

DEVELOPMENT CONSTRUCTION SPECIFICATION

C245

ASPHALTIC CONCRETE

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Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
<i>HC245.1</i>	<i>Approved Contractors "Work Records"</i>	<i>06.1</i>	<i>A</i>	<i>KM</i>	<i>4/11/98</i>
HC245.2	Aggregate rejected if PAFV <48	08.5	M	KM	4/11/98
HC245.3	Compaction testing not required on layers less than 30mm	31.2....	A	KM	4/11/98

SPECIFICATION C245 ASPHALTIC CONCRETE

GENERAL

C245.01 SCOPE

1. The work to be executed under this Specification consists of the design, production and placing of asphalt including the supply of materials, sampling, testing and any other operations necessary to provide asphalt in accordance with the provisions of the Contract. The extent of the Contractor's work shall include:

Extent of Work

- (a) Sampling and testing of materials and the design of asphalt mixes required by the Contract.
- (b) Manufacture of the production mix.
- (c) Provision of a testing laboratory.
- (d) Preparation of the surface on which asphalt is to be placed.
- (e) Transport of asphalt.
- (f) Laying and compaction of asphalt.
- (g) Sampling and testing.

The asphalt mixes shall be dense graded.

2. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements.

Quality

C245.02 REFERENCE DOCUMENTS

1. Documents referenced in this specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

*Documents
Standards Test
Methods*

(a) Council Specifications

C201 - Control of Traffic

(b) Australian Standards

AS 1141.11 - Particle size distribution by dry sieving.
 AS 1141.14 - Particle shape, by proportional calliper.
 AS 1141.18 - Crushed particles of coarse aggregates.
 AS 1141.22 - Wet/dry strength variation.
 AS 1141.41 - Laboratory polishing of aggregate using the horizontal bed machine.
 AS 1141.50 - Resistance to stripping of cover aggregates from binders.
 AS 1160 - Bitumen emulsions for construction and maintenance of pavements.
 AS 1507 - Road tars for pavements.
 AS 2008 - Residual bitumen for pavements.
 AS 2150 - Hot mix asphalt.

- AS 2341.2 - Determination of dynamic viscosity by flow through a capillary tube.
- AS 2341.5 - Determination of apparent viscosity by 'Shell' sliding plate micro-viscometer.
- AS 2341.7 - Determination of density using a density bottle.
- AS 2341.8 - Determination of matter insoluble in toluene.
- AS 2341.11 - Determination of ductility.
- AS 2341.12 - Determination of penetration.
- AS 2341.14 - Determination of flashpoint of residual bitumen.
- AS 2341.18 - Determination of softening point (ring and ball method).
- AS 2357 - Mineral fillers for asphalt.
- AS 2758.5 - Asphalt aggregates.

(c) RTA Standard Test Methods

- T103 - Pretreatment of Road Materials by Artificial Weathering.
- T230 - Resistance of Stripping of Cover Aggregates and Binders.
- T239 - Fractured Faces of Coarse Aggregate.
- T501 - Freedom from Foaming of Bituminous Materials
- T600 - Methods of Sampling Materials used in Bituminous Sealing Works
- T601 - Compaction of Test Specimens of Dense Graded Bituminous Mixtures - Modified Hubbard-Field Procedure.
- T603 - Stability of Dense Graded Bituminous Mixtures - Modified Hubbard-Field Procedure
- T606 - Bulk Density of Compacted Dense Graded Bituminous Mixtures
- T607 - Bitumen Content and Aggregate Grading of Bituminous Mixtures - Reflux Method.
- T731 - Moisture Content of Scrap Rubber
- T732 - Metallic Iron Content of Scrap Rubber
- T733 - Bulk Density of Scrap Rubber
- T734 - Foaming Caused by Scrap Rubber Addition to Bitumen
- T735 - Laboratory Preparation of Rubber Bitumen Mixes.
- T736 - Flow Test for Rubber Bitumen Mixes
- T739 - Torsional Recovery of Polymer Modified Bitumen
- T741 - Elastic Recovery of Polymer Modified Bitumens (ARRB Elastometer)
- T1180 - Resilience Test for Hot Poured Elastomeric Joint Sealants.

(d) ASTM Test Methods

- D5 - Penetration of bituminous materials.

C245.03 PLANT

1. The Contractor shall provide all the plant and equipment necessary for carrying out the work in accordance with this Specification.

Contractor's Responsibility

2. All plant and equipment used on the work shall be kept in good operating condition. The Contractor shall remove from the work any plant or equipment which the Superintendent considers to be unsuitable, not fully operational, or not in a satisfactory condition for carrying out work in accordance with this Specification.

Plant to be Suitable

C245.04 PROTECTION OF SERVICES AND ROAD FIXTURES

1. The Contractor shall take all necessary precautions to prevent asphalt or other material used on the work from entering or adhering to gratings, hydrants or valve boxes, manhole covers, bridge or culvert decks and other road fixtures. Immediately after the

Contractor's Responsibility

asphalt has been spread the Contractor shall clean off or remove any such material as directed by the Superintendent and leave the services and road fixtures in a condition satisfactory to the Superintendent.

C245.05 PROTECTION OF WORK

- 1. The Contractor shall provide for traffic in accordance with the requirements of the Specification for CONTROL OF TRAFFIC while undertaking the work. **Provision for Traffic**
- 2. The Contractor shall take all necessary steps to avoid or minimise delays and inconvenience to road users during the course of the work. **Delays**

C245.06 WORK RECORDS

- 1. Particulars of the work performed shall be recorded by the Contractor on the Asphalt Work Record attached as Annexure C245A or approved contractors equivalent. The Contractor shall complete the Asphalt Work Record, which shall be countersigned by the Superintendent each day as a true record of the work performed. A copy shall be supplied to the Superintendent. **Asphalt Work Record**
- 2. Delivery docket stating the mass of each truck load of asphalt shall be attached to the Asphalt Work Record. **Delivery Dockets**

MATERIALS

C245.07 GENERAL

- 1. Unless otherwise directed by the Superintendent or separately stated in this Specification, materials or mix ingredients shall be sampled in accordance with Test Method T600. **Sampling**

C245.08 AGGREGATES

- 1. Aggregates shall be of uniform quality and grading. Aggregates complying with the requirements of this Clause when combined with the mineral filler shall be capable of achieving the asphalt properties required by this Specification. **Uniformity**

(a) Coarse Aggregate

- 1. Coarse aggregate shall comply with AS 2758.5 and comprises all mineral matter having a nominal size of not less than 5mm. Coarse aggregate shall consist of clean, dry, hard, tough and sound crushed rock, metallurgical slag or gravel, be of uniform quality and be free from dust, clay, dirt or other matter deleterious to asphalt. **Quality**
- 2. The grading of the coarse aggregate used in the work shall be determined in accordance with AS 1141.11. **Grading**
- 3. When submitting details of the nominated mix the Contractor shall submit to the Superintendent NATA Certified Laboratory Test Reports on the quality and grading of the coarse aggregate proposed to be used. The grading shall be known as the "Proposed Grading". **NATA Reports**
- 4. If the Contractor proposes to blend two or more coarse aggregates to provide the Proposed Grading then Test Reports for each constituent material shall be submitted separately and the Superintendent advised of the proportions in which the various sizes and constituents are to be combined. The coarse aggregate from each source and the combined aggregate shall comply with the following requirements: **Test Requirements**
 - (i) Wet Strength - AS 1141.22.

Shall be not less than 100 kN for any fraction.

(ii) Wet/Dry Strength Variation - AS 1141.22

Shall not exceed 35 per cent for any fraction or constituent.

(iii) Particle Shape - AS 1141.14

The proportion of misshapen particles in the fraction retained on the 9.50 mm AS sieve shall not exceed 35 per cent using a caliper ratio of 2:1 and shall not exceed 10 per cent using a caliper ratio of 3:1.

(iv) Fractured (Crushed) Faces of Coarse Aggregate - AS 1141.18

Aggregate which is retained on a 6.70 mm AS sieve shall consist of at least 75 per cent by mass of particles with at least two fractured faces and when used in the wearing course shall have at least 90 per cent by mass of particles with at least one fractured face. The area of each fractured face shall be a significant proportion of the total surface area of the particle.

(v) Resistance to Stripping - AS 1141.50

Stripping of aggregates treated by the addition of a suitable adhesion agent to the binder shall not exceed 10 per cent.

5. When tested in accordance with AS 1141.11 aggregate shall be rejected if the Polishing Aggregate Friction Value (PAFV) for the aggregate is less than 48. Use of the aggregate with a lesser value shall be subject to the Superintendent's approval.

Polishing Value

6. Test samples may be pretreated by procedures described in Test Method T103 before commencement of the tests referred to in Clause C245.08(a).

Pretreatment of Samples

(b) Fine Aggregate

1. Fine aggregate comprises all mineral matter (other than filler) passing the 4.75 mm AS sieve. It shall consist of clean, hard, tough and sound grains, free of coatings or loose particles of clay, silt or other matter deleterious to asphalt. The fine aggregate shall consist of natural sand or a mixture of natural sand and material derived from the crushing of sound stone or gravel.

Soundness

2. When submitting details of the nominated mix the Contractor shall submit to the Superintendent a NATA Certified Laboratory Test Report on the quality and grading of the fine aggregate proposed to be used. The grading shall be known as the "Proposed Grading".

NATA Reports

3. If the Contractor proposes to blend two or more fine aggregates to provide the Proposed Grading then Test Reports for each constituent material shall be submitted separately and the Superintendent advised of the proportions in which the various sizes and constituents are to be combined. The fine aggregate from each source and the combined aggregate shall comply with the requirements of Clause C245.08(a).

Test Requirements

(c) Special Aggregates

1. Where special aggregates are required in an asphalt, the aggregates shall be from a source approved by the Superintendent.

Approved Source

C245.09 MINERAL FILLER

1. Mineral filler shall consist of hydrated lime, fly ash, portland cement, flue dust from the manufacture of portland cement or other material approved by the Superintendent.

Constituents

2. The mineral filler shall comply in all other respects with the requirements of AS 2357. The voids in the dry compacted filler shall be not less than 40 per cent. **Voids**

C245.10 BINDER

1. Unless otherwise directed by the Superintendent, the binder supplied and used in the works shall be bitumen complying with Clause C245.10(a). **Bitumen Quality**

2. Where other binders are required they shall comply with the requirements of Clause C245.10(b).

(a) Bitumen

Qualities

1. The bitumen shall be obtained from processing the residual from the refining of naturally occurring crude petroleum. The residual bitumen shall be homogeneous, contain no inorganic mineral matter other than that naturally occurring and shall be tested and comply with the requirements as shown in Table C245.1.

2. The bitumen used in the works shall be as specified in Annexure C245B. **Specification**

Requirements					
Property	Class 170		Class 320		Test Method
	Min	Max	Min	Max	
Viscosity at 60° (Pa.s)	140	200	260	380	AS 2341.2
Viscosity at 135° (Pa.s)	0.25	0.45	0.40	0.65	AS 2008
Penetration at 15°C (mm) (200g, 60s)	8	-	6	-	AS 2341.12
Flashpoint (°C)	250	-	250	-	AS 2341.14
Matter insoluble in Toluene (% by mass)	-	1.0	-	1.0	AS 2341.8
Effect of heat and air (Rolling thin film oven test)					AS 2008
(a) Ductility of residue at 15°C (mm)	200	-	-	-	AS 2341.11
(b) Viscosity of residue at 60°C as percentage of original	-	300	-	300	AS 2341.2
(c) Apparent viscosity of residue at 25°C and a shear strain rate of 1×10^{-2} /s as percentage of original (alternative to (b) above)	-	300	-	-	AS 2008 AS 2341.5
The film oven test (1.6mm)					AS 2008
(a) Ductility of residue at 25°C (mm)	600	-	-	-	AS 2341.11
Density at 15°C (kg/L)	1.00	-	1.01	-	AS 2341.7
Water Content and Foaming at 175°C		Nil		Nil	T501

Table C245.1 - Requirements of Residual Bitumen

(b) Other Binders

1. These binders shall be incorporated in the works in accordance with the requirements of this Specification unless otherwise directed by the Superintendent.

Incorporated in Works

2. Where other binders are produced by the inclusion of an additive at the time of manufacture of the asphalt, the mixing time required by Clause C245.18(c) shall be increased by 25 per cent unless otherwise approved by the Superintendent.

Mixing Tim

(i) Scrap Rubber Bitumen

1. Scrap Rubber Bitumen shall comprise Class 170 bitumen with scrap rubber either added at the time of mixing or preblended in the proportions as directed by the Superintendent.

Scrap Rubber

2. When Scrap Rubber Bitumen is preblended, the bitumen shall be heated to between 190°C and 200°C and the scrap rubber added in the required proportion. The mixture shall be maintained at between 190°C and 200°C and mixed continuously for one hour to allow for digestion of the scrap rubber in the bitumen.

Heating Temperature

3. A 20 per cent scrap rubber bitumen mixture prepared in accordance with Test Method T735 shall have a minimum recovery of 20 per cent when tested in accordance with Test Method T1180.

Recovery Test

4. Scrap rubber bitumen which has either separated or increased in viscosity to the extent that it is difficult to pump shall be rejected. Scrap rubber shall comply with the requirements of Clause C245.13.

Viscosity

(ii) Modified Bitumens

1. Polymer modified bitumens containing Styrene Butadiene Styrene (SBS) and Ethylene Vinyl Acetate (EVA) modifiers shall comply with the limits shown in Tables C245.2 and C245.3 as appropriate and the requirements set out below. The polymer modified bitumens shall be supplied in the grades shown in Annexure C245.B.

Polymer Modified

2. The binder shall be pumped and stored at the manufacturer's recommended temperatures unless temperatures are otherwise specified by the Superintendent.

Storage Temperature

3. For polymer modified bitumens all blending of materials (with the exception of bitumen adhesion agent) shall be carried out in the manufacturer's premises before dispatch. Materials shall not be blended in a road tanker or sprayer. The polymer modifiers shall be compatible with bitumen complying with AS 2008.

Blending

4. Polymer modifiers may be supplied as powder, pellets or prills provided that, when mixed with bitumen, the resultant modified bitumen complies with Grades 60 or DX of this Specification. For both testing compliance and field use, the required amount of modifier shall be advised by the Contractor.

Form

Contractor's Responsibility

Test	Grade 4*	Grade 5*	Grade 6*	Grade 60	Test Method
Elastic Recovery at 60°C (%)	-	-	85 min	90 min	T741
Viscosity on ER at 60°C (Pa.s)	-	-	5000 min	6000 min	T741
Torsional Recovery at 25°C (%)	-	-	60 min	60 min	T739
Flow at 60°C (mm)	-	-	10 max	1 max	T736
Viscosity at 135°C (Pa.s)	-	-	3 max	5 max	AS 2008
Flash Point (°C)	-	-	250 min	250 min	As 2341.14
Softening Point (°C)	-	-	75 min	85 min	AS 2341.18
Penetration at 25°C (mm/10) (100g. 5 s)	-	-	75 min	50 min	ASTM D5
Other polymers and Mineral Matter	-	-	0.5 max unless disclosed	0.5 max unless disclosed	

* Not applicable to this Specification

NOTE: For the purpose of assessing compliance with this Table samples shall be heated to 135°C without high shear mixing and immediately cast into test moulds.

Table C245.2 - Specified Properties for SBS Modified Bitumens

Test	Grade A	Grade B	Grade BX	Grade C	Grade DX	Test Method
Elastic Recovery at 45°C (%) on heat up	80 min	85 min	40 min	75 min	35 min	T741
Viscosity by Elastomer at 60°C (Pa.s)	2500 min	600 min	2500 min	600 min	600 min	T741
Torsional Recovery at 25°C (%)	40 min	45 min	16 min	25 min	15 min	T739
Softening Point (°C)	62 min	59 min	64 min	57 min	54 min	AS 2341.18
Viscosity at 135°C (Pa.s)	11 max	5.5 max	7 max	2.5 max 0.625 min	1.25 max	AS 2008
Penetration at 25°C (mm/10) (100g. 5 s) after overnight cure	30 min	40 min	45 min	40 min	45 min	ASTM D5
Other polymers and Mineral Matter (%)	0.5 max unless disclosed	0.5 max unless disclosed	0.5 max unless disclosed	0.5 max unless disclosed	0.5 max unless disclosed	

Table C245.3 - Specified Properties for EVA Modified Bitumens

C245.11 BITUMEN ADHESION AGENT

1. A bitumen adhesion agent shall be added to the binder. Details of the proposed bitumen adhesion agent shall be submitted for the Superintendent's approval in accordance with Clause C245.15. The bitumen adhesion agent shall be used in a manner compatible with the manufacturer's recommendations. When tested in accordance with Test Method T230, the bitumen adhesion agent shall comply with the requirement in Clause C245.08(a) at a concentration within the range 0.5 per cent to 1.0 per cent by mass of the binder.

Use and Test Requirements

C245.12 BITUMEN EMULSION

1. The bitumen emulsion shall be cationic rapid setting C170 bitumen emulsion complying with the requirements of AS 1160.

Type

C245.13 SCRAP RUBBER

1. Scrap rubber may consist of either natural or synthetic rubber or a mixture of both. The scrap rubber shall be milled to comply with the grading limits shown in Table C245.4.

Composition

Sieve Size (mm)	Per Cent Passing by Mass
1.18	100
0.600	60 min.
0.300	20 max.

Table C245.4 - Required Grading for Scrap Rubber

2. Scrap rubber particles shall be granular in shape with no more than 10 per cent of the particles having a length greater than 7.5 mm and shall comply with the limits shown in Table C245.5.

Particle Shape

Property	Requirements	Test Method
Foaming (%)	50 max.	T734
Moisture Content (%)	1.0 max.	T731
Iron Content (%)	Nil	T732
Bulk Density (kg/m ³)	400 max.	T733

Table C245.5 - Required Properties for Scrap Rubber

3. Scrap rubber shall not contain any metal fragments or other foreign material.

Foreign Matter

4. Cryogenically produced scrap rubber shall not be acceptable unless the cryogenic size reduction is followed by grinding.

C245.14 GEOTEXTILE

1. Geotextile may be required as an underlay for the drainage layer of asphalt or for other applications as an underlay for wearing or intermediate courses.

Underlay

2. The geotextile used as an underlay for drainage shall be a needle punched polyester felt with a mass per square metre of at least 340 grams. **Mass**

3. For other applications, geotextile proposed by the Contractor may be approved provided the geotextile is considered by the Superintendent appropriate to the application and is used in accordance with the manufacturer's specification. **Other Applications**

ASPHALT MIX DESIGN

C245.15 NOMINATED MIX

1. The Contractor shall design each asphalt mix, henceforth called the 'nominated mix', within the limits shown in Table C245.6 unless otherwise approved by the Superintendent. **Design**

2. Each asphalt mix shall include a bitumen adhesion agent in the binder in accordance with Clause C245.11. **Adhesion Agent**

3. When asphalt containing special aggregate is specified, the special aggregate shall comprise all coarse and fine aggregates of 5 mm nominal size and greater. **Special Aggregate**

4. The Contractor shall provide a Certificate from a laboratory with appropriate NATA registration stating that each nominated mix and its constituents meet the requirements of this Specification. All relevant test results shall accompany the Certificate. All phases of any particular test must be performed at one laboratory. The Certificate shall confirm that the required testing has been carried out in the twelve month period before the date of submission to the Superintendent. **NATA Laboratory Tests**

5. Details of the nominated mix shall be **submitted to the Superintendent** at least twenty one days before the placing of asphalt. The nominated mix information shall include combined aggregate grading and binder content, proportions of constituent materials used (including adhesion agent), gradings of aggregate and filler, and type and sources of aggregates, filler, binder and adhesion agent. **Hold Point Submit Details**

6. If any revision is necessary, then the costs associated with revision of the nominated mix and testing of the revised nominated mix in accordance with Clause C245.16 shall be borne by the Contractor. **Revised Mix Contractor's Cost**

Property	Requirements								
	Classified Roads						Unclassified Roads**		
Aggregate passing AS Sieve (% by mass)	Nominal Size of Asphalt						Type A	Type B	Type R
	5mm (AC5)	10mm (AC10)	14mm (AC14)	20mm (AC20)	28mm (AC28)	40mm (AC40)			
53.0mm						100			
37.5mm					100	85-98			
26.5mm				100	85-98				
19.0mm			100	90-98					
13.2mm		100	85-98	70-90	57-75	55-75	100	100	
9.50mm		90-98					95-100	90-100	
6.70mm	100	70-90	60-75	40-70	45-60	40-55	80-95	65-85	100
4.75mm	85-98						65-80	60-80	85-100
2.36mm	55-75	40-60	35-47	25-55	25-37	25-40	45-60	55-75	55-80
1.18mm							35-50	45-65	38-60
0.600mm	26-43	23-38	15-30	15-27	15-27	14-24	25-40	30-50	25-43
0.300mm							15-25	20-30	15-30
0.150mm							7-15	10-18	8-20
0.075mm	4.5-11	4.5-10	3-7	3-7	3-6	3-6	3-10	5-11	5-12
Binder content (% by mass of total asphalt mix)*	5.6-6.8	5.1-6.4	4.8-6.2	4.6-6.1	4.2-5.8	3.5-5.5	6.0-7.0	5.8-6.8	6.5-7.5
Stability of the compacted asphalt mix (kN)									
Test Methods T601 and T603 (Modified Hubbard Field Procedure)	22-34	22-34	22-34	22-34	22-34	22-34			
Min as per Marshall Method (at 35 blows)							4.0	4.0	3.5
Voids in compacted asphalt mix (% of voids in volume of mix)									
Test Methods T601, AS1507 and T606 (modified Hubbard Field Procedures)	4-7	4-7	4-7	4-7	4-7	4-7			
As per Marshall Method (at 35 blows)							3-5	3-5	3-5
Voids filled by binder (% voids in the total mineral aggregate to be filled by binder)	65-80	65-80	65-80	65-80	65-80	65-80			
Test Method T606									
Flow (mm) of compacted mix (35 blow Marshall)							2-5	2-5	2-5

NOTE: * Some increase beyond these ranges of binder content may be permitted for aggregates having unusually high absorption characteristics.

** Type A and B are suitable for residential streets, car parks and commercial driveways carrying light traffic. Type R is suitable for footpaths, cycleways and recreation areas.

Table C245.6
Limits for Design of Nominated Mix - Dense Graded Asphalt (AC)

C245.16 APPROVED MIX

1. When a nominated mix has been **approved by the Superintendent** it shall be known as the 'approved mix'. Work shall not commence until an asphalt mix has been approved.

**Approval
Hold Point**

2. The Contractor shall not make any changes to the approved mix, its method of production or constituent materials without the prior written approval of the Superintendent. If any such change is proposed, then the Contractor shall provide details of the nominated mix and materials, in accordance with Clause C245.15.

**Changes to
Approved Mix**

3. If the Contractor's nominated mix has received prior approval under a separate contract with the Principal within twelve months before the proposed date of initial delivery under this contract, then provided that:

Prior Approval

- (a) the Contractor produces documentary evidence and full details of the previously approved mix supplied under a specification which required the same standard of materials and product as this Specification;
- (b) the constituent materials and their quality remain unchanged from that previously approved; and
- (c) the in-service performance of the asphalt incorporating the nominated mix has proved acceptable to the Principal;

the Superintendent may approve the nominated mix without requiring the prior-testing of samples by the Contractor at a NATA registered laboratory, but may require samples to be tested in accordance with Clause 241.15 at any time during the course of the contract.

4. Notwithstanding any approval given by the Superintendent to a proposed asphalt mix, the Contractor shall be responsible for producing asphalt which satisfies all requirements of the Specification.

**Contractor's
Responsibility**

C245.17 REQUIREMENTS OF PRODUCTION MIX

1. Asphalt produced in the plant and delivered to the site shall be known as the 'production mix'.

(a) Dense Graded Asphalt

Dense graded asphalt shall comply with the requirements shown in Table C245.7 unless otherwise approved by the Superintendent.

Production Mix Properties	Allowable Variations from Approved Mix *	
Nominated Mix Type (see Table C245.6)	AC5, AC10, AC14, AC20, AC28, AC40	A, B, R
Grading - Test Method T607 Passing 4.75mm AS sieve and larger Passing 2.36mm and 1.18mm Passing 0.600mm and 0.300mm Passing 0.150mm Passing 0.075mm Binder Content - Test Method T607 Voids in compacted mix - Test Methods T601, AS1507 and T606 Voids in compacted mix - Marshall method (at 35 blows) Voids filled by binder - Test Method T606 Flow of compacted mix - (35 blow Marshall)	 $\pm 7\%$ $\pm 5\%$ $\pm 4\%$ $\pm 2.5\%$ $\pm 1.5\%$ $\pm 0.3\%$ 4 - 7% - 65 - 80% -	 $\pm 7\%$ $\pm 5\%$ $\pm 4\%$ $\pm 2.5\%$ $\pm 1.5\%$ $\pm 0.3\%$ - 3 - 5% - 2 - 5mm

* Notwithstanding, these allowable variations shall not fall outside the limits for design of nominal mix as shown in Table C245.6.

**Table C245.7
Dense Graded Asphalt - Requirements for Production Mix**

PRODUCTION

C245.18 MIXING PROCEDURE

(a) Plant

1. Mixing shall be undertaken in an approved batch pugmill, continuous pugmill or drum mixing plant, capable of uniformly mixing coarse and fine aggregate, filler, and binder to meet the requirements specified in this Specification at all times.

Characteristics

(b) Temperature

1. Plant temperatures shall be maintained in a range sufficient to ensure a homogeneous asphalt without causing deleterious effects to the binder through overheating. Temperatures shall be in the ranges shown in Table C245.8. For asphalt made with other binders complying with Clause C245.10(b), the temperatures shall be in accordance with manufacturer's recommendation.

Temperatures

2. In special cases, the Superintendent may permit a lower temperature for manufacture, but in no circumstances shall the temperature of the asphalt at the time of laying be less than the minimum value specified in Clause C245.26(c) for the appropriate road surface temperature and layer thickness.

Limits

3. The asphalt temperature shall be measured as the asphalt leaves the pugmill, drum and/or the hot storage bin(s).

Measurement

4. The asphalt shall have a moisture content not greater than 0.5 per cent by mass when tested in accordance with AS 2150.

Moisture Content

DENSE GRADED ASPHALT			
Type of Binder	Class 170	Class 320	SBS Modified Class 170
Min Binder Temp	140°C	140°C	180°C
Max Binder Temp	165°C	170°C	190°C
Min Asphalt Temp	140°C	140°C	180°C
Max Asphalt Temp	165°C	170°C	190°C

**Table C245.8
Temperatures for Manufacture of the Asphalt**

(c) Mixing Time

1. Mixing time shall be such that all particles of aggregate are uniformly coated with binder.

Uniform Coating

(d) Storage of Asphalt

1. Asphalt may be stored in an insulated storage bin prior to delivery. Asphalt which has been stored for more than twenty four hours or is below the minimum temperature specified in Clause C245.26(c) shall not be used.

Limitations

(e) Contractor's Laboratory

1. The Contractor shall maintain and operate a testing laboratory at or near the mixing plant to control the quality of the asphalt produced.

Quality Control

C245.19 SAMPLING AND TESTING OF PRODUCTION MIX

(a) Responsibility for Sampling

1. The Contractor shall be responsible for taking samples and shall supply all facilities, equipment and labour for that purpose. The samples shall be taken by the Contractor. The costs associated with taking samples of production mix shall be borne by the Contractor.

Contractor's Responsibility and Costs

(b) Frequency of Sampling

1. For the purpose of testing production mix, samples shall be taken at the rate of one sample for each 50 tonnes of asphalt or part thereof. Unless otherwise directed by the Superintendent the sample shall be taken at the point of delivery from trucks spaced to represent each 50 tonnes of asphalt or part thereof.

Sampling Rate

(c) Method of Sampling

1. Each sample shall comprise two increments taken from separate sites distributed over the area of the truck load. Each increment shall represent half the truck load. The sampling point shall be at least 500 mm from any side of the truck body. Surface material shall be removed for a depth of approximately 100 mm and the sample taken from the exposed surface by a deep-sided sampling scoop of such a shape as to prevent the inclusion of material falling in from the sides.

Sampling Points

2. A sample of at least 5 kilograms shall be taken.

Size of Sample

(d) Containers

1. Each sample or sample portion as appropriate shall be placed in an airtight metal container, suitably labelled for identification and delivered to the Contractor's nominated NATA registered Laboratory. The label shall be affixed to the body and the lid of the metal container. A suitable label is as follows:

- Date
- Contract No
- Type of Material
- Quantity delivered
- Sample No.
- Supplier
- Delivery Docket No.
- Delivery Vehicle Regd. No.
- Location and Lot Number

(e) Testing

1. Testing required by this Clause shall be arranged by the Contractor at a NATA registered laboratory.

Registered Laboratory

2. The cost of such testing shall be borne by the Contractor.

Contractor's Costs

(f) Inspection of Mixing Plant

1. The Superintendent shall have access at all times to all parts of the mixing plant for checking masses or proportions, the nature of materials, temperature measurements or the

Access

general operation of the plant and may direct action to be taken to correct any deficiencies. The Superintendent shall advise the asphalt supplier or the supplier's representative of the inspection on or before arrival at the plant.

TRANSPORT

C245.20 GENERAL

- | | |
|--|-----------------------------|
| 1. The bodies of haulage trucks shall be kept clean and coated with a thin film of an approved release agent to prevent asphalt sticking to the body of the truck. Any surplus release agent shall be removed before loading. | <i>Release Agent</i> |
| 2. During transport asphalt shall be covered with a canvas or other suitable cover which is held down securely. | <i>Cover of Load</i> |
| 3. When mix is to be transported over long distances, or in cold conditions, the mix shall be covered with a heavy duty canvas or similar waterproof cover which shall overlap the sides of the truck body by at least 250 mm and shall be tied down securely. The bodies of all trucks shall be suitably insulated. | <i>Long Distance</i> |
| 4. Delivery of the asphalt shall be at a uniform rate within the capacity of the spreading and compacting equipment. | <i>Delivery Rate</i> |
| 5. Unless other means of measurement are approved by the Superintendent, the mass of all truck-loads of asphalt shall be measured on an accredited weighbridge. | <i>Weighbridge</i> |

PLACING

C245.21 GENERAL

- | | |
|--|----------------------------------|
| 1. The type and size of asphalt and the surface levels and thickness for each layer of asphalt shall be as shown in the Drawings, or as specified by the Superintendent. | <i>Layers</i> |
| 2. Placing of asphalt shall not be permitted when the surface of the road is wet or while rain appears imminent, or when cold winds chill the asphalt to such an extent that, in the opinion of the Superintendent, spreading and compaction will be adversely affected. | <i>Weather Conditions</i> |

C245.22 PREPARATION OF PAVEMENT

(a) Cleaning of Surface

- | | |
|--|---------------------------|
| 1. The existing surface shall be dry, clean and free from any loose stones, dirt and foreign matter. The surface shall be swept beyond the edge of the proposed asphalt layer by at least 300 mm. Any foreign matter adhering to the pavement and not swept off shall be removed by other means. Any areas significantly affected by oil contamination shall be cleaned to the satisfaction of the Superintendent. | <i>Requirement</i> |
|--|---------------------------|

(b) Rectification of Pavement Surface

- | | |
|---|---|
| 1. The Contractor shall repair any damage to the existing pavement surface caused by the Contractor's cleaning activities. Affected areas designated by the Superintendent shall be removed and reinstated with fresh asphalt compacted to the degree specified in Clause C245.31 and the cost of repairing such damage shall be borne by the Contractor. | <i>Contractor's Responsibility</i> |
| | <i>Contractor's Cost</i> |

2. The Superintendent may direct that specific surface depressions of greater depth than twice the permissible tolerance (specified in Clause C245.32(d)) of the layer to be placed be tack coated and squared where necessary, filled with fresh asphalt of appropriate nominal size in accordance with Table C245.12 and compacted before the main course is placed. The asphalt in these patches shall be compacted in accordance with Clause C245.31 to the general level of the existing surface.

Correction Courses

3. No placing of asphalt shall be undertaken until the pavement has been prepared to the **satisfaction of the Superintendent.**

Asphalt Placement Hold Point

C245.23 LAYING OF GEOTEXTILES

(a) Geotextile for Drainage Layer

1. Where a geotextile as specified in Clause C245.14 is to be applied, the surface shall be prepared in accordance with Clause C245.22.

Surface Preparation

2. The geotextile shall be neatly cut to fit and at all joins of the geotextile it shall be lapped a minimum of 300 mm with the overlap in the direction of paving. Joins shall be kept to a minimum.

Cutting and Joining

3. The geotextile shall be pinned by means of 'U' shaped wire staples of suitable leg length and a wire diameter of 3mm minimum or other rapid fastening system approved by the Superintendent.

Staples

4. The geotextile shall be pinned through each join and the centre of any length at intervals not exceeding 2 m and at all ends and edges. The pinning shall prevent movement of the geotextile before and during the paving operation.

Pinning

Locations

C245.24 PAVEMENT DRAIN

1. Where a pavement drain or an edge drain is specified or shown on the Drawings, the sequence of operations will be directed by the Superintendent.

C245.25 TACK COAT

1. Unless otherwise directed by the Superintendent, the whole of the area to be sheeted with asphalt shall be tack coated with a light and even coat of bitumen emulsion which shall meet the requirements of Clause C245.12. Where multiple courses are to be applied a tack coat shall be used between each course unless directed otherwise by the Superintendent.

2. The application rate of undiluted bitumen emulsion shall be neither less than 0.15 litres per square metre nor more than 0.50 litres per square metre.

Application Rate

3. Where a geotextile is used as specified in Clause C245.23(a) no tack coat shall be applied.

Excluded with Geotextile

4. The bitumen emulsion shall be applied by a mechanical sprayer with spray bar. Where the areas to be sprayed are small, irregular or inaccessible to mechanical sprayers, such areas shall be tack coated by hand spraying or brushing.

Mechanical Sprayer

5. The bitumen emulsion may be warmed or diluted with water to facilitate spraying of a light uniform application. Adequate time shall be allowed for the emulsion to break before asphalt is laid. Overapplication of tack coat, due to surface depressions, shall be removed or dispersed by brushing.

Application

- | | | |
|-------------------------------|---|---------------------------------------|
| 6. | All contact surfaces of kerbs and other structures and all cold joints shall be coated with a thin uniform application of tack coat. | Contact Surfaces |
| 7. | Care shall be taken to ensure that bitumen emulsion is not sprayed on, or allowed to coat any services or exposed fixtures including concrete kerbs, guardrail or bridge handrails. Any such spray or coating shall be removed in accordance with Clause C245.04. | Surface Protection |
| 8. | When trucks or other vehicles are likely to move from tack coated areas onto adjacent finished surfaces, the Superintendent may require that the finished surfaces be blinded with limestone dust or similar material to protect them from carryover of bituminous material. | Truck Movements |
| 9. | Proprietary tack coats may be approved by the Superintendent in special circumstances. | Proprietary Tack Coats |
|
 | | |
| C245.26 LAYING | | |
| (a) Paver | | |
| 1. | The paver(s) shall have a minimum spreading capacity of 50 tonnes of asphalt per hour and capable of spreading a width of at least 3.7m to the requirements of this Specification. It shall have automatic screed control operated from joint matching shoe, fixed line, travelling straight edge or levelling beam and an automatic crossfall control. | |
| (b) Laying Operations | | |
| 1. | The work shall be so arranged as to keep the number of joints, both longitudinal and transverse to a minimum. Seven days before commencing to lay asphalt the Contractor shall submit to the Superintendent for approval details of proposed laying widths and joint locations for each layer. | Hold Point Submit Joint Layout |
| 2. | The paver shall operate at a uniform speed and the delivery of asphalt shall match the output of the paver such that continuous laying of asphalt is achieved. | Continuous Laying |
| 3. | When laying asphalt in echelon the distance between pavers shall be such that the temperature of the asphalt at the edge of the asphalt laid by the advance paver is not less than 80°C by the time the following paver matches the longitudinal joint. | Laying in Echelon |
| 4. | In the event of faulty operation of the paver causing irregularities in the spread asphalt, work shall cease until the fault is rectified. | Irregularities in Laying |
| 5. | Unless otherwise approved by the Superintendent, asphalt shall not be spread by hand behind the paver. Workers shall not stand or walk on the hot surface until compaction has been completed except where necessary for correction of the surface. | Worker Control |
| 6. | The Superintendent may approve spreading asphalt by hand for minor correction of the existing surface and in areas inaccessible to mechanical pavers. Asphalt so placed, shall be spread so as to produce a smooth even surface with uniform density to the correct level. | Hand Spreading |
| (c) Laying Temperature | | |
| 1. | For asphalts made with Class 170 or 320 bitumen the minimum asphalt temperatures at the time of discharge into the paver shall be as shown in Table C245.9. | Limits |
| 2. | For asphalt made with other binders complying with Clause C245.10(b), the minimum asphalt temperature for laying shall be as directed by the Superintendent. | Other Binders |

3. The Superintendent may allow asphalt to be laid outside the specified limits for wind velocities if the Contractor supplies at least an additional roller above the minimum number of rollers specified in Clause C245.28 and can demonstrate that the level of compaction specified in Clause C245.31 can be achieved.

Outside Specified Wind Velocities

4. The Superintendent may reject that part of any truck load which contains lumps of cooled asphalt which are liable to affect the quality of the finished surface.

Cooled Asphalt in Truck

5. The laying temperature shall be measured in the truck just prior to discharging into the paver hopper. A suitable stem type thermometer readable and accurate to within plus or minus 2°C with a range from at least 0°C to 200°C shall be used. The stem shall be inserted into the asphalt to a depth of approximately 200 mm at a location at least 300 mm from the side of the truck body. The average of two readings shall be adopted as the temperature of the mix. Any necessary measurements of asphalt and road surface temperatures and wind velocity to comply with this Clause shall be made by the Contractor in the presence of the Superintendent.

Temperature Determination

Binder Type	Road Surface Temperature in Shade (°C)	Asphalt Temperatures (°C)			
		Layer Thickness Less than 30mm	Layer Thickness 30mm to 45mm	Layer Thickness 45mm to 100mm	Layer Thickness over 100mm
Class 170 & Class 320 Bitumen	5-10	*	*	145	130-155
	10-15	150#	145#	140	125-150
SBS polymer modified bitumen **	15-25	145#	140#	135	120-145
	over 25	140	135	130	115-140
SBS polymer modified bitumen **	15-25		160	155	
	over 25		150	150	
<p>NOTE: * Layers thinner than 45mm shall not be placed when the pavement temperature is below 10°C for dense graded asphalt and 15°C for open graded asphalt.</p> <p>** For other polymers the minimum temperatures as directed by the Superintendent.</p> <p># Laying not permitted if wind velocity across the pavement exceeds 5 km/hr.</p> <p>## Laying not permitted if wind velocity across the pavement exceeds 15 km/h.</p>					

**Table C245.9
Minimum Asphalt Temperatures for Laying**

(d) Level Control

1. The minimum controls for level set out below shall be used. Additional controls may be necessary to obtain the required finished pavement properties.

Minimum

2. Corrective courses shall be automatically controlled from fixed wire or stringline

Corrective

level controls and, as required by the Superintendent, a joint matching shoe. Where the correction is only minor, the Superintendent may allow the use of levelling beams at least 10m long.

Course

3. Intermediate courses shall be automatically controlled from fixed wire or stringline level controls and, as required by the Superintendent, a joint matching shoe.

Intermediate Course

4. The wearing course shall be controlled by levelling beams at least 10 m long and, as required by the Superintendent, a joint matching shoe.

Wearing Course

(e) Layer Thickness

1. The compacted thickness of each course shall be as shown on the Drawings, or as directed by the Superintendent at any location. A course may comprise one or more layers. The nominal compacted layer thickness shall be in accordance with Table C245.10.

Nominated Layer Thickness

Nominal Size of Asphalt (mm)	Compacted Layer Thickness (mm)	Type of Work
5*	15 to 25	Wearing course
10	25 to 40	Wearing course
14	35 to 50	Wearing course
10	25 to 40	Intermediate course
14	35 to 50	Intermediate course
20	40 to 80	Intermediate course
28	75 to 120	Intermediate course
40	100 to 160	Intermediate course

NOTE: *Special purpose asphalt

Table C245.10 - Course and Layer Thickness

C245.27 JOINTS

(a) General

1. The location of longitudinal and transverse joints shall be approved by the Superintendent in accordance with Clause C245.26(b) before work commences. The density of the asphalt and surface finish at joints shall be similar to those of the remainder of the layer.

Location Hold Point

(b) Longitudinal Joints

1. Unless otherwise directed by the Superintendent, an automatically controlled joint matching device shall be used to control the levels of adjacent runs. Care shall be taken to provide positive bond between adjoining runs. Unless otherwise directed by the Superintendent, longitudinal joints shall be:

Joint Matching Device

- continuous and parallel
- coincident with 150mm of line of change in crossfall
- offset by at least 150mm from joints in underlying layers
- located away from traffic wheel paths

<p>- located beneath proposed traffic linemarkings in the case of a wearing course.</p>	
<p>2. Work shall be arranged to avoid longitudinal joint faces being left exposed overnight.</p>	<p>Overnight Exposure</p>
<p>3. When pavers are laying asphalt in echelon, the hot joint so produced shall be constructed by leaving an uncompacted strip approximately 150 mm wide along the edge of the first run, and after the adjoining run has been spread, both sides of the joint shall be rolled simultaneously.</p>	<p>Paving in Echelon</p>
<p>4. In the case of cold longitudinal joints, the edge or edges of the first paver run shall be butted and slightly elevated while hot using hand lutes.</p>	<p>Cold</p>
<p>5. If the edge of joints are left exposed overnight or longer, the edge shall be trimmed to a straight vertical face by cutting disc, rotary saw or pneumatic spade and lightly coated with tack coat material by brushing. The adjoining run shall be placed against the prepared edge with an overlap of 25 mm to 50 mm. The overlap shall be pushed back using lutes, immediately after placing, to form a slight ridge along the joint which the roller shall compress adjacent to the edge of the previously placed run. Any excess, overlapping or segregated material shall be discarded and not incorporated in the mat.</p>	<p>Treatment of Exposed Joints</p>
<p>6. The compaction of asphalt at a longitudinal joint shall be carried out immediately behind the paver using either a static steel wheeled roller or a vibratory steel wheeled roller operated in a static mode. Compaction shall commence with the roller travelling on the cold lane with a 150 mm overlap on the hot lane for the first forward and reverse pass. The second pass shall be made on the hot lane with 150 mm overlap on the cold lane.</p>	<p>Compaction</p>
<p>7. When thin layers are to be compacted, the Superintendent may allow the use of a vibratory steel wheeled roller operated in the vibratory mode. In this instance, the first forward and reverse pass shall be made with the roller travelling on the hot lane and with a 150 mm overlap on the cold lane.</p>	<p>Thin Layers</p>
<p>8. Rolling shall continue until the joint is smooth and dense.</p>	<p>Rolling</p>
<p>(c) Transverse Joints</p>	
<p>1. When the end of the asphalt layer has cooled due to disruption of the work, or when resuming work on the next day, a transverse joint shall be formed.</p>	<p>Location</p>
<p>2. Transverse joints shall be at right angles to the direction of laying. They shall be staggered by at least 1 m between successive layers and between adjacent runs.</p>	
<p>3. Runs shall end either against a timber bulkhead to ensure a straight vertical, well compacted edge or by feathering out and compacting. In the latter case, before continuing the run the feathered material shall be cut back to a line where the full thickness exists. The surface shape of the end of the run shall be checked by a straight edge to locate the line of cut. The end of the previous run shall be lightly tack coated before the laying of the next run proceeds.</p>	<p>Feathered Edge</p>
<p>4. At the start of the run, care shall be taken to set the screed level with sufficient allowance for compaction so that just the correct thickness of asphalt is placed. The screed shall be heated to the asphalt temperature.</p>	<p>Setting of Screed</p>
<p>5. When the paver has moved a sufficient distance from the joint, a steel roller shall compact the joint in several transverse passes. The roller shall project about 150 mm further onto the fresh asphalt in each pass. If a vibratory roller is used, it shall be operated in the static mode. At locations where it is difficult to roll the joint transversely, the Superintendent may approve an alternative procedure.</p>	<p>Rolling</p>
<p>6. Boards shall be used for off pavement movement of the roller to prevent rounding the edge of the mat.</p>	<p>Off Pavement Movement</p>

7. The joint shall then be rolled longitudinally.

8. When the asphalt layer is required to join and match the level of an existing pavement surface, bridge deck or other fixture, sufficient of the existing material shall be cut out to achieve the minimum layer thicknesses as set out in Table C245.10.

Matching Existing Surface

COMPACTION

C245.28 PLANT AND EQUIPMENT

1. The proposed compaction fleet and rolling pattern shall be adequate to achieve the specified compaction and finish.

Compaction Fleet

2. The minimum number of rollers used for compaction of asphalt laid at various rates shall be as shown in Table C245.11.

Minimum Plant

3. For compaction of confined areas or patching works a small vibrating roller, or hand operated vibrating compactor acceptable to the Superintendent shall be used.

Confined Areas

4. Rollers shall travel at a uniform speed not exceeding 5 kilometres per hour for steel rollers and 10 kilometres per hour for both vibratory steel and pneumatic tyred rollers.

Roller Speed

5. Lateral changes in the direction of rolling shall be made on previously compacted asphalt. Sharp turns shall be avoided and any changes from forward to reverse shall be made smoothly. Vibrating rollers shall not be stopped or reversed while in the vibrating mode.

Direction Change

ASPHALT OUTPUT	ALTERNATIVE ROLLER COMBINATION		
Tonnes per hour per paver	Dense Graded Asphalt		
	Static Steel	Steel Vibrating	Pneumatic Tyred
Up to 45	1	-	1
	-	1	1
45 to 85	1	-	2
	-	1	1
85 to 120	1	-	3
	2	-	2
	-	2	1
Above 120	As for 85 to 120 plus additional rollers as determined by Compaction Trials		
NOTES: 1. At the discretion of the Superintendent, the minimum number of rollers may be decreased for layer thicknesses in excess of 60mm. 2. Additional pneumatic tyred rollers to those specified may be required for backrolling asphalt.			

Table C245.11 - Minimum Roller Combinations for Compaction

C245.29 DENSE GRADED ASPHALT

(a) Initial Rolling

Initial rolling shall be carried out using steel rollers. Vibratory steel rollers may be used, but they shall be operated in the static mode for the first pass. On deep lift asphalt, pneumatic tyred rollers may be used.

Roller Type

Initial rolling shall commence as soon as possible after laying has commenced. Rollers shall be operated as close as possible to the paver.

Commencing Time

The transverse and longitudinal joints and edges shall be compacted first as specified in Clause C245.27.

Priority

Initial rolling shall be completed before the bitumen asphalt temperature falls below 105°C, or 120°C for polymer modified asphalt.

Temperature Level

(b) Secondary Rolling

Secondary rolling shall immediately follow initial rolling. Either vibratory steel rollers, static steel rollers or pneumatic tyred rollers shall be used. The tyre pressures of pneumatic tyred rollers shall be between 500 kilopascals and 600 kilopascals. Rolling shall commence at the longitudinal joint side of the run.

Roller Types and Tyre Pressures

Secondary rolling shall be completed before the mix temperature falls below 80°C.

Temperature Level

(c) Final Rolling

Final rolling shall be carried out by a pneumatic tyred roller with tyre pressures between 600 kilopascals and 700 kilopascals to eliminate all roller marks and to produce a uniform finish. If secondary rolling has been carried out with a pneumatic tyred roller, a steel roller may be used for final rolling instead of the pneumatic tyred roller specified.

Tyre Pressures

Final rolling shall be completed before the asphalt temperature falls below 60°C.

**C245.30 RESERVED
(Open Graded Asphalt not included in this Specification)**

C245.31 ACCEPTANCE CRITERIA FOR COMPACTION

1. The acceptance for compaction shall be on a lot by lot basis where each day's work is generally one lot. Any defective areas which show cracking, or bony or fatty material shall be excluded from the lot and shall be rectified by the Contractor before being tested.

Statistical Basis

2. The Contractor shall arrange for the determination of the relative compaction of all layers greater than or equal to 30mm. Compaction testing of layers less than 30mm is not required. Compaction testing of the lot by either of the following methods:

Relative Compaction

Cores

The cores shall be taken on a random basis and have density tests performed on the cores in accordance with Test Method T606. The layer thickness shall be deemed to be the mean thickness of the cores. The testing shall be undertaken at a NATA registered laboratory.

Nuclear Density Meter

The type of nuclear density meter shall be appropriate to the depth of the layer being measured and shall be calibrated for each type of asphalt.

The Contractor shall arrange for a nuclear density meter (backscatter mode) to measure density in situ and shall determine the acceptable compaction level, in terms of the nuclear density meter, from compaction trials or by correlation with cores taken from a compacted layer. The layer thickness shall be deemed to be the nominal layer thickness. The proposed correlation shall be submitted to the **Superintendent for approval.**

Hold Point

3. Relative compaction of the core is the ratio of the field bulk density of the core and the mean laboratory density of the lot, determined by Test Methods T601 and T606, and reported as a percentage of the mean laboratory density.

Relative Compaction

4. No cores or nuclear density measurements shall be taken within 150 mm of a joint or free edge. Unless directed by the Superintendent, layers less than 30 mm in thickness shall not be cored.

Curing Limitations

5. The minimum Relative Compaction of all values within a lot shall be 95 per cent for a layer of thickness less than 50 mm or 96 per cent for a layer of thickness of 50 mm or greater.

Minimum Relative Compaction

C245.32 FINISHED PAVEMENT PROPERTIES

(a) General

1. Each course of asphalt shall be finished parallel to the finished surface of the wearing course.

Parallel to Finished Course

(b) Thickness

1. The thickness of asphalt shall be specified and/or measured in one of the following ways:

Measurement

(i) No Finished Surface Levels Specified

No corrective course required

When asphalt is placed over an existing pavement in one or more courses and no corrective course is applied, the calculated average compacted thickness of each course shall be in accordance with the course thickness specified in the Drawings and tolerances indicated in Table C245.12.

Calculated Average Compacted Thickness

Nominal Size of Asphalt (mm)	Tolerance (mm)
5	+5 -0
10	+5 -5
14	+5 -5
20	+10 -10
28	+10 -10
40	+10 -10

**Table C245.12
Tolerance for Course Thickness**

(ii) Finished Surface Levels Specified

When asphalt is placed in more than one course (excluding a corrective course) to specified levels over a pavement built by others, each course shall be placed in accordance with this clause provided that the thickness of the wearing course shall be not less than 90 per cent of that specified and the level of the wearing course shall comply with the limits shown in Table C245.13.

When the Contractor also constructs the underlying pavement, the level and thickness of the asphalt shall comply with the requirements of Clauses C245.26(d) and C245.32(c).

(c) Level

1. The top surface of any course after final compaction shall be parallel with the final wearing surface and the levels of the surface of the nominated course shall not vary from the levels determined from the Drawings or as determined by the Superintendent by more than the limits shown in Table C245.13.

Nominated Course	Below Nominated Course Level (mm)	Above Nominated Course Level (mm)
Wearing Course	0	10
Top of Intermediate Course	5	10
Other Intermediate Course	10	10
Corrective Course	15	10

Table C245.13 - Tolerance for Course Levels

2. Surface irregularities exceeding the tolerances given in this Clause shall be corrected to the satisfaction of the Superintendent before a subsequent course is placed.

Surface Irregularities

(d) Shape

1. The surface shall not deviate from the bottom of a 3 m long straightedge laid in any direction by more than the tolerances shown in Table C245.14.

Tolerances

Course	Unclassified Roads (mm)
Corrective Course	20
Intermediate Course	15
Wearing Course	10

Table C245.14 - Deviation from 3m Straightedge

2. Surface irregularities exceeding the tolerances given in Table C245.14 for a particular course shall be corrected to the satisfaction of the Superintendent before a

Surface Irregularities

subsequent course is placed. When the Contractor is required to provide a new wearing course in a single layer operation over a pavement built by others, the tolerance for the wearing course shown in Table C245.12 shall apply provided the deviations of the existing surface from a 3 m straightedge do not exceed the tolerance specified in Table C245.14 for an intermediate course.

(e) Riding Quality

1. The finished surface shall have a smooth longitudinal profile.

(f) Voids

1. For asphalt mixes having voids outside the limits specified in Table C245.7, the requirements in Clause C245.39(a) shall apply.

Limits on Voids

LIMITS AND TOLERANCES

C245.33 SUMMARY OF LIMITS AND TOLERANCES

1. The tolerances applicable to the various clauses of this Specification are summarised in Table C245.17 below:

Item	Activity	Tolerances	Spec Clause
1.	Coarse Aggregate		
	(a) Wet Strength	>100kN for any fraction other than the 40mm open graded asphalt where wet strength is to be >150kN (Test Method T215)	C245.08
	(b) Wet/Dry Strength Variation	<35% (Test Method T215)	C245.08
	(c) Particle Shape	Fraction retained on 9.50mm AS sieve: <35% for caliper ratio 2:1 <10% for caliper ratio 3:1 (Test Method T213)	C245.08
	(d) Fractured Faces	Fraction retained on 6.70mm AS sieve: >75% of mass with at least two fractured faces. When used as a wearing course shall have at least 90% by mass with at least one fractured face. (Test Method T239)	C245.08
	(f) Polished Aggregate Friction Value (PAFV)	> minimum value specified in Annexure C245. (Test Method T233)	C245.08
2.	Fine Aggregate	Shall meet the requirements as specified for Coarse Aggregate (Item 1) above.	C245.08
3.	Mineral Filler		
	(a) Voids	Dry compacted filler voids > 40%	C245.09
4.	Bitumen		
	(a) Property Requirements	As Table C245.1	C245.10

Item	Activity	Tolerance	Spec Clause
5.	Scrap Rubber Bitumen	A 20% scrap rubber bitumen mixture prepared as for Test Method T735 shall have a minimum recovery of 20% when tested in accordance with Test Method T1180	C245.10
6.	Scrap Rubber		
	(a) Grading	As Table C245.4	C245.13
	(b) Length	< 10% of particles having a length greater than 7.50mm	C245.13
7.	SBS Modified Bitumens		
	(a) Specified Properties	As per Table C245.2	C245.10
8.	EVA Modified Bitumens		
	(a) Specified Properties	As per Table C245.3	C245.10
9.	Design of Nominated Mix		
	(a) Dense Graded Limits	As per Table C245.6	C245.15
10.	Production Mix Variation		
	(a) Dense Graded Asphalt	As per Table C245.7	C245.17
11.	Temperatures for Manufacture of Asphalt		
	(a) Binder Temperature	As per Table C245.8	C245.18
	(b) Asphalt Temperature	As per Table C245.8	C245.18
12.	Asphalt		
	(a) Moisture Content	< 0.5% by mass	C245.18
13.	Laying of Geotextiles		
	(a) Lapping at joints	Lap to be > 300mm	C245.23
	(b) Wire Staples	Wire diameter > 3mm	C245.23
	(c) Pinning	Intervals < 2m	C245.23
14.	Tack Coat		
	(a) Bitumen Emulsion	Application Rate > 0.15 and < 0.50 litres per square metre	C245.25

Item	Activity	Tolerance	Spec Clause
15.	Laying		
	(a) Paver Capacity	>50 tonnes asphalt per hour	C245.26
	(b) Laying Depth	Adjustment between 10mm and 150mm	C245.26
	(c) Laying in Echelon	Distance between pavers is such that temperature of asphalt at edge (or laid by leading paver) is >80°C when following paver matches the longitudinal joint.	C245.26
	(d) Faulty Operation of Paver	Thin layer spread by hand to correct irregularity if surface temperature >115°C for dense graded.	C245.26
	(e) Laying Temperature	As per Table C245.9.	C245.26
	(f) Course and Layer Thickness	Nominal size mix and compacted layer thickness as per Table C245.10.	C245.26
16.	Level Control		
	(a) Levelling Beam for Corrective Course	>10m length	C245.26
	(b) Levelling Beam for Wearing Course	>10m length	C245.26
17.	Longitudinal Jointing		
	(a) Change in Crossfall	Within 150mm of line of change.	C245.27
	(b) Where Underlying Layers	Offset at least 150mm from joints in underlying layers.	C245.27
18.	Transverse Jointing		
	(a) Where Underlying Layers	Stagger to be >1m between successive layers and adjacent runs.	C245.27
19.	Compaction		
	(a) Dense Graded Asphalt		
	(i) Roller Speed	Steel Rollers <5km per hr Vibratory Pneumatic <10km per hr.	C245.29 C245.29
19.	Compaction (Cont'd)		
	(a) Dense Graded Asphalt		
	(ii) Rolling	Initial Rolling: To be completed before asphalt temperature falls below 105°C Secondary Rolling: Tyre pressures on pneumatic rollers to be 500kP to 600kP. Rolling to be completed before the asphalt temperature falls below 80°C.	C245.29 C245.29

Item	Activity	Tolerance	Spec Clause
		Final Rolling: Tyre pressures on pneumatic rollers to be between 600kP and 700kP. Rolling to be completed before asphalt temperature falls below 60°C.	C245.29
	(b) Acceptance Criteria for Compaction	Minimum Relative Compaction of all values within a lot >95% for layer of thickness <50mm and >96% for layer thickness >50mm.	C245.31
20.	Finished Pavement		
	(a) Thickness	Max. compacted thickness as for Table C245.12 Where finished surface levels are specified, thickness shall be >90% of specified and level shall comply with requirements of Table C245.13	C245.32
	(b) Shape	Shall not deviate from bottom of 3m straight edge by more than tolerance in Table C245.14	C245.32

Table C245.15 - Summary of Limits & Tolerances

SPECIAL REQUIREMENTS

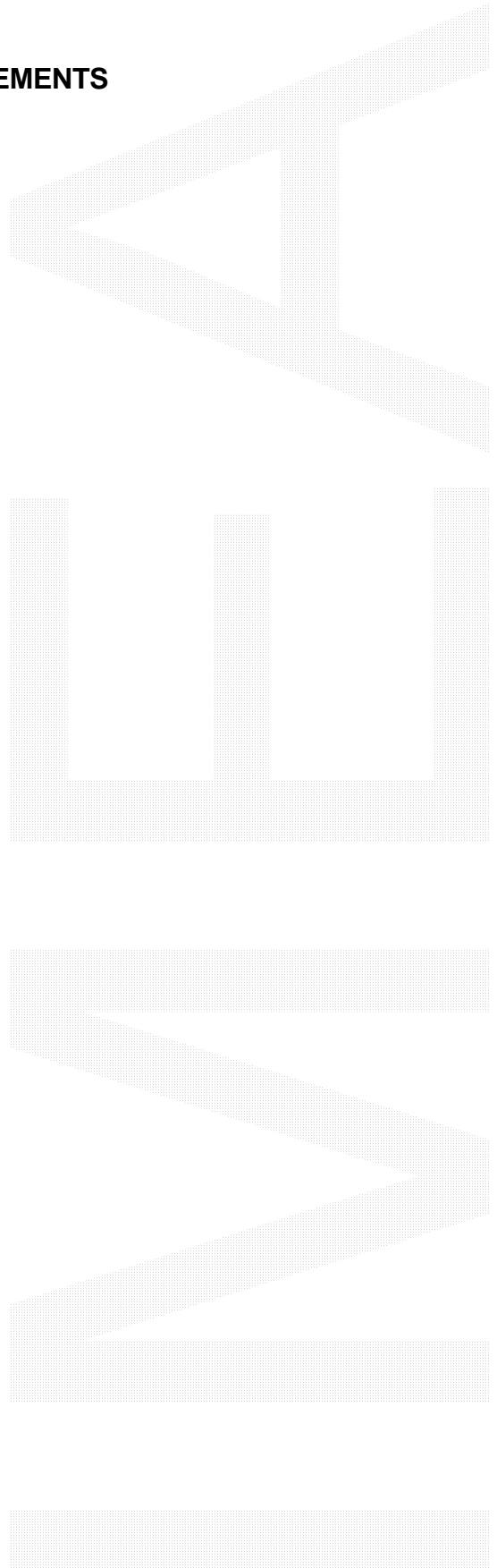
C245.34 RESERVED

C245.35 RESERVED

C245.36 RESERVED

C245.37 RESERVED

C245.38 RESERVED



MEASUREMENT AND PAYMENT

C245.39 PAY ITEMS

1. Payment shall be made for all activities associated with completing the work detailed under this Specification in accordance with Pay Items C245(a) to C245(e) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Where "provisional" items are shown in the schedule, these may not be required during the course of the work as the requirement may be governed by site or external constraints.
5. A section of work on which either the asphalt and/or placing work fails to meet this Specification may be accepted at the absolute discretion of the Principal subject to the provisions listed hereunder.

(a) Voids

- (i) For asphalt mixes having voids outside the limits specified in Table C245.7, the asphalt may be accepted at the absolute discretion of the Superintendent if all other requirements of this Specification are met and provided the void contents fall within the range 3-8% for Classified Road mixes and 2-6% for the Unclassified Road mixes.

(b) Aggregate Grading and Binder Content

- (i) For asphalt having aggregate grading or binder content outside the limits specified in Table C245.8, the asphalt shall be rejected and removed from the site.

6. Provision for traffic is measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.

Pay Item 245(a) SUPPLY AND APPLICATION OF TACK COAT (INCLUDING PREPARATION OF SURFACE)

1. The unit of measurement shall be the litre.
2. The quantity shall be determined by multiplying the nominated application rate of bitumen emulsion (in litres per square metre) by the authorised area of road surface tack coated or other method approved by the Superintendent.
3. No account shall be taken of area of tack coat applied to faces of joints, kerbs and other structures.
4. The schedule rate under this item shall include all operations involved in the supply and application of the tack coat, including surface preparation, control of traffic and provision of a blinded surface where determined by the Superintendent.

Pay Item 245(b) DENSE GRADED ASPHALT IN INTERMEDIATE COURSES

245(b)(i)	10mm Nominal Size
245(b)(ii)	14mm Nominal Size
245(b)(iii)	20mm Nominal Size
245(b)(iv)	28mm Nominal Size
245(b)(v)	40mm Nominal Size

1. The unit of measurement shall be the square metre of each specified thickness.
2. The area shall be calculated from the specified width and length of the asphalt in the Drawings or otherwise as determined by the Superintendent.

3. The schedule rate under this item shall include all operations involved in the supply, spreading and compaction of the asphalt and the control of traffic.
4. A separate unit rate shall be included in the Schedule of Rates for each nominal size of asphalt specified.

Pay Item 245(c) DENSE GRADED ASPHALT IN WEARING COURSE

245(c)(i)	5mm Nominal Size
245(c)(ii)	10mm Nominal Size
245(c)(iii)	14mm Nominal Size

1. The unit of measurement shall be the square metre of each specified thickness.
2. The area shall be calculated from the specified width and length of the asphalt in the Drawings or otherwise as determined by the Superintendent.
3. The schedule rate under this item shall include all operations involved in the supply, spreading and compaction of the asphalt and the control of traffic.
4. A separate unit rate shall be included in the Schedule of Rates for each nominal size of asphalt specified.

Pay Item 245(d) DENSE GRADED ASPHALT OVER AN EXISTING PAVEMENT (NO LEVELS SPECIFIED)

245(d)(i)	5mm Nominal Size
245(d)(ii)	10mm Nominal Size
245(d)(iii)	14mm Nominal Size

1. The unit of measurement shall be the tonne.
2. The quantity shall be determined from truck weighbridge dockets obtained from a registered weighbridge.
3. The schedule rate under this item shall include all operations involved in the supply, spreading and compaction of the asphalt and the control of traffic.
4. A separate unit rate shall be included in the Schedule of Rates for each nominal size of asphalt specified.

Pay Item 245(e) SUPPLY AND PLACE GEOTEXTILE UNDERLAY

1. The unit of measurement shall be the square metre.
2. The width and length shall be taken as specified on the Drawings or as authorised by the Superintendent.
3. No allowance in the measurement shall be made for laps, joins or for upturns at the edges of boxing.
4. A separate unit rate shall be included in the Schedule of Rates for each type of geotextile underlay specified.

Contract No. _____

ASPHALTIC CONCRETE

COUNCIL ASPHALT WORK RECORD

ANNEXURE C245A

Date: _____ Contract No: _____ Work Location: _____ km to _____ km

DO/WO: _____ Supplier: _____ From _____ towards _____

Road No: _____ Job No: _____ Road Loc: [/ / /] to [/ / /]

Plan No: _____ Mix Type: _____ New Surfacing **Error! Switch argument not specified.** Resurfacing

Error! Switch argument not specified. Existing Surface Type _____

Delivery								Paving								Remarks				
Load No.	Time			Truck Reg'd No	Docket No.	Nett Mass (t)	Mix Temperature		Chainage		Paved Width (m)	Direction With or Against Ch	Dist from Left (m)	Thick-ness (mm)	Layer			Sample No. & tonnes sampled	Weather, Work Stoppages, Start & Finish etc	
	Depot Plant	Arrive Job	Depart Job				Ex Plant	Ex Truck	From	To					1st	2nd	3rd			

Remarks:
Penciller: _____ Sampling by: _____ Superintendent's Representative: _____ Contractor's Representative: _____
Affiliation: _____ Affiliation: _____ (Signature) (Signature)

ANNEXURE C245B

SCHEDULE OF DETAILS

Pavement Type _____
 Location _____

Sheet No. _____
 of _____ Sheets

Course	Type and Nom Size of Asphalt	Type of Binder	Grade of Binder and/or % by Wt of Additive	Compacted thickness of course (mm)	Minimum Delivery Rate (per hr)	Delivery Trucks to be Insulated*	Pavers in Echelon	Fixed Wire String Line with Support Intervals (m)	Level Control Device			Clause C245.39 Voids Deduction Requirement**
									Levelling Beam	Joint Matching Shoe	Automatic Crossfall Control	
Wearing												
Intermediate 1												
Intermediate 2												
Intermediate 3												
Intermediate 4												
Correction 1												
Correction 2												
Drainage Layer												

NAASRA Roughness Count of Existing Surface (Clause C245.32(e))

Section _____ Counts/km _____

Section _____ Counts/km _____

* Delivery Trucks to be insulated unless otherwise shown (Clause C245.20)

Section _____ Counts/km _____

** Requirement A to apply unless otherwise shown

PAFV of Aggregate 50 minimum. (Test Method T233)

(TO BE ISSUED BY SUPERINTENDENT FOR EACH SEPARABLE PART)

**SPECIFICATION C245
ASPHALTIC CONCRETE**

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