NEW SOUTH WALES

DEVELOPMENT CONSTRUCTION SPECIFICATION

C245

ASPHALTIC CONCRETE

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
EXAMPLE 1	*Provision for acceptance of nonconformance with deduction in Payment*	*XYZ.00*	*AP*	*KP*	*2/6/97*

SPECIFICATION C245: ASPHALTIC CONCRETE

GENERAL

C245.01 SCOPE

Extent of Work

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. Asphalt produced to the requirements of this Specification is not considered appropriate for heavy duty traffic application which is considered to comprise more than 600 commercial vehicles per lane per day. The extent of the Contractor's work shall include:

(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.

Quality

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

C245.02 REFERENCE DOCUMENTS

Documents Standards Test Methods

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

(a) Council Specifications

201 - 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 in coarse aggregate derived from gravel.
AS 1141.22 - Wet/dry strength variation.
AS 1141.42 - Pendulum friction test (PAFV)
AS 1160 - Bitumen emulsions for the construction and maintenance of pavements.
AS 2008 - Residual bitumen for pavements.
AS 2150 - Hot mix asphalt.
AS 2357 - Mineral fillers for asphalt.
AS 2734 - Asphalt (hot-mixed) paving - Guide to good practice.

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AS 2758.5	-	Asphalt aggregates.
AS 2891.1	-	Sampling of Asphalt.
AS 2891.3.1	-	Bitumen content and aggregate grading - Reflux method.
AS 2891.5	-	Determination of stability and flow - Marshall procedure.
AS 2891.6	-	Determination of stability by the modified Hubbard-Field procedure.
AS 2891.8	-	Voids and density relationships for compacted asphalt mixes.
AS 2891.9.3	-	Determination of bulk density of compacted asphalt - Mensuration method.
AS 2891.10	-	Water and volatile oils content.

(c) NSW RTA Test Methods

T640 - Resistance to Stripping Test

(d) AUSTROADS Test Methods

MBT 11	-	Handling Viscosity of Polymer Modified Binders (Thermosel).
MBT 21	-	Elastic Recovery, Consistency and Stiffness of Polymer Modified Binders (ARRB TR Elastometer).
MBT 22	-	Torsional Recovery of Polymer Modified Binders.

C245.03 PLANT

1. The Contractor shall provide all the plant, equipment and labour 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 in accordance with the Contractor's submitted quality documentation and kept in good operating condition. The Contractor shall not use in the work any plant or equipment demonstrated to be faulty in operation so as to effect the product quality or unsafe in operation as assessed by the Superintendent. ***Plant to be Suitable***

3. All plant shall be registered and insured as appropriate to its use on a public road and shall comply with statutory environmental regulations.

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, access chamber covers, bridge or culvert decks and other road fixtures. Immediately after the 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. ***Contractor's Responsibility***

C245.05 CONTROL OF TRAFFIC

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. Any costs incurred as a result of the supply of labour and materials complying with the Specification for CONTROL OF TRAFFIC shall be borne by the Contractor. ***Contractor's Cost***

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3. The Contractor shall take all necessary steps to avoid or minimise delays and inconvenience to road users during the course of the work but without compromise to the safety of the road users or employees. ***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 as per the Contractor's own procedures where 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 dockets 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 this Specification, materials or mix ingredients shall be sampled in accordance with AS 2891.1. ***Sampling***

2. The types of asphalt and binder required in the contract are as stated in Annexure C245C.

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 comprise all mineral matter retained on a AS 4.75 mm sieve. 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. If the Contractor proposes to blend two or more coarse aggregates from different sources to provide the Nominated Mix then Test Reports for each constituent material shall be submitted separately. The coarse aggregate from each source shall comply with the following requirements: ***Test Requirements***

(a) Wet Strength - AS 1141.22.

Shall be not less than 100 kN for any fraction except the wet strength required for any fraction of open graded asphalt shall not be less than 150 kN.

(b) Wet/Dry Strength Variation - AS 1141.22

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

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(c) Particle Shape - AS 1141.14

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

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

Aggregate which is from a gravel or river deposit and 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.

4. When tested in accordance with AS 1141.42 aggregate shall be rejected if the Polishing Aggregate Friction Value (PAFV) for the aggregate is less than 44. ***Polishing Value***

(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 conforming to the requirement in this clause. ***Soundness***

2 If the Contractor proposes to blend two or more fine aggregates from different sources to provide the Nominated Mix then Test Reports for each constituent material shall be submitted separately. ***Test Requirements***

C245.09 MINERAL FILLER

1. Mineral filler may consist of hydrated lime, fly ash, portland cement, flue dust from the manufacture of portland cement or plant baghouse dust. The nature and proportion of filler shall conform to the requirement of the Nominated Mix design. ***Constituents***

2. The mineral filler shall comply in all other respects with the requirements of AS 2357. ***Quality***

C245.10 BINDER

1. The binder supplied and used in the works shall be bitumen complying with AS 2008 except where other binders are required in accordance with the requirements of Clause C245.10(b) or C245.10(c). ***Bitumen Quality***

(a) Bitumen

1. The bitumen/binder used in the works shall be as specified in Annexure C245C. ***Binder Class***

(b) Other Binders

1. Where included in the mix design these binders shall be incorporated in the works in accordance with the requirements of this Specification. ***Approval***

2. Where other binders are produced by the inclusion of an additive at the time of manufacture of the asphalt, the mixing time shall be adjusted to assure full digestion of the additive and uniform coating of all aggregate particles. ***Mixing Time***

(c) Modified Bitumens

1. Polymer modified bitumens shall comply with the limits shown in Table C245.1 as appropriate and the requirements set out below. The polymer modified bitumens shall be supplied in the grades and in compliance with the requirements shown in Annexure C245.C. ***Polymer Modified Binder***

2. The binder shall be pumped and stored at the manufacturer's recommended temperatures. ***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 in mixing with bitumen complying with AS 2008. ***Blending***

4. Polymer modifier shall be incorporated within bitumen in such a way so as to comply with manufacturer's guidelines regarding concentration, mixing temperatures or other restrictions relating to work place safety. ***Contractor's Responsibility***

Test	A3L	Test Method
Elastic Recovery at 60^{o}C (%)	90 min	MBT 21
Consistency on ER at 60^{o}C (Pa.s)	5000 min	MBT 21
Torsional Recovery at 25^{o}C (%)	50 min	MBT 22
Viscosity at 180 ^{o}C (Pa.s)	0.6 max	MBT 11

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 C245.1 - Specified Properties for Polymer Modified Bitumens

C245.11 BITUMEN ADHESION AGENT

1. A bitumen adhesion agent, if required, shall be added to the binder. Details of the proposed bitumen adhesion agent shall be submitted for the Superintendent's approval. The bitumen adhesion agent shall be used in a manner compatible with the manufacturer's recommendations. The bitumen adhesion agent shall be added at a concentration within the range 0.5 per cent to 1.0 per cent by mass of the binder. ***Approval***

C245.12 BITUMEN EMULSION

1. The bitumen emulsion shall be cationic rapid setting CRS170 bitumen emulsion complying with the requirements of AS 1160. ***Type***

2. Plant and/or containers used for the transport or storage of anionic emulsion or emulsified bitumen shall not be used for the subsequent transport or storage of a cationic emulsion. ***Containers***

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C245.13 RECLAIMED ASPHALT PAVEMENT (RAP)

1. Dense graded asphalt that does not include modified bitumen may include a proportion of RAP up to but not exceeding 20 per cent by mass. The resultant asphalt shall meet all requirements for the Nominated Mix.

RAP Percentage

2. The RAP to be utilised shall be nominated by source and/or stockpile. Testing of the Nominated Mix shall include RAP sampled from the stockpile and of similar physical properties as that to be utilised for the contract. Any change in RAP supply shall be brought to the attention of the Superintendent 5 days prior to proposed usage in asphalt under this contract.

RAP Source

ASPHALT MIX DESIGN

C245. 14 NOMINATED MIX

1. The Contractor shall design each asphalt mix, henceforth called the `Nominated Mix', within the limits shown in Table C245.2 and Table C245.3.

Design

2. 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

3. 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, rap, filler, and binder. Submission of such details constitutes a **HOLD POINT**. Superintendent's approval is required prior to release of the hold point.

HP

4. The Contractor shall nominate the mix design test regime for Stability/Flow and Voids as either Marshall or Modified Hubbard-Field testing. Thereafter the appropriate test parameters set out in Table C245.2 will be assigned as requirements.

Test Method

5. 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 this clause shall be borne by the Contractor.

Revised Mix Contractor's Cost

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Property	Requirements						
	Moderately High Traffic Roads (Collector, Arterial & Industrial)				Local Residential Roads**		
Aggregate passing AS Sieve (% by mass)	Nominal Size of Asphalt						
	5mm (AC5)	10mm (AC10)	14mm (AC14)	20mm (AC20)	Type A	Type B	Type R
53.0mm							
37.5mm							
26.5mm				100			
19.0mm			100	90-100			
13.2mm		100	85-100	70-90	100	100	
9.50mm		90-100			95-100	90-100	
6.70mm	100	70-90	55-75	40-70	80-95	65-85	100
4.75mm	80-100				65-80	60-80	85-100
2.36mm	45-70	40-60	35--52	25-50	45-60	55-75	55-80
1.18mm					35-50	45-65	38-60
0.600mm	20-43	20-38	15-30	10-27	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	3-10	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	6.0-7.0	5.8-6.8	6.5-7.5
Ratio filler/binder content	0.6-1.2[o]	0.6-1.2[o]	0.6-1.2	0.6-1.2	0.6-1.2[o]	0.6-1.2[o]	0.6-1.2[o]
Stability of the compacted asphalt mix (kN)							
As per Modified Hubbard Field Procedure (AS 2891.6)	18-34	18-34	18-34	18-34	NA	NA	NA
Min as per Marshall Method (at 35 blows) (AS 2891.5)	5.5	5.5	6.5	6.5	4.0	4.0	3.5
Voids in compacted asphalt mix (% of voids in volume of mix) (AS 2891.8)							
As per modified Hubbard Field Procedures	4-7	4-7	4-7	4-7	3-6	3-6	3-6
As per Marshall Method	4-6 (50 blows)	4-6 (50 blows)	4-6 (50 blows)	4-6 (50 blows)	3-5 (35 blows)	3-5 (35 blows)	3-5 (35 blows)
Voids filled by binder (% voids in the total mineral aggregate to be filled by binder) Test Method AS 2891.8	65-80	65-80	65-80	65-80	60-85	60-85	60-85
Flow (mm) of compacted mix # (35 blow Marshall)	1.5-4.0	1.5-4.0	1.5-4.0	1.5-4.0	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. Superintendent's approval is required for such adjustments.
\# This requirement only where Marshall Method of Testing is used.
** 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.
[o] Higher filler/binder ratios may be approved by the Superintendent when evidence of local usage and satisfactory performance is submitted with the mix design.

Table C245.2 - Limits for Design of Nominated Mix - Dense Graded Asphalt (AC)

Property	Limits for nominal size asphalt	
	10mm (OG10)	**14mm (OG14)**
Test Method AS 2891.3.3: Combined Particle size distribution passing AS Sieve (% by mass)		
53.0mm		
37.5mm		
26.5mm		
19.0mm		100
13.2mm	100	85-100
9.50mm	85-100	65-95
6.70mm	50-80	35-75
4.75mm	25-55	15-45
2.36mm	10-35	3-25
1.18mm	0-19	0-20
0.600mm	#	#
0.300	#	#
0.150mm	#	#
0.075	#	#
Test Method AS 2891.3.1: Binder Content (% by mass of total asphalt mix)	3.8-5.7	3.4-5.2
Test Methods AS 2891.5, AS 2891.6, AS 2891.9.3: Voids in laboratory compacted asphalt mix (% voids of the volume of the asphalt mix)	18-23	18-23

NOTE: Some increase beyond these ranges of bitumen content may be permitted for aggregates having unusually high absorption characteristics. Superintendent's approval is required for such adjustments.

\# For each sieve given on the left hand side of the table, even when no particle size distribution shall be given in the submission of the Nominated Mix and in the reporting of trial and production mixes.

Table C245.3
Quality Requirements for Open Graded Asphalt

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C245.15 APPROVED MIX

HP

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 by the Superintendent upon inspection of all relevant NATA documentation as required by this Specification.

Changes to Approved Mix

2. The Contractor shall not make any changes to the Approved Mix, 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 C245.14.

Contractor's Responsibility

3. 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 this Specification.

C245.16 REQUIREMENTS OF PRODUCTION MIX

Production Mix

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

2. The production mix shall comply with the materials and mix requirements cited in this specification as assurance to the Principal of quality processes and materials. Additionally the mix shall display the following key performance requirements at delivery and during laying:

(a) The mix shall not show evidence of segregation of aggregate after mixing, transport or paving.

(b) Mix that is not homogeneous and is observed to be "fatty" (bitumen rich) or "bony" (coarse and porous) shall be excluded from the work lots at the Contractor's expense.

(c) The workability and compactability of the mix as delivered shall be consistent and compatible with the capacity of paving and compaction equipment on site.

3. Asphalt, as produced during the course of the contract, shall comply with the requirements shown in Table C245.4 and Table C245.5 unless otherwise approved by the Superintendent.

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Production Mix Properties	Allowable Variations from Approved Mix *	
Nominated Mix Type (see Table C245.5)	AC5, AC10, AC14, AC20, AC28, AC40	A, B, R
Grading - AS 2891.3.3		
Passing 4.75mm AS sieve and larger	±7%	±7%
Passing 2.36mm and 1.18mm	±5%	±5%
Passing 0.600mm and 0.300mm	±4%	±4%
Passing 0.150mm	±2.5%	±2.5%
Passing 0.075mm	±1.5%	±1.5%
Binder Content - AS 2891.3.1	±0.3%	±0.3%

* Notwithstanding, these allowable variations shall not fall outside the limits for design of nominal mix as shown in Table C245.2

Table C245.4
Dense Graded Asphalt - Variation of Production Mix

Production Mix Properties	Allowable Variations from Approved Mix *	
Nominated Mix Type (See Table C245.6)	**OG10 & OG14**	**OG28 & OG40**
Grading - AS 2891.3.3		
Passing 13.2mm AS sieve and larger	± 7%	± 10%
Passing 4.75mm and larger to 13.2mm	± 7%	± 7%
Passing 1.18mm and 2.36mm	± 5%	± 5%
Passing 0.075mm	± 1.5%	± 1.5%
Binder Content - AS 2891.3.1	± 0.5%	±0.5%

* Notwithstanding, these allowable variations shall not fall outside the limits for design of nominal mix as shown in Table C245. 2

Table C245.5
Open Graded Asphalt - Variation of Production Mix

PRODUCTION

C245.17 MIXING PROCEDURE

(a) Plant

Characteristics

1. Mixing shall be undertaken in an approved batch pugmill, continuous pugmill or drum mixing plant, as specified in the Contractor's Quality Documentation and nominated at tender and capable of uniformly mixing coarse and fine aggregate, filler, and binder to meet the requirements specified in this Specification and AS 2150.

(b) Inspection of Mixing Plant

1. The Superintendent, upon provision of notice to the asphalt supplier or the supplier's representative, shall have access to the mixing plant for purposes of inspection to verify production procedures and the supplier's compliance with the Contractor's Quality Management Manual and Project Quality Plan. The Superintendent shall have the right to declare any nonconformance and shall be entitled to request correction of either the Contractor's Quality Management Manual or the Project Quality Plan or both. ***Access***

(c) 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 C245.6. For asphalt made with other binders complying with Clause C245.10, 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 C245.24(c) for the appropriate road surface temperature and layer thickness. ***Limits***

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

4. The asphalt produced in a drum mixing plant shall have a moisture content not greater than 0.5 per cent by mass when tested in accordance with AS 2891.10. ***Moisture Content***

TYPE OF ASPHALT	DENSE GRADED ASPHALT			OPEN GRADED ASPHALT	
Type of Binder	**Class 170**	**Class 320**	**Polymer Modified**	**Class 170**	**Class 320**
Min. Binder Temp. (^{o}C)	140	140	180	115	115
Max. Binder Temp. (^{o}C)	165	170	190	165	170
Min. Asphalt Temp. (^{o}C)	140	140	150	125	125
Max. Asphalt Temp. (^{o}C)	165	170	165	140	140

Table C245.6
Temperatures for Manufacture of the Asphalt

* Minimum values may need to be adjusted to conform to minimum laying temperature as stated within Table C245.8

(d) Mixing Time

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

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(e) 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 Table C245.6 shall not be used. Binder manufacturer's instructions must be followed when polymer modified asphalt is stored. ***Limitations***

(f) Contractor's Laboratory

1. The Contractor shall maintain and operate an appropriately registered NATA testing laboratory at or near the mixing plant to control the quality of the asphalt produced. ***Quality Control***

2. The Contractor will make the laboratory available for inspection by the Superintendent at any time during the course of the Works. ***Inspection***

3. All documented test results shall be submitted to the Superintendent for inspection and approval in a format and to a timetable suitable to the Superintendent. ***Submission of Test Results***

4. The cost of testing required by this Specification shall be borne by the Contractor. ***Contractor's Cost***

C245.18 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 the Contractor shall sample production lots at the minimum frequencies set out in Table C245.7. This testing frequency requirement shall apply to each asphalt mix type and individual mix design. The test results shall be related to production intervals with samples representing the full lot of production of the relevant mix for the production interval. This interval shall extend from the midpoint of production in terms of tonnage between samples to the subsequent midpoint. The production lot represented by the samplings shall consist of material manufactured under essentially uniform conditions being essentially homogeneous with respect to manufacturing equipment and raw materials.

2. Test results from this production control sampling are acceptable as representative of deliveries made under this contract subject to the traceability of production from specific production intervals to the location at the paving site. Such traceability shall include registration of lot number and time of production on the delivery docket system. The size of any production lot shall be limited to production from a 12 hour "shift".

3. Where the Principal has special requirements for sampling and testing of particular mixes the required frequency of testing and the taking of referee samples shall be set out in Annexure C245C.

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Quantity of Asphalt in production lot	Minimum Frequency of Testing
Less than 100 tonnes	One per 50 tonnes or part thereof
101 to 300 tonnes	One per 100 tonnes or part thereof
301 to 600 tonnes	One per 150 tonnes or part thereof
Over 600 tonnes	One per 200 tonnes or part thereof

Table C245.7 Minimum Testing Frequencies for Asphalt Production

Stripping

4. Additionally the Resistance to Stripping Test, RTA Test T640, shall be carried out on all production mixes at a frequency of one test per mix per 5000 tonnes production or once per calendar month whichever is the most frequent. The Tensile Strength Ratio shall be greater than 70 per cent for all mixes. Where Tensile Strength Ratio is between 70 and 80 per cent corrective action shall be proposed by the Contractor including corrections to the mix design. Such advice shall be provided by the Contractor within a period of 48 hours from a result in the range 70-80 per cent which is deemed marginal.

(c) Sampling

1. Sampling shall be performed in accordance with AS 2891.1. Samples shall be identified so as to allow traceability of the mix to the paving site. Each sample or sample portion as appropriate sampled as a referee sample shall be stored in an airtight container labelled so as to be traceable to the job and paving site location.

(d) Testing

Registered Laboratory

1. Testing required by this Clause shall be arranged by the Contractor at an appropriately registered NATA laboratory. Test reports will be made available to the Superintendent as soon as they are available and always within 7 days of delivery of material.

Contractor's Costs

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

TRANSPORT

C245.19 GENERAL

Release Agent

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.

Cover of Load

2. During transport asphalt shall be covered with a canvas or other suitable cover which is held down securely.

Long Distance

3. When the mix whose transportation time exceeds 30 minutes, is to be transported over long distances (in excess of 20 kilometres), or is transported in cold conditions (air temperature below 15^{o}C), 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 250mm and shall be tied down securely. The bodies of all trucks shall be suitably insulated.

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4. Delivery of the asphalt shall be at a uniform rate within the capacity of the spreading and compacting equipment. ***Delivery Rate***

5. The mass of all truck-loads of asphalt shall be measured on a registered weighbridge. ***Weighbridge***

PLACING

C245.20 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. ***Layers***

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. ***Weather Conditions***

3. The Superintendent may order work to cease temporarily on account of adverse weather, unsatisfactory pavement surface condition, or other circumstance which the Superintendent feels may adversely affect the subsequent operations. ***Temporary Suspension of Work***

C245.21 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 300mm. 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. Whilst preparing the surface the Contractor shall be responsible for compliance with environmental requirements including but not limited to prevention of materials from entering stormwater drains and dust. ***Requirement***

2. Surface preparation shall be in accordance with AS 2734. Thermoplastic linemarking or other linemarking, where indicated necessary by the Superintendent in Annexure C245C, will be removed prior to paving. Raised pavement markers shall be removed prior to paving. ***Surface Preparation***

3. The Contractor, when paving over existing road pavement, shall be responsible for the recording of lane marking positions including the extent of barrier line. After paving the Contractor will mark up the pavement to re-establish such positions using conventions agreed with the Superintendent and to a standard adequate to allow accurate re-establishment of line marking. ***Linemarking***

(b) Rectification of Pavement Surface

1. The Contractor shall repair any damage to the existing pavement surface caused by the Contractor's activities. Affected areas designated by the Superintendent shall be removed and reinstated to the Superintendent's satisfaction. The cost of repairing such damage shall be borne by the Contractor. ***Contractor's Responsibility, Contractor's Cost***

2. Surface depressions of greater depth than twice the permissible tolerance (specified in Clause C245.31) of the layer are to be tack coated and squared where necessary, filled with fresh asphalt of appropriate nominal size in accordance with Table C245.9 and compacted before the subsequent course is placed. The asphalt in these patches shall be compacted to comply with the general level of the existing surface to the Superintendent's satisfaction. ***Correction Courses***

3. When the optional "Preparation of Surface Hold Point" is required as indicated in Annexure C245C, placing of asphalt shall not be undertaken until the pavement has been prepared to the satisfaction of the Superintendent. Preparation of the affected area to the satisfaction of the Superintendent shall constitute a **HOLD POINT**. Subsequent inspection and Superintendent's approval of surface condition shall be required prior to the release of the hold point. ***Optional HP***

C245.22 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.

C245.23 TACK COAT

1. The whole of the area to be sheeted with asphalt shall be tack coated with a light and even coat of bitumen emulsion. Where multiple courses are to be applied a tack coat shall be used between each course unless directed otherwise by the Superintendent. ***Placement***

2. The bitumen emulsion shall be applied at a rate of between 0.10 litres per square metre and 0.20 litres per square metre of undiluted bitumen. ***Application Rate***

3. 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***

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

5. 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***

6. 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, guardfence or bridge handrails. Appurtenances susceptible to overspray shall be protected with suitable paper. ***Surface Protection***

7. 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 suitably protected from carryover of bituminous material. ***Truck Movements***

8. In locations of heavy pedestrian traffic, such as shopping areas, the Contractor shall take appropriate precautions in accordance with the Specification for CONTROL OF TRAFFIC to keep pedestrians off tack coated areas. ***Pedestrian Control***

C245.24 LAYING

(a) Paver

1. The paver(s) shall be expected to have a minimum spreading capacity of 50 tonnes of asphalt per hour and be capable of spreading a width of at least 3.7m to the requirements of this Specification. It shall be expected to have automatic screed control operated from joint matching shoe, fixed line, travelling straight edge or levelling beam. The Contractor shall provide the Superintendent with notice of proposed pavers without these capabilities and obtain Superintendent's agreement to their use. ***Capacity of Configuration***

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(b) Laying Operations

1. The work shall be so arranged as to keep the number of joints, both longitudinal and transverse to a minimum. ***Joint Layouts***

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^{o}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. ***Hand Spreading***

7. Asphalt shall not be placed when the surface of the pavement is wet or while rain appears imminent. ***Adverse Conditions***

8. AS 2734 shall constitute a valid reference of good practice for asphalt laying practice.

(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 C245.8. ***Limits***

2. For asphalt made with other binders complying with Clause C245.10(b) or C245.10(c), the minimum asphalt temperature for laying shall be as directed by Table C245.6 or based upon manufacturer's instruction. ***Other Binders***

3. The Superintendent may not allow asphalt to be laid outside the specified limits for wind velocities as specified in Clause C245.26. ***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 of open graded asphalt shall not exceed 140^{o}C unless a polymer modified binder is used in which case the Superintendent shall adopt the temperature based on manufacturer's instruction. Any asphalt exceeding this temperature shall be rejected. ***Excessive Heating***

6. The laying temperature shall be measured in the paver hopper. A suitable stem type thermometer readable and accurate to within plus or minus 2^{o}C with a range from at least 0^{o}C to 200^{o}C shall be used. The stem shall be inserted into the asphalt to a depth of approximately 200mm at a location at least 300mm from the side of the paver. The average of two readings shall be adopted as the temperature of the mix. Measurements of asphalt and road surface temperatures and wind velocity to comply with this Clause shall be recorded on the Asphalt Work Record Sheet. ***Temperature Determination***

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Binder Type	Road Surface Temperature in Shade (^oC)	Minimum Asphalt Temperatures (^oC) for Laying		
		Layer Thickness Less than 30mm	Layer Thickness 30mm to 45mm	Layer Thickness 45mm to 100mm
Class 170	5-10	*	*	145
&	10-15	150#	145##	140
Class 320	15-25	145#	140##	135
Bitumen	over 25	140	135	130
SBS polymer	15-25	NA	160	155
modified bitumen **	over 25	NA	150	150

NOTE: * Layers thinner than 45mm shall not be placed when the pavement temperature is below 10^oC for dense graded and polymer modified asphalt mixes and 15^oC for all open graded asphalt.

** For other polymers the minimum temperatures as directed by the Superintendent.

Laying not permitted if wind velocity across the pavement exceeds 5 km/hr.

Laying not permitted if wind velocity across the pavement exceeds 15 km/h.

Table C245.8
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 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. ***Corrective 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 10m long and, as required by the Superintendent, a joint matching shoe. When identified in the Project Quality Plan and/or approved in writing by the Superintendent, small areas (as defined) may be paved as wearing course without the use of levelling beam. ***Wearing Course***

(e) Layer Thickness

1. The compacted thickness of each course shall be as shown on the Drawings. A course may comprise one or more layers. The nominal compacted layer thickness shall be in accordance with Table C245.9. ***Nominated Layer Thickness***

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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
5	10 to 25	Corrective course
10	20 to 35	Corrective course
14	30 to 45	Corrective course
20	40 to 70	Corrective course

Table C245.9 - Course and Layer Thickness

C245.25 JOINTS

(a) General

1. The location of longitudinal and transverse joints shall be as approved by the Superintendent and at the spacing nominated in the Drawings. All joints shall be compacted and finished with a smooth, planar surface coinciding with, and being of similar appearance to the remainder of the layer. ***Density at Joints***

(b) Longitudinal Joints

1. 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. Longitudinal joints shall be: ***Joint Matching Device***

(a) continuous and parallel.
(b) coincident within 150mm of line of change in crossfall.
(c) offset by at least 150mm from joints in underlying layers.
(d) located away from traffic wheel paths.
(e) located beneath proposed traffic linemarkings in the case of a wearing course.

2. Work shall be arranged to avoid longitudinal joint faces being left exposed overnight. ***Overnight Exposure***

3. When pavers are laying asphalt in echelon, the hot joint so produced shall be constructed by leaving an uncompacted strip approximately 150mm 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. ***Paving in Echelon***

4. A joint shall be considered 'cold' when the temperature of the asphalt has dropped below 60^{o}C for dense graded mix and below 50^{o}C for open graded mix. Cold joints will require tack coating. ***Cold Joint***

(c) Transverse Joints

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. ***Location***

2. Transverse joints shall be at right angles to the direction of laying. They shall be ***Staggered***

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staggered by at least 1.0m between successive layers and between adjacent runs. ***Layers***

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 layer 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. ***Feathered Edge***

4. 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 C245.9. ***Matching Existing Surface***

COMPACTION

C245.26 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 should be as shown in Table C245.10. ***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***

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 C245.10- Minimum Roller Combinations for Compaction

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C245.27 DENSE GRADED ASPHALT

(a) Initial Rolling

1. 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***

2. 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***

3. The transverse and longitudinal joints and edges shall be compacted first. ***Priority***

4. Initial rolling shall be completed before the bitumen asphalt temperature falls below 105^{o}C, or 120^{o}C for polymer modified asphalt. ***Temperature Level***

(b) Secondary Rolling

1. Secondary rolling shall immediately follow initial rolling. In secondary rolling, static steel rollers or pneumatic tyred rollers shall be used. The tyre pressures of pneumatic tyred rollers should equal or exceed 550 kilopascals. Rolling shall commence at the longitudinal joint side of the run. ***Roller Types and Tyre Pressures***

2. Secondary rolling shall be completed before the mix temperature falls below 80^{o}C. ***Temperature Level***

(c) Final Rolling

1. Final rolling shall be carried out by a pneumatic tyred roller 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***

2. Final rolling shall be completed before the asphalt temperature falls below 60^{o}C. ***Final Rolling***

C245.28 OPEN GRADED ASPHALT

1. All rolling of open graded asphalt shall be with static steel rollers. The minimum number of rollers shall be in accordance with Table C245.10. Only initial and final rolling shall be required. ***Roller Type***

2. Compaction methods shall be in accordance with AS 2734, Section 8. ***Number of Passes***

3. All rolling shall be completed while the asphalt temperature is neither less than 90^{o}C nor more than 110^{o}C. ***Rolling Temperature***

C245.29 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, bony material or exhibiting excessive binder shall be excluded from the lot and shall be rectified by the Contractor before being tested. ***Statistical Basis***

2. When directed by the Superintendent the Contractor shall arrange for the determination of the relative compaction of the lot by either of the following methods: ***Relative Compaction***

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(a) Cores

(i) The cores shall be taken on a random basis acceptable to the Superintendent and have density tests performed on the cores in accordance with Test Method AS 2891.9.3. The layer thickness shall be deemed to be the mean thickness of the cores. The testing shall be undertaken at a laboratory with appropriate NATA accreditation.

(b) Nuclear Density Meter Determination

(i) 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.

(ii) 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. Records of nuclear density meter readings shall clearly locate the test position to allow calibration by core testing subsequently if required. The layer thickness shall be deemed to be the nominal layer thickness. The proposed correlation shall be submitted to the Superintendent for approval.

Relative Compaction

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 AS 2891.9.3, and reported as a percentage of the mean laboratory density.

Limitations on Compaction Testing

4. No cores or nuclear density measurements shall be taken within 150mm of a joint or free edge unless directed by the Superintendent, layers less than 30mm in thickness are not tested for compaction as the test results are not reliable for such samples.

Minimum Relative Compaction

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

C245.30 FINISHED PAVEMENT PROPERTIES

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

C245.31 THICKNESS

Measurement

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

(a) No Finished Surface Levels Specified

Calculated Average Compacted Thickness

1. 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 C245.11.

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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 C245.11
Tolerance for Course Thickness

(b) Finished Surface Levels Specified

1. 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 C245.12.

2. When the Contractor also constructs the underlying pavement, the level and thickness of the asphalt shall comply with the requirements of Table C245.11.

C245.32 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 C245.12.

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 C245.12 - Tolerance for Course Levels

2. Surface irregularities exceeding the tolerances given in this Clause shall be corrected to the satisfaction of the Superintendent at the Contractor's cost before a subsequent course is placed. ***Surface Irregularities***

C245.33 SHAPE

1. The surface shall not deviate from the bottom of a 3m long straightedge laid in any direction by more than the tolerances shown in Table C245.13. ***Tolerances***

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Course	Deviation from 3m straight edge (mm)
Corrective Course	15
Intermediate Course	10
Wearing Course	10

Table C245.13- Deviation from 3m Straightedge

2. Surface irregularities exceeding the tolerances given in Table C245.13 for a particular course shall be corrected to comply with Table C245.13 before a 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 3m straightedge do not exceed the tolerance specified in Table C245.13 for an intermediate course. Compliance with Table C245.13 shall be confirmed by the Superintendent where the existing surface has been provided by others. ***Surface Irregularities***

C245.34 VOIDS

1. For dense graded asphalt mixes having voids outside the limits specified in Table C245.2, the deductions shown in Clause C245.41 may apply when approved by the Superintendent. ***Limits on Voids***

C245.35 REMOVAL AND REPLACEMENT OF REJECTED MATERIAL

1. The sections of work that have been rejected under the preceding clauses of this Specification or as otherwise determined by the Superintendent shall be removed within 15 days from the work and replaced with fresh asphalt mix material corresponding in grade and quality to that material specified in the Nominated Mix unless otherwise approved by the Superintendent. ***Time Limit***

2. If removal of the single nonconforming pavement strata is impossible, the effected area as determined by the Superintendent shall be removed to subbase or subgrade depth as appropriate to provide a smooth level surface on which to found the reinstated base and/or subbase course. ***Removal Depth***

3. The perimeter of the nonconforming area shall be prepared in accordance with the practice pertaining to longitudinal and transverse cold joints (AS 2734). ***Perimeter***

4. In rejected sections the material is to be removed over the full length of the affected area except that a minimum length of 5m and a minimum width equal to the paver width shall be removed. ***Length to be Removed***

5. Any damage to abutting layers, structures or utilities shall be rectified by the Contractor. All rectification costs shall be borne by the Contractor. ***Contractor's Cost***

6. The Superintendent shall have the right to alter the constitution, quality, grading, or other parameters of the 'Reinstatement Pavement' if it is felt that reconstruction of the effected area with the Approved Mix would produce nonconforming pavement as a result of non-continuous pavement structure. ***Altered Design***

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7. After removal of the rejected base or subbase course the area shall be made available to the Superintendent for inspection and approval to proceed with the works. This action constitutes a **HOLD POINT**. Superintendent inspection and approval is required prior to release of hold point. ***HP***

8. All materials used in the reinstatement of the nonconforming area shall comply with the requirements of this Specification unless otherwise directed by the Superintendent. ***Replacement Material***

9. All costs associated with removals, testing and corrections of base and subbase course and extra costs incurred by the Contractor in respect of delays caused by such removals, replacements and corrections shall be borne by the Contractor. All costs associated with the removal testing and correction of non-conforming pavement shall be borne by the Contractor. ***Contractor's Costs***

SPECIAL REQUIREMENTS

C245.36 RESERVED

C245.37 RESERVED

C245.38 RESERVED

C245.39 RESERVED

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LIMITS AND TOLERANCES

C245.40 SUMMARY OF LIMITS AND TOLERANCES

1. The limits and tolerances applicable to the various clauses of this Specification are summarised in Table C245.14 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	**Coarse Aggregate**		
	(a) Wet Strength	>100kN for any fraction other than the open graded asphalt where wet strength is to be >150kN	C245.08(a)
	(b) Wet/Dry Strength Variation	<35%	C245.08(a)
	(c) Particle Shape	Proportion retained on 9.50mm AS sieve: <35% for calliper ratio 2:1 <10% for calliper ratio 3:1	C245.08(a)
	(d) Fractured Faces	Proportion 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.	C245.08(a)
	(e) Polished Aggregate Friction Value (PAFV)	> minimum value of 44	C245.08(a)
2.	**Fine Aggregate**	Shall meet the requirements as specified for Coarse Aggregate (Item 1) above.	C245.08(b)
3.	**Polymer Modified Bitumens**		
	(a) Specified Properties	As per Table C245.1	C245.10(d)
4.	**Reclaimed Asphalt Pavement**		
	(a) Proportion of RAP	<20% by mass	C245.13
5.	**Design of Nominated Mix**		
	(a) Dense Graded Limits	As per Table C245.2	C245.14
	(b) Open Graded Limits	As per Table C245.3	C245.14
6.	**Production Mix Variation**		
	(a) Dense Graded Asphalt	As per Table C245.4	C245.16
	(b) Open Graded Asphalt	As per Table C245.5	C245.16
7.	**Asphalt**		
	(a) Moisture Content	< 0.5% by mass	C245.17

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Item	Activity	Limits/Tolerances	Spec Clause
8.	**Temperatures for Manufacture of Asphalt**		
	(a) Binder Temperature	As per Table C245.6	C245.17
	(b) Asphalt Temperature	As per Table C245.6	C245.17
9.	**Preparation of Pavement**		
	(a) Cleaning of Surface	>300mm beyond the edge of proposed layer	C245.21
10.	**Tack Coat**		
	(a) Bitumen Emulsion	Application Rate > 0.10 and < 0.20 litres per square metre	C245.23
11.	**Laying**		
	(a) Paver Capacity	>50 tonnes asphalt per hour	C245.24(a)
	(b) Spread Width	>3.7m	C245.24(a)
	(c) Laying in Echelon	Distance between pavers is such that temperature of asphalt at edge (or laid by leading paver) is >80^{o}C when following paver matches the longitudinal joint.	C245.24(b)
	(d) Laying Temperature		
	(i) Open Grade AC	<140^{o}C	C245.24(c)
	(ii) Dense Grade AC	As per Table C245.8	C245.24(c)
	(e) Level Control		
	(i) Levelling Beam for Corrective Course	>10m length	C245.24(d)
	ii) Levelling Beam for Wearing Course	>10m length	C245.24(d)
	(f) Course and Layer Thickness	Nominal size mix and compacted layer thickness as per Table C245.9.	C245.24(e)
12.	**Longitudinal Jointing**		
	(a) Change in Crossfall	Within 150mm of line of change.	C245.25(b)
	(b) Where Underlying Layers	Offset at least 150mm from joints in underlying layers.	C245.25(b)
13.	**Transverse Jointing**		
	(a) Where Underlying Layers	Stagger to be >1m between successive layers and adjacent runs.	C245.25(c)
14.	**Compaction**		

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Item	Activity	Limits/Tolerances	Spec Clause
	(a) Dense Graded Asphalt	Initial Rolling: To be completed before asphalt temperature falls below 105°C or 120°C for polymer modified asphalt.	C245.27(a)
		Secondary Rolling: Tyre pressures on pneumatic rollers to be ≥550kPa. Rolling to be completed before the asphalt temperature falls below 80°C.	C245.27(b)
		Final Rolling: Rolling to be completed before asphalt temperature falls below 60°C.	C245.27(c)
	(b) Open Graded Asphalt	Rolling to be completed while asphalt temperature is >90°C and <110°C.	C245.28
	(c) 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.	C245.29
15.	**Finished Pavement**		
	(a) Thickness	Max. compacted thickness tolerance as for Table C245.11. Where finished surface levels are specified, thickness shall be >90% of specified and level shall comply with requirements of Table C245.12.	C245.31
	(b) Shape	Shall not deviate from bottom of 3m straight edge by more than tolerance in Table C245.13.	C245.33

Table C245.14 - Summary of Limits & Tolerances

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MEASUREMENT AND PAYMENT

C245.41 DEDUCTIONS

1. 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 dense graded 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 Collector Arterial and Industrial Road mixes and 2-6% for the Local and Residential Road mixes. Deductions shown in Table C245.14 may be applied by the Superintendent to Schedule Pay Items C245(b), (c) or (d) as appropriate.

(b) Aggregate Grading and Binder Content

(i) For asphalt having aggregate grading or binder content outside the limits specified in Table C245.2 and C245.3, the asphalt shall be rejected and removed from the site.

Mix Type by Road Type	Calculated Mean Laboratory Voids Result (%) for a lot reported to 0.1% before rounding		Deduction (%)
(refer Table C245.2)	Modified Hubbard-Field Method	Marshall Method	
Collector Arterial and Industrial Mix	4 3.0 - 3.9 <3.0	4 3.0 - 3.9 <3.0	NIL 20% REJECT
Collector Arterial and Industrial Mix	7 7.1 - 7.5 7.6 - 8.0 >8.0	6 6.1 - 6.5 6.6 - 7.0 >7.0	NIL 10% 20% REJECT
Local and Residential Mix	3 2.0 - 2.9 <2.0	3 2.0 - 2.9 <2.0	NIL 20% REJECT
Local and Residential Mix	6 6.1 - 6.5 6.6 - 7.0 >7.0	5 5.1 - 5.5 5.6 - 6.0 >6.0	NIL 10% 20% REJECT

Table C245.15 - Deductions for Voids (% of Schedule Rate)

C245.42 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(g) inclusive.

2. A lump sum price for any of these items shall not be accepted.

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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. Provision for traffic shall be measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.

Pay Item C245(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 and provision of a blinded surface where determined by the Superintendent.

Pay Item C245(b) DENSE GRADED ASPHALT IN INTERMEDIATE COURSES

C245(b)(1) 5mm Nominal Size
C245(b)(2) 10mm Nominal Size
C245(b)(3) 14mm Nominal Size
C245(b)(4) 20mm Nominal Size

1. The unit of measurement shall be tonnes confirmed by weighbridge dockets.

2. The schedule rate under this item shall include all operations involved in the supply, spreading and compaction of the asphalt.

3. A separate unit rate shall be included in the Schedule of Rates for each nominal size of asphalt specified.

Pay Item C245(c) DENSE GRADED ASPHALT IN WEARING COURSE

C245(c)(1) 10mm Nominal Size
C245(c)(2) 14mm Nominal Size
C245(c)(3) 20mm Nominal Size
C245(c)(4) Residential Type A
C245(c)(5) Residential Type B
C245(c)(6) Residential Type R

1. The unit of measurement shall be tonnes confirmed by weighbridge dockets.

2. The schedule rate under this item shall include all operations involved in the supply, spreading and compaction of the asphalt.

3. A separate unit rate shall be included in the Schedule of Rates for each nominal size of asphalt specified.

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Pay Item C245(d) DENSE GRADED ASPHALT OVER AN EXISTING PAVEMENT

C245(d)(1) 5mm Nominal Size
C245(d)(2) 10mm Nominal Size
C245(d)(3) 14mm Nominal Size

1. The unit of measurement shall be tonnes confirmed by weighbridge dockets.

2. The schedule rate under this item shall include all operations involved in the supply, spreading and compaction of the asphalt.

3. A separate unit rate shall be included in the Schedule of Rates for each nominal size of asphalt specified.

Pay Item C245(e) OPEN GRADED ASPHALT IN WEARING COURSE

C245(e)(1) 10mm Nominal Size
C245(e)(2) 14mm Nominal Size

1. The unit of measurement shall be tonnes confirmed by weighbridge dockets.

2. The schedule rate under this item shall include all operations involved in the supply, spreading and compaction of the asphalt.

3. A separate unit rate shall be included in the Schedule of Rates for each nominal size of asphalt specified.

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COUNCIL ***ANNEXURE C245A***

ASPHALT WORK RECORD

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

Road Name: _____ Supplier: _____ From: _____ *(Crossroad or landmark)* towards _____

Road No: _____ Job No: _____ PMS/MMS Segment Numbers: _____

Plan No: _____ Mix Type: _____ New Surfacing ☐ Resurfacing ☐ Existing Surface Type: _____

Delivery								**Paving**										**Remarks**
Load No.	Time			Truck Reg'd No.	Docket No.	Nett Mass (t)	Mix Temperature Ex paver	Chainage		Paved Width (m)	Direction with or against chainage	Dist. from left edge to centre of run (m)	Thickness (mm)	Layer			Sample No. & Lot Size (tonnes) if sampled	Weather Work Stoppages, Start & Finish etc.
	Depot Plant	Arrive Job	Depart Job					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 _____ Sheet No.

Location _____ Road No._____ PMS/MMS Segment Nos._____ of ____ Sheets

Course	Type and Nom Size of Asphalt	Type and Grade of Binder	Compacted thickness of course (mm)	Minimum Delivery Rate (per hr)	Delivery Trucks to be Insulated* (Yes/No)	Pavers in Echelon Required (Yes/No)	Level Control Device Required			
							Fixed Wire String Line with Support Intervals (m)	Levelling Beam	Joint Matching Shoe	Automatic Crossfall Control
Wearing										
Intermediate 1										
Intermediate 2										
Intermediate 3										
Intermediate 4										
Correction 1										
Correction 2										
Drainage Layer										

(TO BE ISSUED BY SUPERINTENDENT FOR EACH SEPARABLE PART)

ANNEXURE C245C

ASPHALT AND BINDER TYPES

1. Nominal sizes of asphalt required for this contract (tick box) and enter binder type:

AC TYPE	BINDER
AC 5 ☝	
AC 10 ☝	
AC 14 ☝	

AC TYPE	BINDER
AC 20 ☝	
AC 28 ☝	
AC 40 ☝	

AC TYPE	BINDER
Type A ☝	
Type B ☝	
Type R ☝	

OG ASPHALT TYPE	BINDER
OG 10 ☝	
OG 14 ☝	

OG ASPHALT TYPE	BINDER
OG 28 ☝	
OG 40 ☝	

Binder Types: Class 170 A3L
Class 320 A3R

2. Specific Sampling and Testing Requirements differing from those shown in Table C245.7 shall apply to the mixes annotated by an asterisk (*) in the above tabulation.
Testing Frequency:_____ Referee Sampling Frequency_____ (eg 1/50T)

3. Nomination of aggregate pretreatment procedure if required by Superintendent:

_____

_____

4. Special aggregate mixes required for this contract: (Nominate Source)

_____

_____

5. Requirements for removal of thermoplastic or other line marking:

_____

6. Requirement for Preparation of Surface Hold Point

Refer Clause C245.23 PREPARATION OF PAVEMENT ☐1 ☐2
Yes *No*

AUS-SPEC #1

SPECIFICATION C245
ASPHALTIC CONCRETE

AUS-SPEC #1

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ANNEXURES

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