



Australian Asphalt Pavement Association  
**SMA7 Model Specification**

---

Version 1.0  
2 November 2017

Published by  
National Technology & Leadership Committee



This work is licensed under a [Creative Commons Attribution 3.0 Australia License](https://creativecommons.org/licenses/by/3.0/au/).

## Preface

This national model specification is intended as a guide for asset owners in the creation of technical specifications for the supply of stone mastic asphalt mixes with a nominal maximum aggregate size of 7 mm (SMA7). SMA7 materials are typically used as a thin surfacing layer (25 mm – 35 mm). SMA7 will typically contain a polymer modified binder, except under light traffic conditions (defined in this specification), where an unmodified bitumen may be appropriate. The design criteria in this model specification are based on well-established practice. The document brings together years of experience with the supply of SMA7 by industry.

The content of this specification builds on information in the following documents

- *National Asphalt Specification*, 2<sup>nd</sup> edition, Australian Asphalt Pavement Association, Melbourne, VIC, 2004.
- *AS 2150-2005 Hot mix asphalt a guide to good practice*, Standards Australia

## Acknowledgements

The development of this model specification is a result of a collaborative effort between representatives from state road agencies and industry. The initial version of this specification was prepared by the Victorian AAPA Technology and Leadership Committee.

### Disclaimer

Although the information in this specification guide is believed to be correct at the time of printing, the Australian Asphalt Pavement Association, and agents of that organisation together with individuals involved in the preparation of this specification guide do not accept any contractual, tortious or other form of liability for its contents or any consequences arising from its use. People using the information contained in this guide should apply, and rely upon, their own skills and judgement to the particular issue they are considering.

Suggestions for improvements are welcomed, please forward suggestions to the AAPA head office. Contact details available at [aapa.asn.au](http://aapa.asn.au).

## 1. General

### 1.1. Scope

This model specification sets out requirements for stone mastic asphalt mixes with a nominal maximum aggregate size of 7 mm (SMA7). The specification covers:

- Constituent materials
- SMA7 mix design requirements
- Process control in manufacture and placement of asphalt
- Acceptance criteria for the finished SMA7 pavement
- Quality systems, minimum process standards, plant requirements and sampling and testing frequencies.

### 1.2. Quality system requirements

The Contractor shall establish, implement and maintain a Quality System in accordance with this Specification and the requirements of AS/NZS ISO 9001, or an equivalent system approved by the Principal. The Quality System shall include the appropriate Occupational Health and Safety procedures and Safe Working Method Statements.

Where required in the Contract general clauses, the Contractor shall submit a Quality Plan prior to commencement of any works. The Quality Plan shall take into account the specific requirements for inspection and testing, acceptance/rejection criteria, details of proposed methods and other quality requirements that are contained in the Contract Documents. No part of the Quality System shall be used to pre-empt or otherwise negate the technical requirements of the Contract Documents.

### 1.3. Testing requirements

All testing of properties required by this Specification shall be undertaken in a laboratory accredited by the National Association of Testing Authorities (NATA) or International Accreditation New Zealand (IANZ) for the appropriate tests and performed in accordance with procedures contained in the relevant Australian Standard or Austroads Manual of Test Procedures. Where there is no applicable Australian Standard or Austroads Test Method, or where the Standard/Manual provides a choice of procedures, the method to be adopted shall be agreed between the Principal and the Contractor.

### 1.4. Defect liability period

During the first 12 months, the product must not rut, shove, strip, ravel or bleed.

## 2. Constituent materials

### 2.1. Aggregate & mineral filler

#### 2.1.1. General

All aggregates shall be obtained from established quarries and have established properties. Each individual aggregate fraction shall be obtained from the same quarry as the materials used in the design of the Job Mix.

An appropriate system of stockpile management shall be implemented at the asphalt plant to ensure contamination does not occur.

All mineral filler shall come from established sources and have established properties.

#### 2.1.2. Coarse aggregate

Coarse aggregate is comprised of crushed rock particles that are substantially retained on the 4.75 mm sieve. Coarse aggregate shall comply with Australian Standard AS 2758.5 with the application of those test properties specified in Table 2-1 as appropriate.

Table 2-1: Coarse aggregate requirements

Property	Test Method	Requirement
Particle size distribution (PSD)	AS 1141.11.1	Report
Crushed particles <sup>(1)</sup>	AS 1141.18	100% crushed aggregate
Polished aggregate friction value (PAFV)	AS 1141.40, or AS 1141.41	≥ 48 <sup>(2)</sup>
Particle density (Dry basis)	AS 1141.6.1, or AS1141.6.2	report
Water absorption	AS 1141.6.1, or AS1141.6.2	≤ 2.5 %
Los Angeles abrasion loss <sup>(3)</sup>	AS 1141.23	≤ 25 %
Ten percent fines value (wet) <sup>(3)</sup>	AS 1141.22	≥ 150 kN
Wet/dry strength variation <sup>(3)</sup>	AS 1141.22	≤ 35 %

Notes:

1. Test only required on river gravels and metasediments
2. In some regions aggregates that comply with the PAFV requirements in Table 2-1 may not be available. Where this is the case, a lower PAFV requirement may be proposed for acceptance by the Principal.
3. Aggregate to be tested for either Los Angeles abrasion loss, or wet strength and wet/dry strength variation

### 2.1.3. Fine aggregate

Fine aggregate shall consist of crushed rock particles substantially passing the 4.75 mm sieve and manufactured from an approved source complying with the requirements of Section 2.1.2.

The fine aggregate shall be clean, hard, durable and free from lumps of clay and other aggregations of fine materials, organic material and any other deleterious material. Fine aggregate shall comply with the criteria in Table 2-2.

Table 2-2: Fine aggregate requirements

Property	Test Method	Requirement
Particle size distribution (PSD)	AS 1141.11.1	Report
Particle density (Dry basis)	AS 1141.5	Report
Water absorption	AS 1141.5	≤ 2.5 %
Degradation Factor, Crusher fines <sup>(1)</sup>	AS 1141.25.3	≥ 60
Sodium Sulfate Soundness (weighted loss) <sup>(1)</sup>	AS 1141.24	≤ 12%

Notes:

1. Aggregate to be tested for either degradation factor, or Sodium Sulfate Soundness

### 2.1.4. Mineral filler

Mineral filler is that portion of mineral matter passing a 0.075 mm sieve, and includes rock dust derived from coarse and fine aggregates used in the production of asphalt in accordance with this specification, and any other materials added to supplement the quantity and properties of filler in the mix.

SMA7 shall contain shall contain hydrated lime, or adhesion agent. Where hydrated lime is used a minimum of 1.0% shall apply.

The combined filler shall comply with the requirements in Table 2-3

Table 2-3: Combined filler requirements

Property	Test Method	Requirement
Voids in dry compacted filler	AS/NZS 1141.17	≥ 28 % and ≤ 45 %
Apparent density of filler	AS/NZS 1141.7	Report
Methylene blue test <sup>1</sup>	AS 1141.66	≤ 10

Notes:

1. This requirement shall only apply for aggregate from New South Wales or Queensland. Test is to be performed on combined filler including hydrated lime

Added filler (material not derived from the aggregate components) shall comply with the relevant standards listed in Table 2-4. Rock dust that is not derived from the other aggregate components in the mixture may also be used as added filler provided that it is derived from materials that meet the requirements of Clause 2.1.2

Table 2-4: Standards for materials used as filler

Material	Standard <sup>1</sup>
Hydrated lime	AS 1672.1
Fly Ash	AS/NZS 3582.1
Cement Kiln Dust	See note 2
Slag	AS/NZS 3582.2
Ground Limestone	See note 3

Notes:

1. Provision of test certificates for compliance with the relevant Australian Standard and this specification shall be limited to those tests listed in Table 2-4.
2. Cement kiln dust shall be solid material extracted from the flue gases in the manufacture of Portland cement, having a maximum water soluble fraction of 20% by mass and complying with the grading limits specified in Table 2-5
3. Ground limestone shall consist of rock dust derived from the grinding of limestone.

The particle distribution of all added filler fractions shall comply with the grading limits specified in Table 2-5.

Table 2-5: Grading limits for added filler

Test method	Sieve size (mm)	Percentage passing sieve size (by mass)
AS 1141.11.1	0.600	100
	0.300	95–100
	0.075	75–100

Each type of added filler from each source shall be mineral material, dry and free from lumps, organic material or other deleterious matter, and conform to AS 2150. The added filler shall comply with the requirements in Table 2-6.

Table 2-6 Requirements for added filler

Property	Test Method	Requirement
Moisture content	AS 4489.6.1	≤ 3 %
Apparent density	AS/NZS 1141.7	Report

## 2.2. Binder

The binder used for SMA7 shall be a polymer modified elastomeric binder complying with the requirements in AGPT/T190. In light, free flowing traffic situations over a sound pavement where the design traffic does not exceed 100 commercial vehicles per lane per day, a Class 320, or Class 450 bitumen complying with AS2008 may also be used.

## 2.3. Additives

### 2.3.1. Cellulose fibres

Cellulose fibres may be included in the SMA7 mix design to ensure compliance with binder drain-off in Table 3.2.

### 2.3.2. Adhesion agent

Adhesion agent may be added up to 2.0% by mass of bitumen to improve the moisture sensitivity properties of the SMA mix, where required. The type and proportion of the adhesion agent shall be in accordance with a manufacturer's recommendation, purchaser's specification or as agreed between the Principal and Contractor.

### 2.3.3. Warm mix asphalt additive

Warm mix asphalt additive may be included in the asphalt mix design to reduce the SMA7 manufacturing temperature and/or improve workability in the field. The type and proportion of the warm mix additive shall be in accordance with a manufacturer's recommendation, purchaser's specification or as agreed between the Principal and the Contractor.

## 2.4. Reclaimed asphalt pavement

Reclaimed asphalt pavement (RAP) shall not be used in SMA7.

## 3. Mix design

### 3.1. General

The Contractor shall provide a mix design that complies with the requirements of this specification. Where the proposed mix design incorporates additives listed under Clause 2.3, compliance shall be tested on the mix including these additives. Where specified, the Contractor's mix design shall be submitted for approval, or registration.

### 3.2. Aggregate grading

The target combined aggregate grading (including filler) determined in accordance with AS/NZS2891.3.1, AS/NZS2891.3.2, AS/NZS2891.3.3, or AGPT/T234 shall comply with the limits given in Table 3-1.

Table 3-1: SMA 7 aggregate grading limits

Sieve size (mm)	Percentage passing sieve size by mass of total aggregate
9.5	100
6.7	85 – 100
4.75	35 – 55
2.36	17 – 35
1.18	16 – 28
0.600	12 – 24
0.300	10 – 20
0.150	8 – 16
0.075	8 – 13

Notes:

In some regions aggregates that meet the grading envelope requirements in Table 3-1 may not be available. Where this is the case, adjustments to the requirements may be proposed for acceptance by the Principal.

### 3.3. Binder content

SMA7 shall contain 6.5 to 7.5 percent binder by mass of total mix.

Note: the specified binder content range is applicable to commonly used natural aggregates and sands. Where the Contractor proposes to use constituents of substantially different density, the Contractor may propose a nonconforming binder content subject to the approval of the Principal. The Contractor must demonstrate that the effective volumetric binder content complies with the intent of the Specification

### 3.4. Cellulose fibres

If cellulose fibres are required to meet drain-off requirements, the minimum application rate shall be 0.3 % by mass of total mix.

### 3.5. Mix properties

The volumetric design shall be performed with Marshall laboratory compaction equipment as described below. The asphalt mix for the design shall be prepared in accordance with AS/NZS 2891.2.1. Test specimens compacted in accordance with AS/NZS 2891.5 applying 50 blow Marshall compaction effort shall comply with the requirements in Table 3-2.

Table 3-2: SMA7 mix requirements Marshall design

Property	Test Method	Requirement
Combined mineral aggregate density (t/m <sup>3</sup> )	AS/NZS 2891.8	Report
Binder film index	AS/NZS 2891.8	Report
Voids filled with binder (%)	AS/NZS 2891.8	70-80
Voids in mineral aggregate (%)	AS/NZS 2891.8	≥ 19
Air void content (%)	AS/NZS 2891.8	2.5 – 5.0
Binder drain-off (%)	AGPT/T235	≤ 0.3
Water sensitivity (%)	AGPT/T232 <sup>(1)</sup>	≥ 80

Notes:

1. The freeze/thaw moisture conditioning of specimens detailed in Section 5.2 of AG:PT/T232 is mandatory.

### 3.6. Mix design report

The mix design report shall include the following information:

1. Details of manufacturer and manufacturing plant where the mix will be produced.
2. Design grading and binder content.
3. Details of all constituent materials and their proportions, as well as test results from a NATA accredited laboratory demonstrating that the constituents comply with the requirements in Clause 2.
4. Test results provided by a NATA accredited laboratory demonstrating that the mix design complies with the requirements in Clause 3.5.
5. A signed declaration that the mix design complies with the requirements of this specification.
6. Reference to this specification

## 4. Manufacture and storage

### 4.1. General

Asphalt manufacturing plant shall be capable of consistently producing asphalt mixes with the properties specified and at a rate suitable for smooth, continuous asphalt placing.

### 4.2. Storage of raw materials

Raw materials shall be stored at the mixing site in sufficient quantities to ensure continuity of production and enable effective sampling and testing prior to use. The facilities for handling particular materials shall comply with the following:

- a. Aggregates shall be handled and stored in such a manner as to prevent contamination and avoid segregation.
- b. Filler shall be handled and stored in such a manner as to keep it dry and free flowing at all times. Where more than one type of filler is to be used, each shall be handled and stored separately.
- c. Additives shall be protected from moisture or contamination.
- d. Tanks for heating and storage of bitumen shall be thermostatically controlled and each shall be fitted with a thermometer that is located so that the temperature can be read conveniently.
- e. An appropriate bitumen sampling point shall be provided.
- f. Heating and storage of binder must comply with the temperature and time limits set out in Advisory Note 7 published by the Australian Asphalt Pavement Association.

### 4.3. Mixing temperatures

The temperature of the bitumen delivered into the mixer and the temperature at discharge from the asphalt plant shall not exceed the mixing temperature limits specified in AAPA Advisory Note 7. The exit temperature of the material from the mixer shall not exceed 185 °C.

### 4.4. Addition of filler

Filler systems shall be designed or modified to provide for the appropriate quantity of added filler. In drum mix plants, loss of filler shall be minimised by feeding direct into the mixer alongside addition of binder.

### 4.5. Addition of fibres

The following requirements shall apply to the process of adding cellulose fibres:

- a. Fibre shall be added in a manner that ensures good dispersion of fibres, avoids loss of fibre through dust collection systems and avoids damage to fibre by overheating.
- b. Mixing times shall be increased, where necessary, to ensure adequate dispersal and mixing of fibre.

### 4.6. Particle coating

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.

### 4.7. Production tolerances

The proportion of the different aggregate fractions may be varied for the purpose of process control provided that the asphalt produced remains essentially uniform and consistent and in compliance with the nominated mix submission. The actual particle size distribution and binder content of the production mix may vary from the values nominated in the mix design report within the limits shown in Table 4-1.

Table 4-1: Production tolerances

Description	Test method	Tolerance
Permissible variation to nominated combined particle size distribution during production (% by mass of total aggregate)	AS/NZS 2891.3.1, or AS/NZS 2891.3.2, or AS/NZS 2891.3.3	
Passing 4.75 mm sieve and larger		± 7
Passing 2.36 mm and 1.18 mm sieves		± 5
Passing 0.600 mm and 0.300 mm sieves		± 4
Passing 0.150 mm sieve		± 2.5
Passing 0.075 mm sieve		± 1.5
Permissible variation to the nominated binder content during production (% by mass of total mix)	AS/NZS 2891.3.1, or AS/NZS 2891.3.2, or AS/NZS 2891.3.3	± 0.3

#### 4.8. Storage of mixed asphalt

Asphalt may be stored prior to delivery to the purchaser, subject to the following requirements being observed:

- a. The mix is consigned to and deposited in the storage bins in such a manner as to minimise segregation.
- b. The storage bin shall be insulated.
- c. The method of discharge shall be such as to minimise segregation. Any caked or segregated portions of mix shall be discarded.

### 5. Sampling and testing during production

#### 5.1. General

The Contractor shall arrange for all relevant testing.

Samples from asphalt production shall be taken at the required frequency in Table 5-1 in accordance with AS/NZS 2891.1.1. Samples shall not be mixed. In addition, each loaded truck shall be visually inspected for segregation, uncoated particles, excess bitumen or overheating, before dispatch from the plant.

#### 5.2. Frequency of sampling and testing

Frequency of sampling and testing shall be not less than that shown in Tables 5-1 and 5-2. Table 5-1 provides for two levels of minimum frequency. The reduced frequency may only be adopted where the process is demonstrated to be under statistical control as specified in Section 5.3. Where a non-conformance occurs in any test requirement, the frequency of sampling and testing for that particular property shall be increased to the normal level until conforming results have been obtained on five consecutive samples. Loose asphalt mix shall be samples in accordance with AS/NZS 2891.1.1.

Table 5-1: Frequency of sampling and testing of produced asphalt

Property	Test Method	Normal minimum frequency	Reduced minimum frequency
Binder content and grading	AS/NZS 2891.3.1, or AS/NZS 2891.3.2, or AS/NZS 2891.3.3	One test per 300 t of asphalt production, or part thereof over 30 t.	One test per 500 t of asphalt production, or part thereof over 30 t.
Maximum density	AS/NZS 2891.7.1 or AS/NZS 2891.7.3	One test per 300 t of asphalt production, or part thereof over 30 t.	One test per 500 t of asphalt production, or part thereof over 30 t.
Temperature of asphalt discharged from plant	Steel probe digital thermometer	First three loaded trucks, for each lot.	First three loaded trucks, for each lot.

Table 5-2: Frequency of testing of constituent materials

Property	Test Method	Normal minimum frequency
Crushed particles <sup>(1)</sup>	AS 1141.18	3 Monthly
Aggregate density and water absorption	AS 1141.6.1, or AS1141.6.2	3 Monthly
Los Angeles abrasion loss <sup>(2)</sup>	AS 1141.23	3 Monthly
Ten percent fines value (wet) <sup>(2)</sup>	AS 1141.22	3 Monthly
Wet/dry strength variation <sup>(2)</sup>	AS 1141.22	3 Monthly
Voids in dry compacted filler	AS/NZS 1141.17	At time of mix design

Property	Test Method	Normal minimum frequency
Binder properties	As per	Certification of each batch/delivery
Bitumen	AS 2008	
Polymer modified binder	AGPT/T190	
Added filler	As per Table 2-4	Certification of each batch/delivery

Notes:

1. Test only required on river gravels and metasediments
2. Aggregate to be tested for either Los Angeles abrasion loss, or wet strength and wet/dry strength variation

### 5.3. Process control

The Contractor shall implement process control measures in accordance with or exceeding the requirements in Austroads / AAPA Pavement work tips No. 15 *Asphalt Statistical Process Control*. Statistical process control shall include results for tests in Table 5.1

## 6. Delivery

Asphalt shall be transported to the point of delivery in vehicles complying with the following requirements:

- a. The inside of vehicle bodies shall be kept clean and coated with a thin film of an appropriate release agent to prevent asphalt sticking to the body of the vehicle. Care shall be taken to remove surplus release agent before loading asphalt into the vehicle.
- b. After loading with asphalt, the body of the vehicle shall be covered to prevent contamination and reduce the rate of cooling of the mix.
- c. Where the length of the haul or the weather is such that the temperature of the asphalt may drop below a suitable placing temperature, or where excessive local cooling of the mix may occur, the vehicles shall be suitably insulated.

## 7. Placing

### 7.1. General

Prior to tack coating and placing of asphalt, the surface shall be free of all deleterious material. Where required, the Contractor shall sweep clean the area on which asphalt is to be placed.

The Contractor shall prevent tack coat, binder, aggregate, asphalt or other material used on the work from entering, adhering or obstructing gratings, hydrants, valve boxes, inspection pit covers, kerbs and other road fixtures.

Handwork shall be minimised.

### 7.2. Tack coating

Tack coat shall be applied to the cleaned surface prior to placing asphalt.

Tack coat shall consist of bituminous emulsion complying with AS 1160, or proprietary equivalent as approved by the Principal. The type and breaking rate shall be suitable to the climatic and surface conditions of use such that it is fully broken, free of surface water and intact before the commencement of asphalt spreading.

In light traffic conditions as defined in Clause 2.2, tack coat shall be applied to provide a uniform application rate of residual binder > 0.15 L/m<sup>2</sup>.

For all other traffic conditions, the tack coating procedure shall be modified to provide a net residual bitumen content of 0.3 – 0.5 L/m<sup>2</sup> (total) depending on the surface texture of the substrate.

Tack coat shall be applied by spray bar fitted to a mechanical sprayer, or purpose built tack coat spray truck. Hand spraying shall be carried out only in those areas where it is impracticable to use a spray bar.

Bitumen emulsion application rates of more than 0.5 L/m<sup>2</sup> can be applied through a spray bar mounted directly on the asphalt paver, immediately ahead of the spreading of asphalt

Precautions shall be taken to protect kerbs, channels, adjoining structures, traffic and parked vehicles from tack coat spray.

Where asphalt is to be spread over clean, freshly placed asphalt or spray seal, or over a clean primed surface, the Contractor may propose, to the Superintendent, the omission of the tack coat.

### **7.3. Spreading**

Unless otherwise specified, self-propelled mechanical pavers shall be employed to place asphalt except for areas where the use of a paver is impracticable.

Asphalt shall be spread without tearing or segregation.

The Contractor shall conduct spreading operations to ensure that the paver speed matches the rate of supply so that the number of paving stops is minimised.

The paver shall not be left stationary for prolonged periods with the screed box in contact with either the previously placed asphalt or loose asphalt in front of the screed.

### **7.4. Ambient Conditions for Placing**

The surface on which the asphalt is to be placed shall be essentially dry and free from free-standing water. If the Contractor proposes to place SMA7 when the pavement surface temperature is below 10 °C., the process to compensate for rapid cooling of the material must be suitably addressed in the Quality System.

### **7.5. Layer Thickness**

The target thickness of the compacted layer shall be between 25 mm and 35 mm.

### **7.6. Level Control**

The method of paver level control shall be as specified in the Schedule of Job Details. If no method is specified in the Schedule of Job Details, the Contractor shall apply suitable automatic or manual screed level controls to achieve the standards specified in Clause 9.

### **7.7. Compaction**

Asphalt shall be uniformly compacted to the standards specified in Clause 8.5 as soon as the asphalt has cooled sufficiently to support the rollers without undue displacement. The minimum asphalt temperature at commencement of rolling shall be 140 °C. Compaction shall commence before the asphalt temperature drops. Compaction shall be achieved using steel wheeled rollers with a mass ≥7.0 t. A minimum compaction effort of four passes shall be applied in every location.

Pneumatic tyred rollers shall not be used.

The method of compaction shall avoid damage to aggregate or drawing of binder to the surface of stone mastic asphalt. Generally, no more than two vibratory passes using high frequency and low amplitude shall be applied.

### **7.8. Temperature before trafficking**

Surface temperature shall be below 65 °C before opening to traffic for mixes containing polymer modified binder and 50 °C for mixes containing unmodified bitumen.

### **7.9. Joints**

#### **7.9.1. General**

Joints shall be provided as follows:

- a. Longitudinally, if the width of the pavement is such that more than one paving run is necessary.
- b. Transversely, after the completion of a day's paving operations, or where a delay in paving operation allows asphalt to cool and adversely affect placing, and elsewhere if a break in a longitudinal run is required.

The location of joints shall be planned before work commences.

The number of joints shall be minimised by adopting good asphalt paving practices.

All joints shall be well constructed and comply with the compaction requirements specified in Clause 8.

### **7.9.2. Longitudinal Joints**

Longitudinal joints in the wearing course shall coincide with traffic lane lines unless otherwise specified or agreed. Longitudinal joints shall be offset from layer to layer by not less than 150 mm provided that no joint is placed directly below a trafficked wheel path.

Where asphalt is placed against the edge of a preceding lane that has not cooled below 80 °C it shall be considered a hot joint. Hot joints shall be constructed by leaving a 150mm strip of asphalt unrolled along the free edge until the adjoining lane is placed, and then compacting the unrolled strip simultaneously with the material in the adjoining lane.

Where asphalt is placed against the edge of a preceding lane that has cooled below 80 °C it shall be considered a cold joint. Asphalt placed against a cold edge should overlap the previous edge by 25 mm to 50 mm. The overlap should be pushed back using lutes, immediately after spreading, to form a slight ridge that is compacted with the steel wheel roller.

### **7.9.3. Transverse Joints**

Transverse joints shall be offset by not less than 1 m from layer to layer.

## **8. Finished pavement properties**

### **8.1. Lot size**

Compliance testing of asphalt shall be undertaken on a lot basis. A pavement lot shall be an essentially homogeneous and contiguous section of work completed within a 24 hour period of production, unless otherwise specified in the Schedule of Job Details

### **8.2. Level**

The level at the top of SMA7 surfacing shall not differ from the specified design level by more than 10 mm, except that where asphalt is placed against kerb and channel, the surface at the edge of the wearing course shall be flush with, or not more than 5 mm above, the lip of the channel, unless otherwise specified or shown on the Drawings.

### **8.3. Thickness**

The average total compacted thickness of the combined asphalt layers shall be not less than the specified thickness and not be greater than specified thickness + 10 mm. Where confirmation of asphalt thickness is required, it shall be determined by coring to a recognised random sampling plan, based on a minimum of 5 cores per lot.

### **8.4. Surface shape at joints**

No point on the finished surface shall deviate by more than 5 mm below a 3 m straightedge, measured between two points across a joint.

### **8.5. In situ air voids**

This clause shall only apply to SMA placed in layers >30 mm

Bulk density testing shall not be performed on lots of less than 30 tonnes.

The location of each in situ bulk density test shall be chosen by a method of random stratified sampling. A minimum of 6 bulk density tests shall be performed per lot. For core sample tests, the layer thickness is the mean thickness of the core samples and for nuclear gauge tests, the layer thickness is the nominal thickness. All core holes shall be repaired by an appropriate method.

Density testing shall be carried out as soon as practicable after completion of work. Cores shall be taken in accordance with AS/NZS 2891.1.2. For cores, the bulk density shall be determined in accordance with AS/NZS 2891.9.2. The bulk density from nuclear gauge tests shall be determined in accordance with AS/NZS 2891.14.2

Relative compaction is the percentage ratio of the in situ bulk density of the compacted asphalt and the reference density of the asphalt of a particular lot. The reference density shall be the mean of the five most recent maximum density measurements determined in accordance with AS/NZS 2891.7.1, or AS/NZS 2891.7.3 of the same mix, provided that:

- a. The tests have been completed within the previous 4 weeks.
- b. The binder content of samples tested is within  $\pm 0.3\%$  of the job mix binder content.
- c. There has been no change in the mix components or proportions.

The characteristic value of relative compaction is calculated as  $\text{Mean} - K \times S$  where,

Mean = The mean of the relative compaction results

S = The sample standard deviation of the relative compaction results

K = A factor that depends on the number of tests as shown in Table 9.1.

*Table 8-1: acceptance constant*

Number of Tests or Measurements	Acceptance Constant (K)
6	0.72
7	0.76
8	0.78
9	0.81
10	0.83

The work represented by a lot shall be assessed as the characteristic value of in situ voids where: Characteristic value of in situ air voids (%) =  $100 - \text{Characteristic relative compaction}$ .

The maximum characteristic value of in situ air voids shall not exceed 8.0%. The maximum characteristic value for air voids at joints shall not exceed 10.0%.

The density at the joints is not usually tested unless the Superintendent suspects the specified requirements have not been achieved. Where this occurs, the Superintendent may order tests to confirm compliance.

## 9. Measurement and payment

This clause shall only apply where not covered elsewhere in the contract for the work

### 9.1. General

Payment for tack coat shall be included in payment for asphalt.

Payment for asphalt shall be by mass for quantities determined in accordance with Clause 9.2 or 9.3 as appropriate.

Measurement for payment will include all works shown on the plans or as specified but will not include asphalt lost in transit, works not shown on the plans and variations in quantities due to variations in actual thickness exceeding the specified tolerances.

## **9.2. Measurement by mass**

Unless otherwise specified in the Schedule of Job Details, the quantity of asphalt shall be measured by mass (tonnes).

The quantity of asphalt shall be determined from docketts supplied by the Contractor and issued at a certified weighing system unless measurement by batch weights using certified scales is approved by the Superintendent.

Separate pay items shall be included in the Schedule of Rates for each nominal course thickness and each nominal size and type of asphalt specified.

## **9.3. Measurement by volume**

Where specified in the Schedule of Job Details, the quantity of asphalt shall be determined from measurement of area and thickness.

The area and thickness shall be determined from the dimensions on the plans or as specified for the work being measured.

The density of asphalt in a lot shall be taken as the mean of the in situ densities of the lot.

Separate pay items shall be included in the Schedule of Rates for each nominal course thickness and each nominal size and type of asphalt specified.

## **9.4. Non-complying materials**

In the event that the material supplied is not within the tolerances and standards defined for manufacture or placing of asphalt, the Principal may direct:

- The removal of non-complying material; or,
- That the reduced service life arising from the non-complying material is offset by reducing payment for the non-complying material by the method defined in the Schedule of Job Details; or,
- With the consent of the Contractor, any other remedial treatment that is expected to provide the required level of service, or,
- The Contractor to propose a “use as is” disposition where the Contractor can substantiate that the non-conformance will have no adverse impact on the life or performance of the pavement.