asphalt only - where conformance with the requirements of Table 7.2.2 is assessed using Marshall compaction)	ATM 231	For each AC10H, AC14H and AC20H mix design, once as part of the first lot incorporated into the Works, and every 10,000 tonnes thereafter[4]
7.2.11	Mix volume ratio (Stone mastic asphalt only)	Q318	For each mix design, once as part of the first lot incorporated into the Works and every 5000 tonnes thereafter[2,5]
7.4.6	Production temperature of asphalt	The Contractor's documented procedure	Frequency to be nominated in the Contractor' ITP
7.4.6	Dispatch temperature of asphalt	The Contractor's documented procedure	Each delivered load

Notes:

[1] Testing is not required for mixes where Marshall compaction is used to demonstrate the asphalt mix complies with the requirements of Table 7.2.2.

[2] Testing is not required where the Works involves less than 500 tonnes of a particular mix type, nominal size and binder class.

[3] A reduced testing frequency may apply to mix designs that have a demonstrated history of conformance with this test property. Testing frequencies that apply to these mix designs will be identified on the asphalt mix design register.

[4] Testing is not required where the Works involves less than 5000 tonnes of a particular mix nominal size and binder class.

[5] Testing shall also be completed for each particle size distribution nonconformance on the 4.75 mm test sieve for SMA14 and 2.36 mm test sieve for SMA10.

Table 5.4.1(c) – Asphalt placement

Clause	Property	Test Method / Procedures	Minimum Testing Frequency
8.7	Pavement surface temperature	The Contractor's documented procedure	One measurement every 2 hours
8.8	Temperature of asphalt at initial compaction	The Contractor's documented procedure	Each delivered load
8.9	Tack coat application rate	The Contractor's documented procedure	Each lot
9.1	Homogeneity	Visual assessment	Each lot

Table 5.4.1(d) – Finished pavement

Clause	Property	Test Method	Lot Size	Minimum Number of Tests	Minimum Testing Frequency
8.11	Bulk density (mat) (Open graded asphalt only)	AS 1289.1.4.2 AS/NZS 2891.1.2 and AS/NZS 2891.9.3	All	First lot incorporated into the works: 5 per layer	N/A
9.2	Insitu air voids (mat) (Dense graded asphalt only)	AS/NZS 2891.1.2 AS/NZS 2891.9.2, Q306C, Q306E or AS/NZS 2891.14.2 AS/NZS 2891.7.1 and Q311 or AS/NZS 2891.14.5	≤ 50 m²	0[1] per layer	N/A
			51 – 500 m²	3 per layer	N/A
			501 – 1000 m²	4 per layer	N/A
			1001 – 5000 m²	5 per layer	1 per 500 m² per layer
			> 5000 m²	10 per layer	1 per 1000 m² per layer
9.2	Insitu air voids (mat) (Stone mastic asphalt only)	AS/NZS 2891.1.2 Q306C or Q306E AS/NZS 2891.7.1 and Q311 or AS/NZS 2891.8	≤ 50 m²	0[1] per layer	N/A
			51 – 500 m²	3 per layer	N/A
			501 – 1000 m²	4 per layer	N/A
			1001 – 5000 m²	5 per layer	1 per 500 m² per layer
			> 5000 m²	10 per layer	1 per 1000 m² per layer
9.3	Surface texture depth (Stone mastic asphalt only)	ATM 250	≤ 50 m²	0[1] per layer	N/A
			51 – 500 m²	3	N/A
			501 – 1000 m²	4	N/A
			1001 – 5000 m²	5	1 per 500 m²
			> 5000 m²	10	1 per 1000 m²
9.4.2.2	Vertical levels (where level control is specified)	Survey	For each course – as per MRTS56 *Construction*		

Clause	Property	Test Method	Lot Size	Minimum Number of Tests	Minimum Testing Frequency
9.4.2.3	Layer thickness (average)	Clause 9.4.2.4(a)	One calculation per lot where thickness control is specified		
	Layer thickness (individual locations)	Clause 9.4.2.3(b)	a) coring: as specified for insitu air voids, or b) measured dips: for each layer – three points on cross section per 20 lineal metres. Applications: • layers where thickness control is specified and the layer is placed over one or more layers placed by the Contractor		
9.4.3	Horizontal position	Contractor's documented procedure	For each layer – one test per 20 lineal metres at shoulder edge, lane lines and other changes in grade (where applicable)		
9.5	Surface shape (completed course level)	Q712[3]	a) **within lane**: one per 20 metres along each paver run, unless otherwise approved by the Administrator[2]. Measurements shall be taken in both the transverse and longitudinal directions. b) **longitudinal joint**: one per 20 lineal metres along each joint, unless otherwise approved by the Administrator[2]. c) **transverse joint**: one measurement per joint in each wheel path in each lane. For all joints located within the works, place the straightedge on the road surface perpendicular to the joint. With the end of the straightedge directly over the joint, gradually move the straightedge across the joint for its full length and identify the point on the road surface that produces the largest deviation under the straightedge (between two points of contact). Record the deviation at this point. For all joints that tie the new works to existing pavement (not constructed under the Contract), place the straightedge on the road surface perpendicular to the joint. With the end of the straightedge directly over the joint and the other end located within the works, record the largest deviation under the straightedge (between two points of contact).		
9.6	Road roughness	Q708B, Q708C, or Q708D	The lot length shall be 100 m.		

Notes:

[1] Unless otherwise ordered by the Administrator, testing is not required.

[2] The Administrator may approve the adoption of a reduced testing frequency of 1 per 50 m in 'mid-block' applications (i.e., areas of asphalt not located in the vicinity of intersections, roundabouts, steep grades and/or sharp curves). NATA accreditation is not required for this test.

[3] This testing is exempt from the requirement for NATA accreditation or Construction Materials Testing (CMT) registration

Where a minimum frequency of testing has not been specified, the Contractor shall nominate an appropriate testing frequency in accordance with Clause 8.5 of MRTS50 *Specific Quality System Requirements*.

5.4.2 Sampling

5.4.2.1 General

The Contractor shall nominate all sampling locations, frequencies and test methods in the AQP.

For the determination of insitu air voids and thickness of cores, sampling locations shall be selected using random stratified methods in accordance with AS 1289.1.4.2.

For the determination of levels, horizontal position, thickness (by dip readings) and deviation from a three metre straightedge, sampling locations shall be selected using the minimum nominated frequency.

Asphalt samples must be taken in accordance with AS/NZS 2891.1.1 or AS 2891.1.2 as appropriate.

5.4.2.2 Sub-lotting

In addition to the requirements of MRTS50 *Specific Quality System Requirements*, and unless otherwise specified or agreed with the Administrator, boundaries of sub-lots represented by individual tested samples are deemed to be the midpoint between the adjacent sample locations.

Sub-lotting should be undertaken, where necessary, to reflect portions of work that are essentially uniform in their construction with testing that demonstrates compliance with the relevant Technical Specification(s), including MRTS50 *Specific Quality System Requirements.*

5.4.3 Sampling and testing requested by the Administrator

When the Administrator requests loose asphalt samples for testing, the Contractor must riffle and/or quarter the samples.

All samples, including core samples, must be delivered in sealed and labelled containers identifying the following:

- lot number
- sample description
- sampler
- date produced and/or laid
- date sampled, and
- any other quality system references, as appropriate.

5.5 Maximum lot size

The maximum lot size shall consist of:

- asphalt of the same nominal size manufactured and supplied from the same plant to the same registered mix design
- material that is essentially homogeneous and manufactured, placed and compacted under essentially uniform conditions

- asphalt placed during a single work shift, and
- multiple layers of asphalt provided that the minimum testing frequencies are observed, and the tonnage of asphalt in each layer and the conformance of each layer are recorded separately.

Multiple layers may be placed in a single lot, however in this instance it would generally be considered that inherent variance in the placement process would support classification of each layer as a sub-lot for conformance purposes.

The minimum number of tests shall be applied at the minimum testing frequency given in Table 5.4.1(d).

To achieve the requirements for air voids and layer thickness measurement, the Contractor may elect to deep core the full thickness of asphalt placed in the lot at the completion of the final layer of the lot. In this instance, it is accepted that random stratification will not vary between layers, however care must be taken in reporting results to ensure that the layers are appropriately recorded and described for future reference.

5.6 Time for submission of test results

For each lot, the Contractor shall report to the Administrator:

a) within one working day of completing asphalt placement - preliminary test results for binder content, combined particle size distribution and air voids in laboratory compacted mix

b) within three working days of completing asphalt placement - preliminary test results for insitu air voids, layer thickness and vertical level tolerance and horizontal position

c) within seven days of completing asphalt placement – preliminary test results for moisture sensitivity and mix volume ratio (where applicable), and

d) within 21 days of completing asphalt placement – preliminary test results for deformation resistance (where applicable).

5.7 Process control

The Contractor shall employ a capable process and implement process control in accordance with or exceeding the requirements of AP-PWT15 - *Asphalt Production Process Control*.

5.8 Nonconformances

If a lot fails to conform to this Technical Specification, such failure will constitute a nonconformance under the Contract.

If a nonconformance is not accepted in accordance with the requirements of the Contract, the Contractor shall rectify or replace the lot so that the asphalt conforms to the requirements of this Technical Specification.

Engineering judgement should be applied when evaluating nonconformances on a case-by-case basis.

6 Asphalt contractor prequalification

Asphalt shall be manufactured, placed and compacted by a prequalified asphalt contractor (PAC). At least seven days before asphalt is to be incorporated into the Works, the Contractor shall notify the Administrator in writing of the identity and address of the PAC(s) who will undertake the manufacture, placement and compaction of asphalt that will be incorporated into the Works.

Stone mastic asphalt shall be manufactured, placed and compacted by an A4 Prequalified Asphalt Contractor. A contractor holding a lower prequalification level shall not be used for the manufacture, placement or compaction of stone mastic asphalt.

The criteria for asphalt contractor prequalification are detailed in the *Transport Infrastructure Project Delivery System (TIPDS) Manual*, Volume 3.

The Department of Transport and Main Roads maintains a Contractor prequalification register on its website. Administrators can check the prequalification status of a particular Contractor using this register.

7 Supply of asphalt

7.1 Materials for asphalt

7.1.1 General

All materials used in the manufacture of asphalt must comply with the requirements of this Technical Specification and maintain an essentially uniform appearance for the duration of the Works.

7.1.2 Coarse aggregate

Coarse aggregate must comply with MRTS101 *Aggregates for Asphalt*.

7.1.3 Fine aggregate

Fine aggregate must comply with MRTS101 *Aggregates for Asphalt*.

Additionally, the proportion of recycled glass fine aggregate shall not exceed the following limits:

- 2.5% by mass of total mix in the surfacing course
- 10% by mass of total mix in courses other than the surfacing course.

Recycled glass fine aggregate shall not be used in open graded and stone mastic asphalt.

Fine aggregates for stone mastic asphalt are typically crushed. Use of natural (i.e., not crushed) sand should be minimised where possible.

7.1.4 RAP material

RAP material may be utilised in dense graded asphalt and must comply with MRTS102 *Reclaimed Asphalt Pavement Material*. RAP material shall not be utilised in stone mastic and open graded asphalt.

7.1.5 Filler

The total filler in asphalt comprises the combined fractions of fines produced from the crushing of aggregates and any added filler which passes the 0.075 mm test sieve.

Filler must meet the following requirements:

a) added filler must comply with MRTS103 *Fillers for Asphalt*

b) the combined filler must have voids in dry compacted filler determined in accordance with AS/NZS 1141.17 that comply with the following requirements:

   i. 40% or greater for dense graded asphalt, and

   ii. 38% or greater for stone mastic asphalt and open graded asphalt.

c) methylene blue value of the combined filler in asphalt (excluding hydrated lime) determined in accordance with AS 1141.66 must not exceed 18 mg/g. Where the methylene blue value of the combined filler in asphalt (excluding hydrated lime) exceeds 10 mg/g, the methylene blue value of the combined filler in asphalt (including hydrated lime) must not exceed 10 mg/g.

7.1.6 Binder

For open graded and stone mastic asphalt, A15E polymer modified binder shall be used unless otherwise specified in Clause 1 of Annexure MRTS30.1 *Asphalt Pavements*. For dense graded asphalt, the class of binder used in the Works must be as nominated in Clause 1 of Annexure MRTS30.1 or on the Drawings.

The Contractor may also propose an alternative class of binder, subject to the approval of the Administrator, provided the proposed change does not reduce the life of the pavement structure. The Contractor shall support the proposal with appropriate test data.

The binder must comply with the requirements of MRTS17 *Bitumen and Multigrade Bitumen* or MRTS18 *Polymer Modified Binder (including Crumb Rubber)* for the class of binder specified.

The Contractor shall provide documentary evidence to the Administrator, as specified in MRTS17 and MRTS18, of the binder conformance.

For dense graded asphalt mixes containing > 15% RAP, the Contractor shall manage the viscosity of the binder blend by complying with one of the following methods:

- Method 1 – Adopting the RAP percentage, RAP binder content and binder class requirements outlined in Table 7.1.6(a), or
- Method 2 – Monitoring the binder viscosity and binder content of the RAP and adjusting the RAP content, binder class or rejuvenating oil content to ensure the binder blend viscosity complies with the requirements of Table 7.1.6(b).

The method to be adopted shall be stated on the Asphalt Mix Design Certificate and documented in the Contractor's Asphalt Quality Plan.

Method 1 can be used by A3 and A4 prequalified asphalt contractors.

Method 2 can only be used by A4 prequalified asphalt contractors. Where method 2 is used, the Contractor must document in their Asphalt Quality Plan how variations in binder viscosity and the binder content of the RAP will be managed so that the viscosity and binder content of the asphalt mix will be controlled within specification limits.

Table 7.1.6(a) – Binder class to be used for dense graded asphalt mixes containing RAP (Method 1)

Asphalt Mix Characteristics		Binder Class to be Used in Mix					
		Base, Intermediate and Corrector Courses				Surfacing Course	
RAP Approval Level		1	2		3	1S	2S
Allowable percentage of RAP in mix (%)		0 – 15	13 – 22	23 – 25	23 – 30	0 – 15	13 – 20
Binder content of RAP[1] (%)		Not applicable	4.1 ± 0.5%			Not applicable	4.1 ± 0.5%
Binder Class Specified	C320	C320	C240	C170	C170	C320	C240
	C450	C450	C320	C240	C240	C450	C320
	C600	C600	C450	C320	C320	C600	C450
	M1000	M1000				M1000	
	PMB	PMB class specified				PMB class specified	

Notes:

[1] For fractionated RAP, the weighted average binder content for the combined RAP should be used.

Table 7.1.6(b) – Binder blend viscosity requirements for dense graded asphalt mixes containing > 15% RAP (Method 2)

Specified Binder Class	Binder Blend Viscosity (Pa.s)
C320	320 – 500
C450	430 – 640
C600	600 – 880

Guidance on binder selection is provided in the guide note in Clause 1.1 of this Technical Specification. Irrespective of the binder specified, the requirements of Clause 1.2 of this Technical Specification apply.

A Contractor's proposal to substitute a more deformation resistant binder would typically be accepted provided:

a) the binder proposed does not reduce the fatigue life of the asphalt pavement, and

b) the alternative binder is provided at no additional cost to the Principal.

Where the Contractor proposes to substitute a binder that may reduce the deformation resistance or fatigue life of the asphalt, a risk assessment must be completed, and the proposal evaluated against the risk profile and objectives of the project.

Proposals to adjust the binder grade should be submitted at the time of tender and considered as part of the tender assessment process.

For dense graded asphalt mix designs containing > 15% RAP, guidance on how the Contractor can demonstrate compliance with the binder blend requirements is provided in Technical Note TN183 *Use of High Percentage of Reclaimed Asphalt Pavement (RAP) Material in Dense Graded Asphalt*.

7.1.7 Additives

7.1.7.1 Bitumen adhesion agent

Bitumen adhesion agent may be added to improve the asphalt's resistance to stripping.

7.1.7.2 Warm mix asphalt additive

A warm mix asphalt additive must be included in all asphalt mixes.

More sustainable asphalt and lower emissions

This Technical Specification requires asphalt mixes to contain a warm mix asphalt additive to enable these mixes to be produced at a lower temperature than has historically been required (in previous versions of this Technical Specification). This temperature reduction should help lower emissions and improve sustainability outcomes while still achieving a conforming product.

7.1.7.3 Fibre additive

Cellulose fibre must be used in stone mastic asphalt and the fibre content shall be not less than 0.3% by mass of the mix. Cellulose fibre may also be used in open graded asphalt.

The Contractor may propose and use, subject to a technical review by the Asphalt Mix Design Registrar, an alternative fibre additive provided that the Contractor submits, as part of the mix design submission, documented evidence of successful use or trial of such fibre additive under circumstances similar to those which exist under the Contract.

In all cases, the Technical Specification for the fibre additive and manufacturer's recommendations on the application, handling and incorporation of the additive into asphalt must be included in the mix design submission and the Contractor's AQP.

7.1.8 Asphalt rejuvenating oil

Asphalt rejuvenating oil may be added to dense graded asphalt mixes containing > 15% RAP such that the binder blend complies with the specified viscosity requirements.

7.1.9 Bituminous emulsion tack coat

Unless otherwise approved by the Administrator, bituminous emulsion must comply with AS 1160. The Contractor shall select a grade of bituminous emulsion that provides a strong bond between the existing surface and new asphalt layer and results in minimal pick-up on truck tyres or paving equipment during paving operations.

7.2 Requirements for asphalt

7.2.1 Constituent material proportions

The constituent material proportions must comply with the requirements of Clauses 7.2.1.1 to 7.2.1.6.

7.2.1.1 Particle size distribution of combined aggregate and filler

The particle size distribution of the asphalt aggregate and filler must conform to Table 7.2.1.1(a) for dense graded asphalt, and to Table 7.2.1.1(b) for open graded asphalt and stone mastic asphalt. The particle size distribution of asphalt aggregate and filler shall be determined in accordance with AS/NZS 2891.3.1, Q308A or AG:PT/T234.

Table 7.2.1.1(a) – Particle size distribution limits for dense graded asphalt

Test Sieve Size (mm)	Particle Size Distribution Limits (% Passing by Mass) for Different Asphalt Nominal Size (Asphalt Designation)			
	7 mm (AC7M and AC7H)	**10 mm (AC10M and AC10H)**	**14 mm (AC14M and AC14H)**	**20 mm (AC20M and AC20H)**
26.5				100
19.0			100	80 – 100
13.2		100	80 – 100	65 – 93
9.50	100	80 – 100	#	#
6.70	80 – 100	65 – 90	55 – 80	45 – 70
4.75	#	#	40 – 65	#
2.36	45 – 65	35 – 65	25 – 45	20 – 40
1.18	#	#	#	#
0.600	15 – 40	15 – 35	10 – 30	5 – 25
0.300	#	#	#	#
0.150	#	#	#	#
0.075	3 – 11	3 – 11	2 – 8	2 – 8

Notes

The particle size distribution limits must be stated in the nominated mix design submission and in the test reports for the trial and production mixes.

Table 7.2.1.1(b) – Particle size distribution limits for open graded asphalt and stone mastic asphalt

Test Sieve Size (mm)	Particle Size Distribution Limits (% Passing by Mass) for Different Asphalt Nominal Size (Asphalt Designation)			
	Open Graded Asphalt		**Stone Mastic Asphalt[1]**	
	10 mm (OG10)	**14 mm (OG14)**	**10 mm (SMA10)**	**14 mm (SMA14)**
19.0		100		100
13.2	100	85 – 100	100	84 – 100
9.50	85 – 100	40 – 76	85 – 100	40 – 65
6.70	40 – 75	20 – 47	40 – 62	25 – 45
4.75	20 – 46	9 – 30	25 – 45	18 – 32

Test Sieve Size (mm)	Particle Size Distribution Limits (% Passing by Mass) for Different Asphalt Nominal Size (Asphalt Designation)			
	Open Graded Asphalt		Stone Mastic Asphalt[1]	
	10 mm (OG10)	14 mm (OG14)	10 mm (SMA10)	14 mm (SMA14)
2.36	4 – 20	3 – 17	18 – 31	14 – 28
1.18	2 – 16	1 – 14	14[2] – 28	12[2] – 24
0.600	#	#	12[2] – 24	10[2] – 20
0.300	0 – 10	0 – 9	10[2] – 20	9[2] – 17
0.150	#	#	8.0[2] – 17.0	7.5[2] – 14.5
0.075	0.5 – 5.5	0.5 – 5.5	6.5 – 12.5	6.5 – 12.5

Notes:

1. For stone mastic asphalt, where the apparent particle density of the combined filler is lower than the aggregate particle density (dry) by more than 0.4 t/m³, the lower limit on the 0.075 mm test sieve shall be reduced by 1% for density differences up to 0.8 t/m³ and 2% for density differences greater than 0.8 t/m³.

2. For stone mastic asphalt mixes that do not contain natural sand, lower limits do not apply but the particle size distribution limits must be stated in the nominated mix design submission and in the test reports for the trial and production mixes.

The particle size distribution limits must be stated in the nominated mix design submission and in the test reports for the trial and production mixes.

7.2.1.2 Binder

For the nominated asphalt mix design, the proportion of effective binder, expressed as a percentage by volume of the total mix, must comply with the requirements of Table 7.2.1.2(a) for dense graded asphalt and Table 7.2.1.2(b) for open graded asphalt and stone mastic asphalt. Effective binder volume shall be determined in accordance with Q311 or AS/NZS 2891.8.

Table 7.2.1.2(a) – Minimum dense graded asphalt binder content

Asphalt Type	Minimum Binder Content for Different Asphalt Nominal Size (Asphalt Designation)			
Nominal Size of Asphalt (Asphalt Designation)	7 mm (AC7M and AC7H)	10 mm (AC10M and AC10H)	14 mm (AC14M and AC14H)	20 mm AC20M and AC20H)
Effective Binder Volume (%)[1]	≥ 11.5 (≥ 11.0)	≥ 11.0 (≥ 10.5)	≥ 10.5 (≥ 10.0)	≥ 10.0 (≥ 9.5)

Notes:

[1] Values in brackets apply when the percentage of absorbed binder is determined using the binder absorption / water absorption relationship referenced in Q311.

Table 7.2.1.2(b) – Minimum open graded asphalt and stone mastic asphalt binder content

Asphalt Type	Minimum Binder Content for Different Asphalt Nominal Size (Asphalt Designation)			
Nominal Size of Asphalt (Asphalt Designation)	10 mm (OG10)	14 mm (OG14)	10 mm (SMA10)	14 mm (SMA14)
Effective Binder Volume (%)[1]	≥ 9.0 (≥ 8.5)	≥ 8.0 (≥ 7.5)	≥ 14.5 (≥ 14.0)	≥ 13.5 (≥ 13.0)

Notes:

[1] Values in brackets apply when the percentage of absorbed binder is determined using the binder absorption / water absorption relationship referenced in Q311.

7.2.1.3 Reclaimed asphalt pavement material

7.2.1.3.1 Dense graded asphalt mixes containing bitumen

Where bitumen is used as the binder in dense graded asphalt, the Contractor is permitted to use RAP material in the surfacing and other courses up to a maximum of 15% by mass (Approval Level 1 or 1S as shown in Table 7.2.1.3.1(a), subject to compliance with the testing requirements of Section A of Table 7.2.1.3.1(b).

Table 7.2.1.3.1(a) – Prerequisites for allowable percentage of reclaimed asphalt pavement material in asphalt

RAP Approval Level	Maximum Percentage[1] (%)	Testing Required (Table 7.2.1.3.1(b))
Surfacing Course		
1S	15	Section A
2S	20	Sections A & B
Other than Surfacing Course		
1	15	Section A
2	25	Sections A & B
3	30	Sections A & B
4	40	Sections A & B

Notes:

[1] Determined as percentage by mass of RAP material to mass of total mix.

To progress from RAP Approval Level 1 or 1S to a higher Approval Level (which allows the inclusion of greater percentages of RAP), the asphalt manufacturer must demonstrate to the satisfaction of the Asphalt Mix Design Registrar:

a) compliance with this Technical Specification, including the requirements for RAP Level progression as specified in Table 7.2.1.3.1(b)

b) implementation of suitable AQP and RAP management plans, and

c) plant capability (i.e., ability to produce conforming asphalt for the RAP Approval Level being requested, as shown in Table 7.2.1.3.1(a) for the nominated plant).

It is recommended that requests to progress to a higher Approval Level be submitted to the Asphalt Mix Design Registrar not less than 28 days prior to the asphalt being incorporated into the Works. This will allow sufficient time for review of the RAP management plan (including its implementation), the mix design and the plant capability to be evaluated without the Works being delayed.

The RAP management plan should be consistent with the requirements of MRTS102 *Reclaimed Asphalt Pavement Material* and AfPA publication – *Reclaimed Asphalt Pavement (RAP) Management Plan.*

Table 7.2.1.3.1(b) – RAP level progression criteria

Submission Type	Testing
Section A	
Mix design submission	Binder content and grading of RAP in accordance with Q308A or AS/NZS 2891.3.1
Contract testing frequency (each Lot of RAP used in asphalt production)	Binder content and grading of RAP in accordance with Q308A or AS/NZS 2891.3.1
Contract testing frequency (daily on RAP incorporated into asphalt)	a) moisture content of RAP in accordance with AS/NZS 2891.10 b) visual monitoring of incoming RAP by a person experienced in the process. Visual monitoring must include an assessment for the presence of foreign and/or deleterious materials
Section B	
Mix design submission	Recovered binder viscosity of RAP in accordance with ATM 192
Contract testing frequency (refer MRTS102)	Where method 2 is used to control the binder blend viscosity, recovered binder viscosity for RAP in accordance with ATM 192

The percentage of RAP material must not exceed the percentages shown in Table 7.2.1.3.1(a) for the RAP Approval Level at which the asphalt mix has been registered.

For RAP Approval Level 3 and Level 4, the following additional requirements apply:

d) processed RAP material must be screened into at least two fractions (coarse and fine) and each fraction must be separately metered into the asphalt mixing process, and

e) a statement must be provided in the RAP Management Plan detailing how the processed RAP material within a stockpile will be controlled at a moisture content which will not affect the asphalt properties.

The RAP approval level is stated on the asphalt mix design register.

7.2.1.3.2 Dense graded asphalt mixes containing polymer modified binder and multigrade bitumen

For dense graded asphalt containing polymer modified binder (PMB) and multigrade bitumen, the RAP Approval Level cannot progress beyond Level 1 or 1S as defined in Table 7.2.1.3.1(a). RAP shall not be included in PMB mixes that are used in the lowest asphalt layer (excluding corrector or pavement repairs) to be constructed as part of the Works unless the Contractor can demonstrate to the satisfaction of the Asphalt Mix Design Registrar that the inclusion of RAP will not adversely affect the performance characteristics of the asphalt. The Contractor shall support any such application with appropriate test data. RAP may be used in PMB mixes in all other situations.

Where the pavement design is reliant on the enhanced fatigue performance of the polymer modified binder, this Technical Specification does not allow RAP to be included in these mixes unless the Contractor can demonstrate the performance characteristics of the asphalt mix have not been adversely affected by the inclusion of RAP. Fatigue and resilient modulus testing of the mix, with and without RAP, would typically be required to demonstrate the performance characteristics of the asphalt mix have not been adversely affected. Mix designs meeting these requirements will be identified on the asphalt mix design register.

7.2.1.4 Hydrated lime

Dense graded asphalt manufactured using an asphalt plant that reincorporates baghouse fines into the mix must contain, by mass of total aggregate, not less than 1.0% hydrated lime.

Dense graded asphalt manufactured using an asphalt plant that does not reincorporate baghouse fines into the mix must contain, by mass of total aggregate, not less than 1.5% hydrated lime.

Notwithstanding the above, dense graded asphalt manufactured using an asphalt plant that incorporates hydrated lime into the mix after the completion of the secondary dust collection process must contain, by mass of total aggregate, not less than 1.0% hydrated lime.

(Typical example - hydrated lime incorporated directly into mixing pugmills on batch plants).

Stone mastic asphalt must contain, by mass of total aggregate, not less than 1.0% hydrated lime if the combined filler (excluding hydrated lime) has a methylene blue value > 10 mg/g and ≤ 18 mg/g.

Open graded asphalt must contain, by mass of total aggregate, not less than 1.0% hydrated lime.

All hydrated lime incorporated into asphalt mixes must comply with the requirements of MRTS103 *Fillers for Asphalt*.

7.2.1.5 Adhesion agent

Binder may contain bitumen adhesion agent not exceeding 1.0% by mass of the binder.

7.2.1.6 Warm mix asphalt additive

The proportion of additive shall comply with Table 7.2.1.6.

Table 7.2.1.6 – Proportion of additive in warm mix asphalt

Additive	Proportion
Wax	1.0 – 2.0% by mass of binder
Surfactants	0.4 – 0.8% by mass of binder
Water (either directly, or in the form of water containing crystals)	1.0 – 3.0% by mass of the binder

7.2.2 Volumetric characteristics

Asphalt mix must comply with the following requirements:

a) air voids in laboratory compacted specimens as stated in Table 7.2.2(a), and

b) design mix requirements for binder film index, filler / binder ratio and fixed binder fraction requirements stated in Table 7.2.2(b).

Table 7.2.2(a) – Requirements for laboratory compacted specimens

Asphalt Type	Laboratory Compaction Method[1]	Air Voids in Laboratory Compacted Speciments[2]	Applicable Test Methods
Medium duty dense graded asphalt	Marshall compaction (50 blows per face) or gyratory compaction (120 cycles)	3.0 – 6.0	• AS/NZS 2891.2.2, or Q305 • AS/NZS 2891.7.1 • AS/NZS 2891.8 or Q311 and • AS/NZS 2891.9.2
Heavy duty dense graded asphalt	Marshall compaction (50 blows per face)	3.0 – 6.5	
	Gyratory compaction (120 cycles) and (350 cycles)	3.0 – 6.0 ≥ 2.0[3]	
Stone mastic asphalt	Marshall compaction (50 blows per face)	2.0 – 5.0	• Q305 • AS/NZS 2891.7.1 • AS/NZS 2891.8 or Q311 and • AS/NZS 2891.9.2 or Q306C
Open graded asphalt	Marshall compaction (50 blows per face)	≥ 20.0	• Q305 • AS/NZS 2891.7.1 • AS/NZS 2891.8 or Q311 and • AS/NZS 2891.9.3

Notes:

[1] The laboratory compaction method to be used for a particular mix design must be stated on the asphalt mix design certificate.

[2] Compliance shall be assessed using the average of results from duplicate test specimens.

[3] Lot average.

Table 7.2.2(b) – Design mix requirements for binder film, index, filler / binder ratio and fixed binder fraction

Property	Test Method	Asphalt Mix Type		
		Dense Graded Asphalt	Stone Mastic Asphalt	Open Graded Asphalt
Binder film index	Q317, AS/NZS 2891.8 or AGPT/T237	> 7.5 (> 7.1)[1]	–	> 16.0 (> 15.0)
Filler / binder ratio	N/A[2]	1.0 – 1.3	–	–
Fixed binder fraction	Q321	–	≤ 0.55[3]	–

Notes:

[1] Values in brackets apply when the percentage of absorbed binder is determined using the binder absorption / water absorption relationship referenced in Q311.

[2] The filler / binder ratio is the ratio of the percentage passing the 0.075 mm test sieve by mass of total aggregate to the percentage of binder by mass of total mix.

[3] The fixed binder fraction for the mix must be determined using the binder absorption / water absorption relationship detailed in the Notes section of Q321.

For dense graded asphalt and stone mastic asphalt, air voids in laboratory compacted specimens below the minimum value(s) may lead to rutting, flushing, bleeding and/or mix instability. Factors that influence the performance of the asphalt include:

- the magnitude of the nonconformance
- traffic loading
- depth of the layer from the pavement surface, and
- the binder used in the asphalt mix.

For dense graded asphalt and stone mastic asphalt, air voids in laboratory compacted specimens above the maximum limit may lead to the maximum value for insitu air voids not being achieved and the mix being prone to oxidation and moisture related damage over time. Mix with air voids in laboratory compacted specimens above the maximum limit is typically accepted subject to compliance with the insitu air voids requirements.

The workability of stone mastic asphalt mixes at placement temperatures reduces as the fixed binder fraction of the binder-filler mastic increases. Although the maximum specification limit is set at 0.55, mixes with a fixed binder fraction exceeding 0.50 may also exhibit poor workability.

7.2.3 Moisture content

For all mixes, the moisture content must be < 0.5% by mass of total mix when determined in accordance with AS/NZS 2891.10. The Contractor need not have NATA accreditation for this test.

7.2.4 Particle coating

For all mixes, the degree of particle coating shall be not less than 99%, when determined in accordance with AS/NZS 2891.11, once discharged from the asphalt plant into delivery vehicles.

The Administrator may order testing of the production mix for particle coating and/or moisture content if there is evidence of poor mixing or uncoated particles in the mix being delivered to site.

7.2.5 Moisture sensitivity

For dense graded asphalt, the tensile strength ratio (TSR) must be ≥ 80% when determined in accordance with ATM 232 and the average tensile strength of the freeze / thaw group must be:

a) ≥ 500 kPa for mixes containing SBS based polymer modified binder (e.g., A10E, A15E and A20E), and

b) ≥ 600 kPa for mixes containing all other binders.

The procedures detailed in Table 7.2.5 apply to accepted nonconformances in tensile strength ratio. However, when the TSR is less than 70% and the air voids in laboratory compacted mix are nonconforming, the nonconformance will not be accepted.

Table 7.2.5 – Procedures for nonconforming TSR

Condition	Action Required
70% ≤ TSR < 80% and previous result ≥ 80%	a) promptly implement corrective action and b) test after implementing corrective action and report results to the Administrator within 7 working days
70% ≤ TSR < 80% and previous result < 80%	**Observe Hold Point 1**
TSR < 70%	**Observe Hold Point 1**
Tests not carried out at required frequency or test results not reported within specified timeframe or corrective action not promptly implemented	**Observe Hold Point 1**

Where a Hold Point is required to be observed, the Contractor shall investigate the causes of the nonconformance and propose corrective action to prevent recurrence of the nonconformance. The Contractor shall submit:

a) test results covering the same Lot for insitu air voids and all characteristics specified in Clause 9.2, and

b) the proposed corrective action to achieve conformance.

The Administrator shall consider the submitted documents prior to authorising the release of the Hold Point allowing recommencement of asphalt production. **Hold Point 1** The Contractor shall not recommence production of asphalt until the corrective action is implemented. The Contractor shall test the tensile strength ratio after implementing corrective action, and report results within seven working days of the resumption of production.

7.2.6 Resilient modulus

Resilient modulus testing shall be completed on dense graded asphalt and stone mastic asphalt mixes and the test results reported as part of the mix design submission, unless otherwise advised by the Asphalt Mix Design Registrar. Triplicate test specimens shall be prepared in accordance with AS/NZS 2891.2.2 (to 5.0 ± 1.0% air voids) and tested in accordance with AS/NZS 2891.13.1 at a temperature of 25 ± 0.5ºC.

7.2.7 Deformation resistance

Deformation resistance testing shall be completed on the following mixes using laboratory mix (prepared at the target binder content and grading) or mix from the production trial as part of the mix design submission:

a) heavy duty dense graded asphalt mixes (where conformance with the requirements of Table 7.2.2(a) is assessed using 50 blows per face Marshall compaction), and

b) stone mastic asphalt.

Two test specimens shall be prepared in accordance with AG:PT/T220 and tested in accordance with ATM 231. For production compliance testing of heavy duty dense graded asphalt, only production mix shall be used for deformation resistance testing.

Heavy duty dense graded asphalt mixes (where conformance with the requirements of Table 7.2.2(a) is assessed using 50 blows per face Marshall compaction) and stone mastic asphalt mixes must comply with the requirements of Table 7.2.7.

Table 7.2.7 – Deformation resistance requirements for heavy duty dense graded asphalt[1] and stone mastic asphalt

Asphalt Designation	Binder Type	Final Rut Depth (mm)	
		Mix Design Submission	Production Compliance
AC7H	Bitumen or multigrade bitumen[2]	to be reported	–
AC10H	Polymer modified binder	≤ 2.5[3]	≤ 3.0
	Bitumen and multigrade bitumen	≤ 4.0	≤ 4.5
AC14H	Polymer modified binder	≤ 2.0[4]	≤ 2.5
	Bitumen and multigrade bitumen	≤ 3.5	≤ 4.0
AC20H	Polymer modified binder	≤ 3.0[3]	≤ 3.5
	Bitumen and multigrade bitumen	≤ 4.0	≤ 4.5
SMA10 and SMA14	A15E polymer modified binder	≤ 2.0	–

Notes:

[1] Deformation resistance requirements for heavy duty dense graded asphalt only apply where conformance with the requirements of Table 7.2.2 is assessed using 50 blows per face Marshall compaction.

[2] Class 320 bitumen shall be used for the test unless an alternative binder class has been used for the production trial.

[3] For AC10H and AC20H mixes, the mix design is deemed to comply with this requirement if the mix produces a final rut depth ≤ 4.0 mm when Class 320 bitumen is used as the binder in the test.

[4] For AC14H mixes, the mix design is deemed to comply with this requirement if the mix produces a final rut depth ≤ 3.5 mm when Class 320 bitumen is used as the binder in the test.

7.2.8 Asphalt binder drain-off

For open graded asphalt and stone mastic asphalt, a sample of production mix shall be prepared and tested in accordance with AG:PT/T235. Testing shall be completed at the maximum production temperature to be adopted for the mix. The asphalt binder drain-off shall be ≤ 0.3%. The results must be reported as part of the mix design submission.

7.2.9 Asphalt particle loss

For open graded asphalt containing binder other than A15E polymer modified binder, triplicate test specimens of production mix shall be prepared and tested in accordance with AG:PT/T236. The asphalt particle loss shall be ≤ 20%. The results must be reported as part of the mix design submission.

7.2.10 Mix volume ratio

For stone mastic asphalt, the mix volume ratio of the mix shall be ≤ 1.04 when calculated in accordance with Q318 using the grading and air voids test results.

The compacted unit mass of the coarse aggregate shall be determined from the same stockpile of coarse aggregate as that used for asphalt production. The coarse aggregate sample shall be prepared by combining the current raw materials in the production mix proportions.

The results must be reported as part of the mix design submission and at a frequency not less than that specified Table 5.4.1(b).

7.2.11 Marshall stability, flow and stiffness

Where the Marshall method is used for the design of dense graded asphalt, triplicate test specimens shall be prepared and tested in accordance with Q305 for stability, flow and stiffness. The results shall be reported as part of the mix design submission and comply with the following requirements:

- stability: ≥ 6.0 kN for AC7M and AC7H mixes, ≥ 7.5 kN for AC10M, AC10H, AC14M, AC14H, AC20M and AC20H mixes
- flow: ≥ 2.0 mm for all dense graded asphalt mixes, and
- stiffness: ≥ 2.0 kN/mm for all dense graded asphalt mixes.

7.3 Nominated mixes

7.3.1 Nominated mix design

The nominated mix design to be used for the Works must:

a) satisfy the requirements of this Technical Specification

b) be registered in accordance with the requirements of Clause 7.3.2, and

c) be targeted during production of the asphalt.

Nominated mix designs are:

a) materials specific (and substitution of constituents is not permitted)

b) design specific (and variation to the registered mix design is not permitted), and

c) asphalt plant specific (and except for component maintenance, changes in the components and/or configuration of the plant are not permitted).

7.3.2 Asphalt mix design registration

The process for asphalt mix design registration is defined in Technical Note TN148 *Asphalt Mix Design Registration*. An asphalt mix design certificate, that has been signed by the Contractor's mix designer, certifying that the mix design complies with the requirements of MRTS30 *Asphalt Pavements* shall be included as part of the mix design submission.

It is recommended that mix design(s) are submitted to the Asphalt Mix Design Registrar for registration not less than 28 days prior to asphalt being incorporated into the Works. This will allow sufficient time for review and resubmission of the mix design (if required) without the Works being delayed.

7.3.3 Nomination of registered mix designs

At least seven days before asphalt is to be incorporated into the Works, the Contractor shall submit to the Administrator a copy of the mix design certificate(s) for each nominal size and type of asphalt mix to be incorporated into the Works. **Milestone** The asphalt mix design(s) must be listed on the department's asphalt mix design register. Only asphalt complying with the nominated mix design(s) shall be incorporated into the Works. Where more than one mix design certificate is submitted to the Administrator for a nominal size and type of asphalt, the Contractor shall nominate one 'primary' mix design to be incorporated into the Works. Nominated mix designs, other than the 'primary' mix design, may only be incorporated into the Works with the prior approval of the Administrator. The Contractor may use a different mix design as the 'primary' mix design (provided it is selected from the list of nominated mix designs) at any time during the Works provided the Contractor advises the Administrator in writing at least 24 hours prior to the implementation of this change.

At any time during the Works, the Contractor may submit a revision to a nominated mix design to ensure ongoing compliance with specification requirements. Prior to the revised mix design being incorporated into the Works, the Contractor must:

a) submit a certified copy of an updated mix design certificate (and supporting documentation) for the revised mix design to the Administrator and Asphalt Mix Design Registrar, and

b) allow not less than three working days for the Administrator to consider the Contractor's submission.

A heavy duty dense graded asphalt mix design may be used where medium duty dense graded asphalt is specified for the Works.

The Department of Transport and Main Roads maintains an asphalt mix design register on the Transport and Main Roads website. Administrators can check the currency of an asphalt mix design certificate using this register. For recently submitted mix designs, the Administrator should check their registration status with the Asphalt Mix Design Registrar.

For the purposes of this clause, a mix design revision only relates to a minor change in grading, binder content, maximum density and constituent proportions. A change to the mix design constituents constitutes a new mix design. The Administrator may seek advice from the Asphalt Mix Design Registrar when assessing the suitability of a revised mix design.

Test reports for properties that are not for conformance (i.e., test results are 'report only') do not need to be included in a revised mix design submission.

7.4 Production of asphalt

7.4.1 General

Asphalt shall be produced by a registered asphalt manufacturer from the nominated asphalt plant in accordance with the nominated mix design for the Works. Asphalt shall not be incorporated into the Works until the Contractor has demonstrated to the Administrator that the underlying lots conform to the specified requirements or have been accepted by the Administrator for utilisation at a reduced level of service, and the following documents have been received and reviewed by the Administrator. **Hold Point 2**:

a) identity of the PAC(s) who will undertake the asphalt production, placement and compaction and the address of the asphalt plant that will produce the asphalt (refer Clause 6)

b) the mix design certificate, which holds current registration with Transport and Main Roads, for each conforming mix design to be used in the Works (refer Clause 7.3) or conforming revised mix design submissions (where applicable) (refer Clause 7.3.3)

c) the Contractor's AQP (refer Clause 5.2)

d) the Contractor's Aggregate Production Procedure (refer MRTS101 *Aggregates for Asphalt*), and

e) the Contractor's RAP Management Plan (where applicable).

These documents shall be submitted to the Administrator not less than seven days prior to the commencement of asphalt being incorporated into the Works.

Any subsequent changes to any of the above documents will require re-submission and re-release of the Hold Point.

The requirements of this Technical Specification represent the minimum standards that generally apply to asphalt incorporated into the department's projects. However, in some regional localities, the use of asphalt fully conforming with the requirements of this Technical Specification may be prohibitively expensive, particularly if conforming constituent materials are not locally available. There may also be situations where the department wishes to trial the use of nonstandard constituent materials in asphalt mixes that are innovative in nature and their use aligns with other strategic objectives of the department (such as increasing the use of recycled materials).

The need for project specific variations to enable the use of constituent materials that are nonstandard or that do not conform with the default requirements should be endorsed by the Principal during the preconstruction phase of the project and the requirements nominated in the Contract to enable competitive tendering for the Works.

Given that these mix designs contain nonconforming or nonstandard materials, they may be registered, at the discretion of the Asphalt Mix Design Registrar, as nonconforming or nonstandard mix designs. However, the Asphalt Mix Design Registrar may require additional testing to be carried out prior to registration being granted. 'Conditions of use' associated with the implementation and use of these mix designs on Transport and Main Roads projects may also be nominated on the Asphalt Mix Design Register.

An engineering risk assessment should be undertaken during the preconstruction phase of a project to evaluate whether a departure from the default requirements or the use of nonstandard constituent materials is appropriate. The designer for the Works is advised to seek advice from the Principal Engineer (Asphalt and Surfacings) when undertaking these assessments. These assessments should consider as a minimum, the following:

- the estimated cost savings or additional costs of the departure
- potential performance impacts, including those on road users, serviceability, durability and overall functionality
- whole-of-life performance including maintenance requirements
- construction programme impacts
- safety and environmental impacts, and
- additional monitoring that will occur post construction.

Hold Point 3 provides a mechanism for acceptance of a nonconforming or nonstandard mix designs that do not conform to the default constituent materials' specifications but conform to project specific requirements listed in the Contract to be accepted on a project specific basis. The Administrator may seek advice from the Principal Engineer (Asphalt and Surfacings) when undertaking these assessments as well as the interpretation of any 'conditions of use' nominated on the Asphalt Mix Design Register for a particular mix design.

Nonconforming or nonstandard mix designs that hold current registration with the department shall not be incorporated into the Works unless otherwise accepted in writing by the Administrator prior to the commencement of asphalt production. **Hold Point 3**

7.4.2 Method of production

A method of production shall be adopted that:

a) controls the process and targets the nominated mix, and

b) supplies an essentially homogeneous and consistent product at the nominated manufacturing temperature.

7.4.3 Production tolerances

7.4.3.1 Proportions of constituents

The proportion of each constituent may be varied for the purpose of process control provided that:

a) the asphalt produced remains essentially uniform and consistent and in compliance with the nominated mix submission, and

b) the proportion of RAP does not exceed the maximum allowed for the RAP Approval Level stated on the asphalt mix design register.

7.4.3.2 Combined particle size distribution, binder content and maximum density

The actual particle size distribution and maximum density of the production mix may vary from the nominated value within the limits shown in Table 7.4.3.2, provided they also comply with Table 7.2.1.1(a) or Table 7.2.1.1(b), as appropriate.

The actual binder content and maximum density of the production mix may vary from the nominated value within the limits shown in Table 7.4.3.2.

For a particular mix design, the nominated design with the tolerances applied represents the job limits. The job limits for a particular design are stated on the asphalt mix design certificate.

Table 7.4.3.2 – Production tolerances

Description	Tolerance
Permissible variation to nominated combined particle size distribution during production (% by mass of total aggregate) (Q308A, AS/NZS 2891.3.1 or AG:PT/T234)	–
Passing 4.75 mm and larger	± 7
Passing 2.36 mm and 1.18 mm	± 5
Passing 0.600 mm and 0.300 mm	± 4
Passing 0.150 mm	± 2.5
Passing 0.075 mm	± 1.5
Permissible variation to the nominated binder content during production (% by mass of total mix) (Q308A, AS/NZS 2891.3.1 or AG:PT/T234)	± 0.3
Permissible variation to the nominated maximum density during production (t/m³) (AS/NZS 2891.7.1)	± 0.035[1]

Notes:

[1] A larger tolerance may apply provided the Contractor can demonstrate to the satisfaction of the Asphalt Mix Design Registrar that a larger tolerance is appropriate for the particular design. The limits applicable to a particular design shall be stated on the mix design certificate.

7.4.4 Asphalt manufacturing plant

The asphalt manufacturing plant shall be operated with adequate production process controls to produce asphalt of a consistent quality and conforming to the requirements of this Technical Specification. The production control system must produce auditable records of key process parameters including individual aggregate and filler feed rates / batch masses, binder feed rate / batch mass and various process temperatures.

A documented procedure for the management and control of the moisture content of each constituent aggregate material, including RAP material, shall be implemented and the asphalt manufacturing process controls adjusted accordingly.

RAP materials where added must be dispersed uniformly throughout the mix such that there is no apparent variability or temperature segregation in the mix.

The asphalt manufacturing plant must have sufficient capacity to supply asphalt for continuous operation of the paver.

7.4.5 Storage and handling

7.4.5.1 Binder

Heating and storage of binder must comply with the temperature and time limits set out in Advisory Note 7 published by AfPA.

The Contractor shall provide details in the AQP of the procedures for acquisition, storage and handling of binder which identify and prevent segregation and/or contamination of the binder and shall implement these procedures.

At the asphalt manufacturing plant, binder supplied in accordance with MRTS18 *Polymer Modified Binder (including Crumb Rubber)* must be recirculated in delivery and/or storage tanks to a uniform consistency immediately prior to its use in the manufacturing process.

7.4.5.2 Asphalt

Asphalt that is retained in hot storage silos shall be stored in such a manner that minimises oxidation of the binder and maintains temperature uniformity.

Dense graded asphalt mix may be retained in hot storage silos for a period not exceeding 30 hours, unless otherwise approved by the Administrator.

Open graded and stone mastic asphalt mix shall be loaded into delivery vehicles as soon as practical and the total storage and transportation time shall not exceed four hours, unless otherwise approved by the Administrator.

For each load of asphalt, the Contractor must record the time of manufacture, dispatch from the manufacturing plant and incorporation into the Works.

Storing asphalt at elevated temperatures may lead to excessive degradation of the binder and a reduced service life for the asphalt. This Technical Specification provides for overnight storage of hot dense graded asphalt if unexpected events (such as wet weather or traffic management issues on the job site) mean that all the asphalt produced during a day's production cannot be incorporated into the Works during that work shift. Provided the asphalt is stored in such a way that minimises oxidation, does not cool excessively and maintains temperature uniformity, it may be incorporated into the Works on the following day. Some plants may be able to achieve longer storage times without causing excessive degradation of the asphalt binder. In these cases, the Contractor must demonstrate this to the satisfaction of the Administrator.

7.4.6 Manufacturing temperatures

The temperatures of constituent materials shall be controlled using suitable thermometer elements placed in the flow of materials from the drier, and in the binder storage system or binder supply line.

The temperature of the asphalt shall be measured and recorded when:

a) the asphalt leaves the pugmill or mixing drum or

b) the asphalt discharges from the hot storage bin(s), or

c) in the trucks prior to leaving the plant.

The dispatch temperature of the asphalt must facilitate achieving the specified compaction level in the finished product. Details of the project specific process temperatures and the frequency of recording must be provided in the AQP.

The temperature of asphalt must not at any time in the process exceed the temperatures stated in Table 7.4.6.

Table 7.4.6 – Maximum asphalt temperature

Asphalt Binder Type	Maximum Mix Temperature (ºC) for	
	The first, second and last (truck) loads of a work shift	All other loads of a work shift
Bitumen and multigrade bitumen	175	155
Polymer modified binder	185[1]	165

Note:

[1] Unless otherwise stated on the Asphalt Mix Design Certificate.

More sustainable asphalt and lower emissions

This Technical Specification requires asphalt mixes to contain a warm mix asphalt additive to enable these mixes to be produced and compacted at a lower temperature than has historically been required (in previous versions of this Technical Specification). This temperature reduction should help lower emissions and improve sustainability outcomes while still achieving a conforming product.

Implementation of these new requirements will require adjustment to manufacturing, transport and construction processes when compared to hot mix asphalt. However, there may be cases where conformance with the insitu air voids requirements could be difficult to achieve due to the lower maximum production temperature limits. These situations would typically be associated with placing asphalt during cold weather (e.g., when the air temperature or pavement surface temperature is less than 20°C for 7 mm mixes, 15°C for 10 mm mixes, 10°C for 14 mm mixes and 5°C for 20 mm mixes), or when the work involves long haul distances to site (e.g., haul time between the asphalt plant and a remote job site exceeds 3 hours). If construction needs to proceed in these situations, the Administrator may approve an increase to the maximum production temperature (to 175°C for mixes containing a bitumen binder and 185°C for mixes containing a polymer modified binder) to help reduce the risk of nonconforming (that is, high) insitu air voids. Preferably such decisions and the process for making them would be discussed and confirmed at a contract pre-start meeting (that includes the prequalified asphalt contractor) or a contract meeting (that includes the prequalified asphalt contractor) held well in advance of the asphalt works starting.

Prior to approving this type of relaxation, Administrators should seek advice from asphaltmixdesign@tmr.qld.gov.au.

7.5 Transport of asphalt

The transport of asphalt must be in accordance with the requirements in AS 2150.

The Contractor shall state in the AQP the method of control and application of release agent to ensure a uniform, light coating of the transport vehicle's tray without causing ponding of surplus release agent. Diesel shall not be used as a release agent.

Continuous operation of the paving train shall be facilitated as best as practicable by:

a) providing and allocating sufficient transport capacity, and

b) ensuring efficient on-site management of asphalt deliveries.

8 Placing of asphalt

8.1 General

The Contractor's method of placing and finishing the asphalt must:

a) produce a homogeneous product with a tightly bound surface

b) achieve a strong bond to the surface below, and

c) achieve the finished pavement properties, specified in Clause 9, within the specified tolerances.

The application of water to induce rapid cooling in the asphalt shall not be used at any stage in the process, including preparation for trafficking, unless approved by the Administrator.

8.2 Preparation of pavement

8.2.1 General

The Contractor shall carry out the preparation work detailed in Clauses 8.2.2 to 8.2.4 on existing surfaces on or against which the asphalt is to be placed.

8.2.2 Preparation

The surface of the pavement base / bridge deck or existing substrate shall not be wet and shall be thoroughly swept using a rotary broom to remove any loose material or other deleterious material which may be present. Any deleterious material which still adheres to the surface after sweeping shall be removed by other means. Following mechanical sweeping:

a) areas of oil or fuel spillage shall be cleaned with detergent, flushed with clean water and allowed to dry prior to application of the tack coat, and

b) cracks, joints or holes in the pavement / bridge deck shall be rectified as stated in Clause 8.2.3.

Frames for manhole covers, gully pits, kerb / channels and other structures shall have joint surfaces cleaned free of any extraneous material.

Raised extruded thermoplastic road markings and raised pavement markers shall be removed prior to tack coating and placing asphalt.

For asphalt placed over pavement constructed by others, the surface on which asphalt will be placed shall be tested for perceptible surface deformation by ‘proof rolling’ in the presence of the Administrator. **Witness Point 1** Testing shall be in accordance with Test Method Q723 unless otherwise approved by the Administrator. Testing for perceptible surface deformation is exempt from the requirement for NATA accreditation or Construction Materials Testing (CMT) registration.

Unless otherwise approved by the Administrator, asphalt shall not be placed over pavement exhibiting significant perceptible surface deformation. **Hold Point 4**

Where the contract requires the Contractor to place the first layer of asphalt directly over a pavement / substrate that exhibits significant perceptible surface deformation under load, the Administrator will typically direct:

- additional pavement preparation / strengthening work to be undertaken prior to placement of asphalt, or
- placement of asphalt over the weak substrate. Areas of asphalt placed directly over substrate exhibiting significant perceptible surface deformation under load are typically excluded from the lot when determining the characteristic value of insitu air voids (refer Clause 9.2.1).

The procedure for release of **Hold Point 4** should be agreed between the Contractor and Administrator as part of the pre-start meeting.

8.2.3 Crack filling

In areas shown in the Drawings or stated in Clause 2 of Annexure MRTS30.1, cracks greater than 2 mm wide shall be filled prior to placement of any asphalt. The Contractor shall mark out, in the presence of the Administrator, the extent of crack filling to be carried out. **Witness Point 2**

Prior to filling of cracks, the existing cracks shall be cleaned with compressed air or vacuumed.

Cracks shall be filled level with the surrounding surface with a polymer modified sealant approved by the Administrator.

8.2.4 Strain alleviating fabric strips

In the areas shown on the Drawings or stated in Clause 3 of Annexure MRTS30.1, strain alleviating fabric strips shall be applied to existing cracks prior to placement of asphalt or sprayed sealing.

The Contractor shall mark out, in the presence of the Administrator, the extent of the strain alleviating fabric strips to be applied. **Witness Point 3**

Strain alleviating fabric strips shall be non-woven polyester fabric strips precoated with a rubberised bitumen adhesive base.

Prior to application of the fabric strips, the existing surface shall be swept clean so that it is free of dust, grit, surface moisture and vegetation. Any cracks or joints wider than 2 mm shall be filled as detailed in Clause 8.2.3.

The surface to which the strain alleviating fabric strip is to be applied shall be sprayed with a bituminous emulsion tack coat or proprietary primer. The fabric strips shall be laid to cover a minimum width of 250 mm (normally 125 mm on each side of the crack).

Placement of the strain alleviating fabric strip shall be carried out only under the following conditions:

a) the pavement temperature is sufficient for a strong bond to be achieved between the fabric and the pavement surface and rain is not likely to fall prior to completing the installation, and

b) the pavement surface is clean and dry.

Installation, including overlapping of joints, shall be in accordance with the manufacturer's recommendations.

After placement, the strain alleviating fabric strip shall be rolled with at least one pass of a pneumatic-tyred roller to ensure proper adhesion. The strain alleviating fabric strip shall be placed free of wrinkles and creases.

Traffic shall not be permitted to traverse the strain alleviating fabric strip for at least 20 minutes after rolling.

Prior to placing the asphalt, the normal application of bituminous emulsion tack coat shall be applied over the strain alleviating fabric strip, unless otherwise approved by the Administrator.

8.3 Method of placement

The asphalt must be placed by a self-propelled paving machine equipped with the ability to be operated with automatic thickness control and automatic joint matching facility.

Hand placement of asphalt is only permitted for minor corrections of the existing surface and in areas where placement with a paving machine is impractical.

The Contractor must state in the AQP the method of achieving conforming insitu air voids within the asphalt layer, and the factors affecting / determining rolling patterns.

For stone mastic asphalt and open graded asphalt, a Material Transfer Vehicle (MTV) must be used in the paving process except for areas to be paved at tapers, turning lanes less than 100 m in length, roundabouts of radius less than 50 m and other areas approved to be excluded by the Administrator.

If specified in Clause 4 of Annexure MRTS30.1, a Material Transfer Vehicle (MTV) must be used in the paving process for dense graded asphalt except for areas to be paved at tapers, turning lanes less than 100 m in length, roundabouts of radius less than 50 m and other areas approved to be excluded by the Administrator.

The MTV must be a self-propelled machine with independent controls which will receive asphalt from delivery vehicles, and store, remix and transfer the asphalt to the paving machine without contact and be equipped with:

a) a receiving hopper compatible with delivery vehicles

b) conveying mechanisms and anti-segregation devices for remixing asphalt

c) conveying mechanisms capable of delivering asphalt to the paver at a minimum rate to suit the paving output

d) a minimum nominal on-board storage capacity of 15 tonnes

e) an additional holding bin in the paving machine hopper or the paver hopper enclosed by other means to prevent asphalt from falling out of the front of the paver during paving operations, and

f) sufficient power output from the motor to operate with full load on grades up to 6% and travel in tandem with the paver, either directly in front or in an offset position.

Where asphalt paving occurs across structures, the Contractor shall control the gross mass of the MTV to the maximum permissible loadings as set out in Clause 5 of Annexure MRTS30.1.

Where asphalt paving occurs on bridge decks, the additional requirements specified in MRTS84 *Deck Wearing Surface* shall apply.

8.4 Protection of work

Traffic shall be controlled in accordance with the requirements of MRTS02 *Provision for Traffic* while undertaking the Works.

The Works shall be protected until the required thickness of asphalt has been placed, compacted and cooled sufficiently to carry traffic without damage to the Works.

It is the Contractor's responsibility to ensure the asphalt has cooled sufficiently to minimise deformation of the asphalt when trafficked. The Contractor must consider the traffic management requirements outlined in MRTS02 *Provision for Traffic* (particularly any restriction on lane closure times) when developing the construction program.

8.5 Protection of services and road fixtures

Asphalt or other material used in the Works shall not be allowed to enter or adhere to pits, grates, drains, pipes, hydrants or valve boxes, service covers, bridge joints and other road fixtures and furniture. Immediately after the asphalt has been placed, any affected services and road fixtures shall be cleaned to remove all waste asphalt.

8.6 Course and layer thicknesses

A course of dense graded asphalt may be comprised of more than one layer. Where a course is comprised of more than one layer, and the layer thicknesses have not been specified, the Contractor shall nominate the thickness of each layer in the AQP.

8.6.1 Nominated layer thickness

The nominated thickness of a layer of asphalt must be within the limits specified in Table 8.6.1.

Table 8.6.1 – Nominated layer thickness limits

Asphalt Type	Nominal Size of Asphalt (Asphalt Designation)	Layer thickness (mm)	
		Minimum	Maximum
Dense graded asphalt	7 mm (AC7M and AC7H)	25	35
	10 mm (AC10M and AC10H)	35	50
	14 mm (AC14M and AC14H)	50	70
	20 mm (AC20M and AC20H)	60	100
Open graded asphalt	10 mm (OG10)	25	35
	14 mm (OG14)	35	45
Stone mastic asphalt	10 mm (SMA10)	35	40
	14 mm (SMA14)	50	60

8.6.2 Corrective courses and tie-ins to existing pavement

For corrective courses and tie-ins to an existing pavement, the Contractor may be required to implement a layer thickness that does not conform to the thickness requirements of Clause 8.6.1.

Where this is required, the Contractor shall detail the work methods to be adopted in the AQP and notify the Administrator prior to implementation. These work methods shall provide a layer that is essentially dense and homogeneous.

Placement of asphalt in a nonconforming layer thickness shall not occur unless approved by the Administrator prior to each instance the work method is required to be implemented. **Hold Point 5**

8.7 Pavement temperature and weather conditions

The pavement surface temperature shall be measured and recorded at the point of asphalt placement on a regular basis during paving operations. The Contractor shall document the method of measuring and recording pavement temperatures in the AQP. Unless otherwise accepted by the Administrator, asphalt placement shall not commence or continue, unless the pavement surface temperature complies with the requirements of Table 8.7. **Hold Point 6**

Tack coat and/or asphalt shall not be placed during weather conditions that will lead to the formation of a poor bond between the new asphalt and the underlying pavement, the minimum rolling temperatures cannot be achieved, and/or essentially homogeneous and conforming air voids cannot be achieved in the compacted asphalt.

Tack coat and/or asphalt shall not be placed when the pavement surface is wet, or rain is imminent.

Table 8.7 – Minimum pavement surface temperature for asphalt placement

Asphalt Type	Nominal Size of Asphalt (Asphalt Designation)	Minimum Surface Temperature for Asphalt pavement (ºC)[1]	
		Bitumen and Multigrade Bitumen	Polymer Modified Binder
Dense graded asphalt	7 mm (AC7M and AC7H)	15	20
	10 mm (AC10M and AC10H)	10 (5)	15 (10)
	14 mm (AC14M and AC14H)	10 (5)	15 (5)
	20 mm (AC20M and AC20H)	5	10 (5)
Open graded asphalt	10 mm (OG10)	–	15 (10)
	14 mm (OG14)	–	15 (10)
Stone mastic asphalt	10 mm (SMA10)	–	15 (10)
	14 mm (SMA14)	–	15 (5)

Notes:

[1] The minimum surface temperature requirements shown in brackets apply when the Contractor uses a material transfer vehicle as part of the asphalt paving process.

The Administrator may consider accepting the placement of asphalt at temperatures below the temperatures nominated in Table 8.7 in situations where the Contractor can demonstrate to the satisfaction of the Administrator that their construction process ensures a strong bond is formed between the new asphalt and the underlying pavement, and the specified level of compaction is achieved for the compacted asphalt with low variation in insitu air voids. These objectives are typically demonstrated by:

- extracting cores from the pavement to show that a strong bond has been achieved
- for dense graded asphalt (with a nominated layer thickness > 30 mm) and stone mastic asphalt, testing for insitu air voids to show the air voids in the compacted asphalt is conforming with low variation, and
- for dense graded asphalt (with a nominated layer thickness ≤ 30 mm) and open graded asphalt, measuring the asphalt temperature at the commencement of rolling to show the requirement of Table 8.8 has been achieved.

Acceptance to pave asphalt at temperatures below the minimum values stated in Table 8.7, does not discharge the Contractor’s responsibilities under Clause 1.2.

8.8 Paving and compaction temperatures

The Contractor's AQP must document the temperatures at which the asphalt is placed and compacted to achieve the insitu air voids requirements specified in Clause 9.2.1. The Contractor shall nominate the following requirements in the AQP:

a) the minimum temperature at which asphalt is to be delivered to the pavement

b) the minimum temperature at which initial compaction of the asphalt is to commence, and

c) the method of temperature measurement (e.g., internal probe, infrared surface thermometer etc.).

The Contractor must not incorporate asphalt in the Works that exhibits a temperature variation unless it has been remixed to a consistent and adequate temperature for compaction.

At the commencement of rolling, the temperature of open graded asphalt shall not be less than that stated in Table 8.8.

Table 8.8 – Minimum temperature at commencement of rolling for dense graded asphalt with a nominated thickness ≤ 30 mm and open graded asphalt

Asphalt Mix Type	Minimum Mix Temperature (ºC)
Dense graded asphalt	115
Open graded asphalt	120

For open graded asphalt, the Contractor's compaction procedure shall include not less than five passes of the steel-wheeled roller within 20 minutes of discharge of the asphalt into the paver receiving hopper. Rollers used to compact open graded asphalt shall have a minimum static weight of six tonnes.

For dense graded asphalt and stone mastic asphalt, each asphalt mix design has its own optimal temperature range for compaction and therefore specific temperature limits are not stated in this Technical Specification. However, the objective of the asphalt placement and compaction process is to achieve an asphalt layer that is relatively uniform in thickness and density. Achieving a relatively uniform density requires the asphalt to be placed and compacted at relatively uniform temperatures. Intermittent supply of asphalt to the paver is a common cause for stop / start paving and significant temperature variation at the commencement of rolling. Such variations should be avoided wherever possible, as they often lead to variation in density (air voids) and premature distress. Areas may be sub-lotted and tested separately to confirm they comply with the specification requirements for air voids.

AP-PWT13 - Temperature Characteristics of Binders in Asphalt provides guidance on minimum temperatures for effective compaction of asphalt mixes.

For open graded asphalt and dense graded asphalt with a nominal layer thickness ≤ 30 mm, insitu air voids is not typically tested. For this reason, a minimum temperature at the commencement of rolling is specified.

The temperatures referenced in Table 8.8 are the internal temperatures of the paved layer.

The Contractor shall measure, monitor, and record paving and compaction temperatures as described in the AQP with a hand held or machine mounted infrared thermometer or other suitable temperature measuring device at the discharge point from a tipper truck or at the distribution auger on the paver.

8.9 Tack coat

Prior to applying the tack coat, the existing surface must be clean, dry and free from loose and other deleterious material.

The Contractor shall nominate in the AQP the bituminous emulsion grade and proposed tack coat application rate(s). The Contractor shall advise the Administrator in writing of any change to the nominated application rate due to site conditions prior to applying the tack coat. The tack coat shall be:

a) evenly applied to the pavement surface at a rate that achieves a strong bond between pavement layers (i.e., 0.10 to 0.30 L/m² residual binder at 15ºC), and

b) allowed to break and be dry to touch prior to laying asphalt.

The nominated application rate for joints and chases shall be doubled.

Tack coat is not required where asphalt is placed directly over an asphalt or sprayed bituminous treatment (i.e., spayed seal) that:

a) has been placed on the same day or previous day as the asphalt that will be placed

b) has not been subjected to traffic, and

c) has a clean appearance.

It is the Contractor's responsibility to ensure that the tack coat type and application rate achieve a strong bond to the underlying pavement and between asphalt layers. AP-PWT51 - *Asphalt Tack Coating* provides guidance on asphalt tack coating.

The time lapse between applying the tack coat and laying the subsequent asphalt layer will vary depending on the climatic conditions and the grade of bituminous emulsion being used.

Application rates towards the low end of the specified range (0.10 to 0.30 L/m²) should be adopted when placing asphalt over relatively new asphalt layers. Application rates that are towards the higher end of this range should be used when placing asphalt over oxidised and/or milled surfaces.

Asphalt layers may be lightly trafficked for construction purposes without the need for tack coating. This would typically be limited to trafficking with the paving train and associated equipment such as traffic control and other service vehicles provided the asphalt surface remains free of any material or contamination that may compromise bonding to the underlying layer. Asphalt layers that are open to general traffic or used for broader construction access would typically require tack coating.

A sprayed bituminous surfacing (instead of a tack coat) is typically placed immediately below open graded asphalt to waterproof the underlying pavement.

The Contractor shall provide an endorsed daily record to the Administrator of the average tack coat application rate applied to each lot. The tack coat application rate shall be reported in terms of residual bitumen and the percentage dilution of the tack coat used during spraying shall be stated.

Tack coat shall be applied by spray bar fitted to a mechanical sprayer. Hand spraying shall be carried out only in those areas where it is impractical to use a mechanical sprayer. Precautions shall be taken to protect kerbs, channels, adjoining structures, traffic and parked vehicles from tack coat spray.

The tack coat must be intact at the commencement of asphalt placement.

The tack coated surface shall not be opened to public traffic.

8.10 Joints

The Contractor shall describe in the AQP the procedure for the construction of asphalt joints. The Contractor's procedure must maximise joint density and include mechanised edge compaction or mechanised edge trimming. Hand tamping of edges is permitted only where the use of a machine is impractical. Excess material resulting from hand preparation of edges must not be spread on the surface of the Works.

All loose, cracked and/or bony material at the edge of a paved run must be removed prior to placing the adjacent run. Asphalt resulting from the clean-up and trimming of joints shall be discarded and shall not be incorporated into the Works.

Each joint must be finished with a smooth, planar surface aligning with the surface of the rest of the layer and satisfying the surface shape requirements specified in Clause 9.6.

Unless otherwise approved by the Administrator, longitudinal joints must be:

a) offset by 150 mm from the joint in the underlying layers, except for longitudinal joints on a crowned pavement

b) within 150 mm of the line of change in crossfall

c) located away from trafficked wheel paths, and

d) for the final surfacing layer, coinciding with the final traffic lane markings.

The Administrator may approve pavement joints to be constructed away from lane marking where this represents the best outcome to achieve the pavement design intent. For example, when paving a single lane ramp with asphalt shoulders, the Administrator may allow the Contractor to form a single longitudinal joint along the centre of the ramp rather than paving the ramp lane between the edge line marking and subsequently paving narrow shoulders on either side.

In certain circumstances it may be necessary for joints in underlying pavement layers to not be offset where geometric design requirements apply, e.g., when paving in a mill and fill situation or where minimum paving widths apply.

Unless otherwise approved by the Administrator, transverse joints must be:

a) located a minimum of 25 m apart

b) offset by a minimum of 1 m from the joint in the underlying layer or as shown on the Drawings

c) formed at the commencement of each paving run, and

d) formed when a delay in paving causes asphalt temperature to fall below the initial compaction temperature nominated in Clause 8.8.

8.11 Placement trial

If specified in Clause 6 of Annexure MRTS30.1 and prior to commencing work, the plant and personnel proposed for use for the Works must be subjected to a placement trial.

Each nominated mix must be subjected to a separate placement trial. Each placement trial may be located within the Works. The size of each placement trial must be limited to one lot. The Contractor must design the trial to implement all the procedures described in the AQP and demonstrate conformance with this Technical Specification, including:

a) homogeneity

b) insitu air voids

c) course thickness

d) course position

e) surface shape, and

f) joint quality.

The Contractor shall submit a copy of the completed inspection and test plan and all relevant test results and records from the placement trial. Prior to further placement of the Contractor's nominated mix(s) in the Works, the Administrator shall review the outcomes of the placement trial. No further work shall be undertaken until the Administrator has given approval to proceed. **Hold Point 7**

In the event of a nonconformance in the placement trial, or when the Administrator determines that a previous trial is not representative of the materials, asphalt mix proportions, temperature, plant, rate of output and/or method of placement, a new trial must be undertaken and the Hold Point re-released, prior to full-scale placement resuming.

Where a placement trial forms part of the Works, all nonconformances in respect of materials, process and finished pavement properties shall be managed in accordance with Clause 5.

For open graded asphalt, the trial shall also determine the assigned compacted density of the asphalt mix. The assigned compacted density of the asphalt layer shall be determined using the following formula:

$$D = 1000 \times M / (T_c \times A)$$

where:

D = the assigned compacted density of an open graded asphalt mix, in tonnes per cubic metre.

T_c = average thickness of cores extracted from the pavement lot, in millimetres

M = the mass of asphalt in the pavement lot, in tonnes

A = area of the pavement lot, in square metres.

A minimum of five cores shall be taken from the lot to determine the average bulk density (determined in accordance with AS/NZS 2891.9.3) and thickness of the layer.

8.12 Temporary ramps to existing pavement and structures

8.12.1 General

Temporary ramps that are constructed for the safe trafficking of the Works must be constructed by placement of asphalt complying with this Technical Specification as appropriate for the application, or by cold milling of existing or new asphalt.

The dimensions of ramps shall be determined by the Contractor to suit the situation and be of a standard not less than that stated in Clauses 8.12.2 to 8.12.4.

8.12.2 Transverse joints

Where the speed limit exceeds 60 km/h, a minimum taper length of 2.5 metres shall be provided for each 50 mm variation in levels (or part thereof).

Where the speed limit is less than or equal to 60 km/h, a minimum taper length of 1.5 metres shall be provided for each 50 mm variation in levels (or part thereof).

8.12.3 Longitudinal joints

Where traffic can reasonably be expected to travel across a longitudinal edge, a ramp of minimum 1.0 m length shall be provided for each 50 mm variation in levels (or part thereof).

8.12.4 Interface with structures

Asphalt ramps shall be formed and compacted around manholes, gully pits, utility covers or other similar structures that fall within the traffic lanes and shoulders, unless otherwise directed by the Administrator.

The ramps must have a minimum taper length of 1.5 metres for each 50 mm variation in levels (or part thereof).

8.13 Surface gritting

Stone mastic asphalt shall be gritted. The material used for gritting shall consist of natural sand particles having a grading complying with the requirements shown in Table 8.13, or other material as approved by the Administrator. The grit shall be dry, clean, hard, angular, durable, and free from clay and other aggregations of fine material, soil, organic matter and any other deleterious material.

Table 8.13 – Particle size distribution limits for grit material

Test Sieve Size (mm)	% Passing by Mass
4.75	100
2.36	90 – 100
0.600	0 – 20
0.075	0 – 1.0

The grit shall be uniformly spread and rolled into the surface of the hot asphalt during the compaction process. The temperature at which the grit material is applied shall be such that the grit forms a strong bond with, and is partially coated by, the binder in the asphalt mix. The spread rate to be adopted for grit material shall be nominated by the Contractor and be applied at a rate ≥ 0.3 kg/m² for SMA14 and ≥ 0.2 kg/m² for SMA10. After consultation with the Administrator, the nominated spread rate may be adjusted to ensure an adequate coverage of grit is achieved.

Prior to the pavement section being opened to traffic, any loose grit material shall be removed from the road surface.

9 Finished pavement properties

9.1 Homogeneity

All asphalt must be homogeneous in appearance.

Areas of asphalt that exhibit cracking, ravelling, bony or fatty material, or have been damaged during construction must be rectified or replaced.

Any proposal by the Contractor that the Administrator accept non-homogeneous and/or segregated material or work must be in writing and must show:

a) the technical reasons for acceptance

b) justification that the non-homogeneous section complies with this Technical Specification, and

c) sub-lotting that minimises performance risk to the surface and structure of the pavement.

9.2 Insitu air voids

9.2.1 Requirements for insitu air voids

Dense graded asphalt and stone mastic asphalt must have a dense appearance. Each layer of asphalt must be uniformly compacted to achieve the specified characteristic values for insitu air voids.

Asphalt layers of ≤ 30 mm thickness shall not be tested for insitu air voids.

The characteristic values of insitu air voids for the lot must comply with Table 9.2.1(a) for dense graded asphalt, and Table 9.2.1(b) for stone mastic asphalt.

Table 9.2.1(a) – Insitu air voids requirements for dense graded asphalt

Location	Layer	Limited of Characteristic Value of the Insitu Air Voids (%)	
		Nominated Layer Thickness > 30 mm and < 50 mm	**Nominated Layer Thickness ≥ 50 mm**
Mat	Surfacing layer and layer below surfacing	V_L = 3.0 and V_U = 8.0	V_L = 3.0 and V_U = 7.0
	Layer covered by two layers of asphalt	V_L = 2.5 and V_U = 8.0	V_L = 2.5 and V_U = 7.0
	Layer covered by three or more layers of asphalt	V_L = 2.0 and V_U = 8.0	V_L = 2.0 and V_U = 7.0
Joints[1]	All	V_U = 11.0	V_U = 10.0

Notes:

V_L is the lower limit for characteristic value of insitu air voids and V_U is the upper limit for characteristic value of insitu air voids.

[1] Where testing is ordered by the Administrator, only asphalt constructed as part of the Works shall be tested (including asphalt abutting existing pavement or other infrastructure).

Table 9.2.1(b) – Insitu air voids requirements for stone mastic asphalt

Location	Location of Characteristic Values of Insitu Air Voids (%)	
	Nominated Layer Thickness > 30 mm and < 50 mm	**Nominated Layer Thickness ≥ 50 mm**
Mat	V_L = 2.0 and V_U = 7.0	V_L = 2.0 and V_U = 6.0
Joints[1]	V_U = 10.0	V_U = 9.0

Notes:

V_L is the lower limit for characteristic value of insitu air voids and V_U is the upper limit for characteristic value of insitu air voids.

[1] Where testing is ordered by the Administrator, only asphalt constructed as part of the Works shall be tested (including asphalt abutting existing pavement or other infrastructure).

For dense graded asphalt and stone mastic asphalt, insitu air voids below the minimum value may lead to rutting, flushing, bleeding and/or mix instability. Factors that influence the performance of the asphalt include traffic loading, depth of the layer from the pavement surface and the binder used in the asphalt mix.

Insitu air voids above the maximum value may lead to accelerated hardening of the binder (through oxidation), ravelling, ingress of moisture and/or stripping of the asphalt layer.

Pavement joints are typically accepted as areas with insitu air voids greater than the maximum value for the mat. Therefore, a higher maximum limit for insitu air voids applies to joints. However, joints are not usually tested for insitu air voids unless the Administrator suspects, based on surveillance and/or the visual appearance of the joints, the specified requirements have not been achieved. Typically, joint compaction would be tested across joints where both adjoining sections of asphalt have been placed under the same contract, or within 150 mm of joints where the asphalt being tested is adjacent to asphalt not placed under the same contract.

9.2.2 Determination of insitu air voids

The characteristic values of insitu air voids for dense graded asphalt and stone mastic asphalt shall be determined using the following process:

a) For dense graded asphalt, determine the bulk density either from cores in accordance with AS/NZS 2891.9.2, Q306C, or from nuclear gauge density measurements taken in accordance with Q306E or AS.NZS 2891.14.2. Trimming must not reduce the core layer thickness by more than 5 mm. The nuclear gauge density method is not to be used when steel reinforcement exists within 300 mm of the surface of the layer.

b) For stone mastic asphalt, determine the bulk density either from cores in accordance with Q306C, or from nuclear gauge density measurements taken in accordance with Q306E. Trimming must not reduce the core layer thickness by more than 5 mm. The nuclear gauge density method is not to be used when steel reinforcement exists within 300 mm of the surface of the layer.

c) Determine the reference density for the purpose of insitu air voids calculations as the mean maximum density of the lot, where the individual values are determined in accordance with AS/NZS 2891.7.1.

d) Calculate the characteristic values of insitu air voids using the acceptance constant 'k' provided in Table 12(b) of MRTS01 *Introduction to Technical Specifications* and the following test methods:

   i. Q311 and Q020, or

   ii. AS/NZS 2891.14.5 and AS 2891.14.15.

If the Contractor proposes to determine the bulk density of the pavement layer using nuclear gauge measurements taken in accordance with AS/NZS 2891.14.2 or Q306E, they shall establish an asphalt density bias on the first lot of each mix design and pavement layer combination constructed as part of the Works.

The Contractor shall submit a copy of all relevant test results and nuclear gauge density measurement records used to determine the asphalt density bias. The nuclear gauge may be used for compliance testing of subsequent lots once these test results and records have been submitted to the Administrator.

9.3 Surface texture

For each construction lot, the average surface texture depth of stone mastic asphalt after gritting shall not be less than:

- 0.7 mm for SMA10
- 0.7 mm for SMA14 where the posted speed limit is ≤ 80 kilometres per hour, and
- 1.1 mm for SMA14 where the posted speed limit is > 80 kilometres per hour.

9.4 Geometrics

9.4.1 General

The specified course thickness shall be as detailed on the Drawings. Unless otherwise approved by the Administrator, asphalt layers shall be placed at an essentially uniform thickness over the areas to be paved, with due consideration given to the shape of the surface to be paved over.

The pavement shall be constructed so as not to depart from the relevant widths, lengths and levels or thicknesses stated in the Contract by more than the tolerances listed in Clauses 9.4.2 and 9.4.3. Where the new asphalt surfacing course is required to match the surface levels of a road structure (e.g., tie-in to existing pavement or bridge joints, pavement gutter, utility access point, etc.), the pavement must be constructed so as to drain the surface of water and match the surface levels of the existing road structure, unless otherwise directed by the Administrator.

9.4.2 Vertical tolerances

9.4.2.1 General

There are two alternative methods of vertical tolerance control for asphalt pavements. They are:

a) level control (as detailed in Clause 9.4.2.2), or

b) thickness control (as detailed in Clause 9.4.2.3).

Unless otherwise stated in Clause 7 of Annexure MRTS30.1, the method of vertical tolerance control to be adopted is as follows:

a) intermediate, base and corrector courses – level control, and

b) surfacing courses – thickness control.

9.4.2.2 Level control

When level control is specified, the levels for the top surface of the course must not vary from the design levels by more than 10 mm.

Dispositions for nonconformances must be approved before a subsequent course is placed over a nonconforming course accepted by the Administrator.

Level nonconformities are assessed on the surface of each course rather than on individual layers.

9.4.2.3 Thickness control

When thickness control is specified, the requirements for layer thickness shall be as follows:

a) the average compacted layer thickness for each lot, when determined in accordance with Clause 9.4.2.4(a), shall not vary from the nominated layer thickness by more than the average value tolerance given in Table 9.4.2.3, and

b) where the layer being placed is over one or more layers placed by the Contractor, the thickness of the compacted layer at any point, when measured in accordance with Clause 9.4.2.4(b), shall not vary from the nominated layer thickness by more than the individual value tolerance given in Table 9.4.2.3.

For the purposes of this clause, the use of isolated areas of corrector does not constitute a layer.

In addition to the requirements of each layer, the total thickness of constructed asphalt pavement shall be within ± 10 mm of the total thickness specified.

Table 9.4.2.3 – Allowable tolerances for layer thickness (when thickness control is specified)

Asphalt Type	Nominal Size of Asphalt (Asphalt Designation)	Layer Thickness Tolerance (mm)	
		Average Value	Individual Value[1]
Dense graded asphalt	7 mm (AC7M and AC7H)	± 3	± 5
	10 mm (AC10M and AC10H)	± 3	± 5
	14 mm (AC14M and AC14H)	± 4	± 7
	20 mm (AC20M and AC20H)	± 5	± 10
Open graded asphalt	10 mm (OG10)	± 3	± 5
	14 mm (OG14)	± 4	± 7
Stone mastic	10 mm (SMA10)	± 3	± 5
	14 mm (SMA14)	± 4	± 7

Notes:

[1] Individual value only applies to layers placed over one or more layers placed by the Contractor.

Tolerances that would apply for a 300 mm asphalt pavement consisting of a 50 mm thick AC14H layer (surfacing course) placed to thickness, a 50 mm thick AC14H layer (intermediate course) placed to levels and 2 x 100 mm thick AC20H layers (base course) placed to levels are as follows:

- AC14H surfacing course:
    - Thickness:
        - Average: ± 4 mm
        - Individual locations: ± 7 mm
- AC14H intermediate course:
    - Levels: Individual locations: ± 10 mm
- AC20H base course:
    - Upper layer:
        - Levels: Individual locations: ± 10 mm
    - Lower layer:
        - Not specified. However, it is expected that Contractors will adopt an appropriate standard of level control to achieve the level requirements specified for the top of base course.

For some asphalt inlay projects where the work will match existing surface levels, the default requirements for level control may not be appropriate. When undertaking a 130 mm thick asphalt inlay project consisting of a 50 mm thick AC14H layer (surfacing course) and an 80 mm thick AC20H layer (intermediate course), the typical vertical control requirements are as follows:

- Cold mill the existing pavement to a nominated depth (to be specified elsewhere in the contract)
- AC14H surfacing course:
    - Levels:
        - Match the surrounding pavement surface
- AC20H intermediate course:
    - Thickness:
        - Average: ± 5 mm

9.4.2.4 Determination of actual layer thickness

The thickness of the layer shall be determined as follows:

a) the average compacted thickness of the layer shall be determined using the following formula:

$T_A = 1000 \times M / (D \times A)$

where:

T_A = average thickness of compacted layer, in millimetres

M = mass of asphalt in the lot, in tonnes

D = average compacted density of the lot, in tonnes per cubic metre. For open graded asphalt, the average compacted density shall be assumed to be the assigned compacted density determined from the pavement trial.

A = area of the lot, in square metres.

b) the compacted layer thickness at any point shall be determined using one of the following methods:

i. cores sampled in accordance with AS 1289.1.4.2, and AS 2891.1.2 where:

- the core layer thickness is determined prior to trimming of the core
- the core diameter can be less than 95 mm, and
- the test specimen may comprise more than one layer.

or

ii. where compaction testing is determined using a nuclear gauge or for open graded asphalt, measured dip records taken in accordance with procedures documented in the Contractor's AQP where measured loose dip readings are converted to a compacted thickness value using the mean compacted density for the lot.

9.4.3 Requirement for horizontal location

The horizontal location of any point on the surface of a course must be located within 50 mm from the corresponding point determined from the Drawings.

However, where alignment of the pavement with an existing road or other existing road structure is necessary, the new work shall be joined to the existing work in a smooth manner.

9.5 Surface shape

9.5.1 Determination of surface shape

The surface shape shall be determined and reported in accordance with Q712.

The maximum lot size must be in accordance with Clause 5.5 and extended to include the adjacent longitudinal joints, transverse joints and tie-ins. Testing shall be conducted at a frequency not less than that specified in Table 5.4.1(d).

9.5.2 Requirement for surface shape

The surface of any trafficked layer must not pond water.

The surface shape of each course within and across traffic lanes at the time of construction must not deviate from the bottom of a straightedge laid in any direction by more than the tolerances shown in Table 9.5.2 with due allowance being made for design shape, where relevant. Where the deviations from a straightedge for an existing surface exceed 10 mm, rectification of those areas shall be carried out before the subsequent asphalt layer (other than corrector) is placed, unless directed otherwise by the Administrator.

Shape correction is typically completed using a dense graded asphalt corrector course under Work Item(s) 41751 or 41801 (as relevant) or milling (which is not covered by the Technical Specification). Further guidance about asphalt shape correction can be found in AP-PWT30 *Asphalt Shape Correction*.

All nonconformances shall be corrected before testing road roughness and before any subsequent course is placed.

Table 9.5.2 – Maximum deviation from a straightedge placed within or across traffic lanes

Course	Maximum Deviation from a Three Metre Straightedge (mm)	
	Through Carriageways (< 70 km/h Traffic Speed) Roundabouts & Signalised Intersections (including approaches)	**Through Carriageways (≥ 70 km/h Traffic Speed)**
At Actual Completion Date		
Surfacing course	5	3[2]
Course immediately below the surfacing course	10 [5][1]	5
All other courses	10	10
12 Months after Date of Practical Completion		
Asphalt surface	8	6

Notes:

[1] The maximum straightedge deviation in brackets applies when the surfacing course is open graded asphalt.

[2] A maximum deviation from a three metre straightedge of 5 mm shall apply to joints.

9.6 Road roughness

9.6.1 Determination of road roughness

Unless otherwise specified in Clause 8 of Annexure MRTS30.1, the road roughness (R) shall be determined from measurements of longitudinal profile in accordance with Q708B, Q708C or Q708D. All surfacing layers shall be measured and each trafficked lane tested with a lot size of 100 m in length, unless otherwise approved by the Administrator. Areas of pavement affected by roundabouts, railway lines, bridge joints and inspection pit covers should be identified in the road roughness report and taken in consideration by the Administrator as part of the road roughness assessment.

The Contractor shall prepare and implement a specific Inspection and Test Plan (ITP) for road roughness that meets the requirements of this Technical Specification. The lot description and the start and end locations for testing shall be defined in the ITP.

9.6.2 Requirement for road roughness

The surfacing course must have a smooth longitudinal profile.

Road roughness of each lot of the asphalt surfacing must not exceed the international roughness index (IRI) limits given in Clause 8 of Annexure MRTS30.1 where:

a) the construction of the underlying pavement forms part of the contract, or

b) asphalt is placed in more than one layer including any full length, full width corrective course over a pavement constructed by others.

Where not otherwise specified in Clause 8 of Annexure MRTS30.1, the IRI shall be in accordance with the requirements of Table 9.6.2 for the above situations.

Table 9.6.2 – Road roughness requirements

Property	Maximum value
Road roughness (R) (m/km)	1.93

For road resurfacing work where the existing asphalt surface is milled / profiled to a nominal depth prior to the placement of a single layer of asphalt, the roughness reduction formula provided below applies.

Where a single layer of asphalt (including sections where isolated corrector is required) is placed over pavement constructed by others, the road roughness for each lot must not exceed the IRI_a values determined as follows:

$IRI_a = 0.6 \times IRI_b + 0.2$, or 1.56 m/km, whichever is the greater

where:

IRI_a is the IRI after placing the asphalt layer (m/km)

IRI_b is the IRI before placing the asphalt layer (m/km).

IRI_b measurement shall be undertaken by the Contractor and reported to the Administrator a minimum of seven days prior to the commencement of works. Measurement of road roughness of the existing surface shall be undertaken such that it coincides with lots for measurement of road roughness of the finished work.

10 Asphalt contractor performance

A Performance Report - Asphalt Prequalification shall be prepared in accordance with the requirements of the Transport and Main Roads *Transport Infrastructure Project Delivery System (TIPDS) Manual*. A performance report is not required for a project or program of works that involves less than 2000 tonnes of asphalt.

11 Supplementary requirements

The requirements of MRTS30 *Asphalt Pavements* are varied by the supplementary requirements given in Clause 9 of Annexure MRTS30.1.