



Construction Specification for Civil Works

C245 Asphaltic Concrete

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This Specification includes a series of Annexures that detail Project Specific Requirements

GENERAL

C245.01 SCOPE

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 Works.

Extent of Work

Asphalt produced to the requirements of this Specification is not routinely 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 Constructor's work shall include:

- (a) Sampling and testing of materials and the design of asphalt mixes required for the works.
- (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.

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in *CQC-Quality Control Requirements Sub-Annexure B7*.

Quality

C245.02 DEFINITIONS

The Works – Defined as follows:

The Works

- **Developer Infrastructure Works** - work includes subdivisions and any public infrastructure work associated with an approved Development in the ARC local government area requiring a construction certificate.
- **Contracted Works** – infrastructure work undertaken by a Principal Contractor or subcontractor formally appointed by ARC and supervised by ARC.
- **Internal Works** - infrastructure work undertaken by ARC's day labour workforce.

Constructor – Defined as the organisation responsible for construction of the Works and the Principal Contractor as defined in the *Work Health and Safety Act 2011*.

Constructor

ARC Representative – Defined as follows:

ARC Representative

- **Developer Infrastructure Works** – Nominated ARC officer(s) for the approved Development.
- **For Contracted Works** – the Superintendent.
- **For Internal Works** – ARC Asset Owner.

Constructor's Representative – Defined as follows:

Constructor's Representative

- **Contracted Works** – the Principal Contractor's nominated representative as per the relevant contract.
- **Internal Works** – ARC officer responsible for delivery.

Developer's Representative– Defined as the person or organisation appointed by the Developer to administer the Constructor responsible for the delivery of Developer Infrastructure Works.

Developer's Representative

C245.03 REFERENCE DOCUMENTS

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**

Where not otherwise specified in the relevant Armidale Regional Council (ARC) Construction Specifications or the approved design drawings, the Constructor shall use the latest versions of the Reference documentation, including amendments and supplements, listed in the ARC Construction Specifications at the time of the Works approval.

Currency

(a) Armidale Regional Council (ARC) Specifications

- C201 - Control of Traffic.
- CQC - Quality Control Requirements

**ARC
Specifications**

(b) Australian Standards

References in this Specification or on the approved design drawings to Australian Standards are noted by their prefix AS or AS/NZS.

**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.
- 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) Transport for NSW (TfNSW) Publications

- RMS Test Method T640 - Resistance to Stripping Test.

**RMS Test
Methods**

(d) AUSTRROADS

- 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.

**Austrroads
Publications**

MBT 31 - Softening Point Test for Polymer Modified Binders

AP-T04 - Austroads Specification Framework for Polymer Modified Binders (June 2000).

(e) Other Publications

ARC Engineering Design Code.

Other Publications

C245.04 PLANT

The Constructor shall provide all the plant, equipment and labour necessary for carrying out the work in accordance with this Specification.

Constructor's Responsibility

All plant and equipment used for the work shall be in accordance with the Constructor's submitted quality documentation and kept in good operating condition. The Constructor shall not use in the Works any plant or equipment demonstrated to be faulty in operation so as to adversely impact the product quality or unsafe in operation as assessed by the ARC Representative and the Developer's Representative (for Developer Infrastructure Works).

Plant to be Suitable

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

C245.05 PROTECTION OF SERVICES AND ROAD FIXTURES

The Constructor 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 Constructor shall clean off or remove any such material as directed by the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) and leave the services and road fixtures in a condition satisfactory to the ARC Representative.

Constructor's Responsibility

C245.06 CONTROL OF TRAFFIC

The Constructor shall provide for traffic in accordance with the requirements of C201 – Control of Traffic while undertaking the work.

Provision for Traffic

Any costs incurred as a result of the supply of labour and materials complying with C201 – Control of Traffic shall be borne by the Constructor.

Constructor's Cost

The Constructor 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 and workers.

Delays

C245.07 WORK RECORDS

Particulars of the work performed shall be recorded by the Constructor on the Asphalt Work Record attached as **Annexure C245A** or as per the Constructor's own procedures where equivalent. The Constructor shall complete the Asphalt Work Record, which shall be countersigned by the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) each day as a true record of the work performed. A copy shall be supplied to the ARC Representative.

Asphalt Work Record

Delivery dockets stating the mass of each truck load of asphalt shall be attached to the Asphalt Work Record.

Delivery Dockets

MATERIALS

C245.08 GENERAL

Unless otherwise directed by this Specification, materials or mix ingredients shall be sampled in accordance with AS 2891.1. **Sampling**

The types of asphalt and binder required for the works as stated in **Annexure C245C**.

C245.09 AGGREGATES

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

Coarse aggregate shall comply with AS 2758.5 and comprise all mineral matter retained on a 4.75 mm AS 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**

The grading of the coarse aggregate used in the work shall be determined in accordance with AS 1141.11. **Grading**

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

(b) Wet/Dry Strength Variation - AS 1141.22.

Shall not exceed 35% for any fraction or constituent.

(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% using a calliper ratio of 2:1 and shall not exceed 10% 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% by mass of particles with at least two (2) fractured faces and when used in the wearing course shall have at least 90% by mass of particles with at least one (1) fractured face. The area of each fractured face shall be a significant proportion of the total surface area of the particle.

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

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**

If the Constructor proposes to blend two (2) or more fine aggregates from different sources to provide the Nominated Mix, then Test Reports for each constituent material **Test Requirements**

shall be submitted separately.

C245.10 MINERAL FILLER

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**

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

C245.11 BINDER

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 C245.11(b) or C245.11(c). **Bitumen Quality**

(a) Bitumen

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

(b) Other Binders

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

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

Polymer modified bitumens (PMBs) shall be nominated by the pavement designer in accordance with *Austrroads Specification AP-T04* to indicate type and grade and entered into **Annexure C245C** as per the site-specific requirements. Typical PMBs and key performance parameters are indicated in Table C245.1. The use of PMBs in a nominated asphalt mix is considered as an extension of the nomination of a compliant mix as set out in Clause C245.15 of this Specification. **Polymer Modified Binder**

The binder shall be pumped and stored at the manufacturer's recommended temperatures. **Storage Temperature**

For PMBs, 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**

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. **Constructor's Responsibility**

Test	A30P	A15E	Test Method
Consistency on ER at 60°C (Pa.s)	1500 min	8000 min	MBT 21
Torsional Recovery at 25°C (%)	12 min	58 min	MBT 22
Viscosity at 165 °C (Pa.s)	0.75 max	0.9 max	MBT 11
Softening Point °C	60 min	82 min	MBT 31

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, unless otherwise specifically required by the test method.

Table C245.1 - Typical Specified Properties for PMBs for Roads with less than 600 commercial vehicles per lane per day.

Hubbard-Field and Marshall stability requirements shown in Table C245.2 shall not apply when a PMB binder is nominated in the mix design.

C245.12 BITUMEN ADHESION AGENT

A bitumen adhesion agent, if required, shall be added to the binder. Details of the proposed bitumen adhesion agent shall be submitted for the ARC Representative'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% to 1.0% by mass of the binder.

Approval

C245.13 BITUMEN EMULSION

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

Type

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

C245.14 RECLAIMED ASPHALT PAVEMENT (RAP)

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

RAP Percentage

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 Works. Any change in RAP supply shall be brought to the attention of the ARC Representative at least five (5) working days prior to proposed usage in asphalt for the Works.

RAP Source

ASPHALT MIX DESIGN

C245.15 NOMINATED MIX

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

Design

The Constructor 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 the same laboratory. The Certificate shall confirm that the required testing has been carried out in the twelve (12) month period before the date of submission to the ARC Representative and the Developer's Representative (for Developer Infrastructure Works).

**NATA
Laboratory
Tests**

HOLD POINT

Details of the Nominated Mix shall be submitted to the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) at least ten (10) working 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.

PROCESS HELD: Approved Mix.

Hold Point

The Constructor 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

If any revision of the Nominated Mix is necessary, then the costs associated with the revision and associated testing of the revised Nominated Mix in accordance with this Clause shall be borne by the Constructor.

**Revised Mix
Constructor's
Cost**

Property	Requirements						
	Moderately High Traffic Roads (Collector, Arterial & Industrial)				Local Residential Roads**		
	Nominal Size of Asphalt				Type A	Type B	Type R
Aggregate Passing AS Sieve (% by mass)	5mm (AC5)	10mm (AC10)	14mm (AC14)	20mm (AC20)			
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°	0.6-1.2°	0.6-1.2°	0.6-1.2°	0.6-1.2°	0.6-1.2°	0.6-1.2°
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. Approval from the ARC Representative 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.

° Higher filler/binder ratios may be approved by the ARC Representative 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 (Open G10)	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 (OG) Asphalt

C245.16 APPROVED MIX

When a Nominated Mix has been approved by the ARC Representative and the Developer's Representative (for Developer Infrastructure Works), it shall be known as the 'Approved Mix'. Work shall not commence until an asphalt mix has been approved by the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) upon inspection of all relevant NATA documentation as required by this Specification (Refer Clause C245.15).

Hold Point

The Constructor shall not make any changes to the Approved Mix, or constituent materials without the prior written approval of the ARC Representative and the Developer's Representative (for Developer Infrastructure Works). If any such change is proposed, then the Constructor shall provide details of the Nominated Mix and materials, in accordance with Clause C245.15.

Changes to Approved Mix

Notwithstanding any approval given by the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) to a proposed asphalt mix, the Constructor shall be responsible for producing asphalt which satisfies all requirements of this Specification.

Constructor's Responsibility

C245.17 REQUIREMENTS OF PRODUCTION MIX

Asphalt produced in the plant and delivered to the site shall be known as the **Production Mix** 'Production Mix'.

The Production Mix shall comply with the materials and mix requirements cited in this Specification as assurance to the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) of quality processes and materials. In addition, the Production Mix shall display the following key performance requirements at delivery and during laying:

- (a) The Production Mix shall not show evidence of segregation of aggregate after mixing, transport or paving.
- (b) Production 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 Constructor's expense.
- (c) The workability and compactability of the Production Mix as delivered shall be consistent and compatible with the capacity of paving and compaction equipment on site.

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

Asphalt produced in the plant shall comply with "voids" requirements set out in Table C245.2.

Production Mix Properties	Allowable Variations from Approved Mix *	
Nominated Mix Type (see Table C245.2)	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 *	
	OG10 & OG14	OG28 & OG40
Nominated Mix Type (refer Table C245.3)		
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 (OG) Asphalt - Variation of Production Mix

PRODUCTION

C245.18 MIXING PROCEDURE

(a) Plant

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

Characteristics

(b) Inspection of Mixing Plant

The ARC Representative and the Developer's Representative (for Developer Infrastructure Works), 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 Constructor's Project Quality Plan. The ARC Representative shall have the right to declare any non-conformance and shall be entitled to request correction of either the Constructor's Project Quality Plan or both.

Access

(c) Temperature

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 C245.11, the temperatures shall be in accordance with manufacturer's recommendation.

Temperatures

In special cases, the ARC Representative 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 C245.25(c) for the appropriate road surface temperature and layer thickness.

Limits

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

The asphalt produced in a drum mixing plant shall have a moisture content not greater than 0.5% 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
Min. Binder Temp. (°C) *	140	140	180	115	115
Max. Binder Temp. (°C)	165	170	190	165	170
Min. Asphalt Temp. (°C) *	140	140	150	125	125
Max. Asphalt Temp. (°C)	165	170	165	140	140

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

Table C245.6 - Temperatures for Manufacture of the Asphalt

(d) Mixing Time

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

Uniform Coating

(e) Storage of Asphalt

Asphalt may be stored in an insulated storage bin prior to delivery. Asphalt which has been stored for more than 24 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) Constructor's Laboratory

The Constructor 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

The Constructor shall make the laboratory available for inspection by the ARC Representative at any time during the course of the works.

Inspection

All documented test results shall be submitted to the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) for inspection and approval in a format and to a timetable suitable to the ARC Representative and the Developer's Representative (for Developer Infrastructure Works).

Submission of Test Results

The cost of testing required by this Specification shall be borne by the Constructor.

Constructor's Cost

C245.19 SAMPLING AND TESTING OF PRODUCTION MIX

(a) Responsibility for Sampling

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

Constructor's Responsibility and Costs

(b) Frequency of Sampling

For the purpose of testing Production Mix, the Constructor 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.

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”.

Where ARC 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**. Referee samples are to be taken, secured and labelled for identification in sealed containers by the asphalt supplier and made available under ARC’s instruction for confirmation testing if required.

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

Additionally, the Resistance to Stripping Test, *RMS Test Method T640*, shall be carried out on all Production Mixes at a frequency of one (1) 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% for all mixes. Where Tensile Strength Ratio is between 70 and 80%, corrective action shall be proposed by the Constructor including corrections to the mix design. Such advice shall be provided by the Constructor within a period of 48 hours from a result in the range 70 to 80% which is deemed marginal.

Stripping

(c) Sampling

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

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

Registered Laboratory

The cost of such testing shall be borne by the Constructor.

Constructor's Costs

TRANSPORT

C245.20 GENERAL

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. **Release Agent**

During transport, asphalt shall be covered with a canvas or other suitable cover which is held down securely. **Cover of Load**

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°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. **Long Distance**

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

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

PLACING

C245.21 GENERAL

The type and size of asphalt and the surface levels and thickness for each layer of asphalt shall be as shown on the approved drawings and to be nominated in **Annexure 245B** by the Constructor. **Schedule of Details**

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 ARC Representative, spreading and compaction will be adversely affected. **Weather Conditions**

The ARC Representative and the Developer's Representative (for Developer Infrastructure Works) may order work to cease temporarily on account of adverse weather, unsatisfactory pavement surface condition, or other circumstance which the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) feels may adversely affect the subsequent operations. **Temporary Suspension of Work**

C245.22 PREPARATION OF PAVEMENT

(a) Cleaning of Surface

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 ARC Representative and the Developer's Representative (for Developer Infrastructure Works). Whilst preparing the surface the Constructor shall be responsible for compliance with environmental requirements including but not limited to prevention of materials from entering stormwater drains and dust. **Requirement**

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

The Constructor, 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 Constructor will mark up the pavement to re-establish such positions using conventions agreed with the ARC Representative and to a standard adequate to allow accurate re-establishment of line marking.

Line marking

(b) Rectification of Pavement Surface

The Constructor shall repair any damage to the existing pavement surface caused by the Constructor's activities. Affected areas designated by the ARC Representative shall be removed and reinstated to the ARC Representative's satisfaction. The cost of repairing such damage shall be borne by the Constructor.

Constructor's Responsibility, Constructor's Cost

Surface depressions of greater depth than twice the permissible tolerance (specified in Clause C245.32) 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 ARC Representative's satisfaction.

Correction Courses

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 ARC Representative. Preparation of the affected area to the satisfaction of the ARC Representative shall constitute a **HOLD POINT**. Subsequent inspection and ARC Representative's approval of surface condition shall be required prior to the release of the hold point.

Optional HP

C245.23 TACK COAT

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 ARC Representative.

Placement

The bitumen emulsion shall be applied at a rate of between 0.10 litres/m² and 0.20 litres/m² of undiluted bitumen.

Application Rate

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

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

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

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, safety barriers or bridge handrails. Appurtenances susceptible to overspray shall be protected with suitable paper.

Surface Protection

When trucks or other vehicles are likely to move from tack coated areas onto adjacent finished surfaces, the ARC Representative may require that the finished surfaces be suitably protected from carryover of bituminous material.

Truck Movements

In locations of heavy pedestrian traffic, such as shopping areas, the Constructor shall take appropriate precautions in accordance with C201 – *Control of Traffic* to keep pedestrians off tack coated areas.

Pedestrian Control

C245.24 LAYING

(a) Paver

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 Constructor shall provide the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) with notice of proposed pavers without these capabilities and obtain the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) agreement to their use.

Capacity of Configuration

(b) Laying Operations

The work shall be so arranged as to keep the number of joints, both longitudinal and transverse to a minimum and outside of wheel paths.

Joint Layouts

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

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

Unless otherwise approved by the ARC Representative, 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

The ARC Representative may approve spreading asphalt by hand for minor correction of the existing surface and in areas inaccessible to mechanical pavers.

Hand Spreading

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

Adverse Conditions

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

(c) Laying Temperature

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. Measurement may be made by calibrated infra-red thermometers when accepted by both the Constructor and the ARC Representative.

Limits

For asphalt made with other binders complying with Clause C245.11(b) or C245.11(c), the minimum asphalt temperature for laying shall be as directed by Table C245.6 or based upon manufacturer's instruction.

Other Binders

The ARC Representative and the Developer's Representative (for Developer Infrastructure Works) shall not allow asphalt to be laid outside the specified limits for wind velocities as specified in Clause C245.26.

Outside Specified Wind Velocities

The ARC Representative and the Developer's Representative (for Developer Infrastructure Works) 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

The laying temperature of open graded asphalt shall not exceed 140°C unless a polymer modified binder is used in which case the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) shall adopt the temperature based on manufacturer's instruction. Any asphalt exceeding this temperature shall be rejected.

Excessive Heating

The laying temperature shall be measured in 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 200mm at a location at least 300mm from the side of the paver. The

Temperature Determination

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.

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

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

** For other polymers the minimum temperatures as directed by the ARC Representative.

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

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

Table C245.8 - Minimum Asphalt Temperatures for Laying

(d) Level Control

The following minimum requirements shall be observed for level control. The procedure shall be reported to the ARC Representative and the Developer’s Representative (for Developer Infrastructure Works) at least one (1) working day in advance of operations at any site. Additional controls may be necessary to obtain the required finished pavement properties.

Minimum

Target levels will be established on site by way of pegs, stringline, wire or previously constructed kerb and gutter (channel) or similar physical longitudinal control. Such target levels will be made available for the ARC Representative’s inspection.

Level Control

Corrective course shall be automatically controlled by programmed computer control of the paver, joint matching shoe or stringline sensor. Where the correction is only minor, the ARC Representative may allow the use of levelling beams.

Corrective Course

Intermediate courses shall be automatically controlled by programmed computer control of the paver or a joint matching shoe.

Intermediate Course

The wearing course shall be controlled by levelling beams or a joint matching shoe. When identified in the Constructor’s Project Quality Plan and/or approved by the ARC Representative, small areas (as defined) may be paved as wearing course to target levels indicated by pegs or pavement markings.

Wearing Course

The Constructor is at all times responsible for selection of the procedure for paving subject to the minimal requirements set out in this Clause. The Constructor’s procedure shall ensure the accuracy of the resultant pavement levels and their compliance with the approved design drawings or documented requirements.

Level Accuracy

(e) Layer Thickness

The compacted thickness of each course shall be as shown on the approved design drawings. A course may comprise one or more layers. The nominal compacted layer thickness adopted in designs or instructions shall be in accordance with Table C245.9.

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	50 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

Minimum compacted thickness and maximum compacted thickness for each asphalt layer as constructed shall be in accordance with the requirements set out in **Annexure C245C** for each work site.

C245.25 JOINTS

(a) General

The location of longitudinal and transverse joints shall be as approved by the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) and at the spacing nominated in the approved design 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

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 pavement markings in the case of a wearing course.

Work shall be arranged to avoid longitudinal joint faces being left exposed overnight.

Overnight Exposure

When pavers are laying asphalt so as to produce "hot joint", this joint 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.

Hot Joint

A joint shall be considered 'cold' when the temperature of the asphalt has dropped below 60°C for dense graded mix and below 50°C for open graded mix. Cold joints will require tack coating.

Cold Joint

(c) Transverse Joints

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

Transverse joints shall be at right angles to the direction of laying. They shall be staggered by at least 1m between successive layers and between adjacent runs.

Staggered Layers

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

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

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

Compaction Fleet

For compaction of confined areas or patching works a small vibrating roller, or hand operated vibrating compactor acceptable to the ARC Representative and the Developer's Representative (for Developer Infrastructure Works) shall be used.

Confined Areas

As a minimum practical compaction fleet, the Constructor shall provide one (1) vibrating steel roller and one (1) pneumatic tyred roller. Additional rollers and roller size shall be determined by the Constructor so as to meet the criteria for compaction and nominated in the Constructor's Project Quality Plan.

C245.27 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.

Priority

Initial rolling shall be completed before the 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. 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

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 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.

Final Rolling

C245.28 OPEN GRADED ASPHALT

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

Compaction methods shall be in accordance with AS 2734, Section 8.

Number of Passes

All rolling shall be completed while the asphalt temperature is neither less than 90°C nor more than 110°C.

Rolling Temperature

C245.29 ACCEPTANCE CRITERIA FOR COMPACTION

The acceptance for compaction shall be on a lot by lot basis where each day's work is generally one (1) 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 Constructor before being tested.

Statistical Basis

When directed by the ARC Representative, the Constructor shall arrange for the determination of the relative compaction of the lot by either of the following methods:

Relative Compaction

(a) Cores

- (i) The cores shall be taken on a random basis acceptable to the ARC Representative 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 Constructor 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 ARC Representative for approval.

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.

Relative Compaction

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

Limitations on Compaction Testing

The minimum Relative Compaction of all values within a lot of dense graded asphalt shall be 95% for a layer of thickness less than 50mm or 96% for a layer of thickness of 50mm or greater.

Minimum Relative Compaction

C245.30 FINISHED PAVEMENT PROPERTIES

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

C245.31 THICKNESS

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

(a) No Finished Surface Levels Specified

When asphalt is placed over an existing pavement in one or more courses, the calculated average compacted thickness of each course, except any approved corrective course, shall be in accordance with the course thickness specified in the approved design drawings and tolerances indicated in Table C245.10. *Calculated Average Compacted Thickness*

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

Table C245.10 - Tolerance for Course Thickness

(b) Finished Surface Levels Specified

When asphalt is placed in more than one course to specified levels over a pavement built by others, each course (excluding a corrective course) shall be placed in accordance with this Clause provided that the thickness of the wearing course shall be not less than 90% of that specified and the level of the wearing course shall comply with the limits shown in Table C245.11.

When the Constructor also constructs the underlying pavement, the level and thickness of the asphalt shall comply with the requirements of Table C245.10.

C245.32 LEVEL

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 approved design drawings by more than the limits shown in Table C245.11.

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 C245.11 - Tolerance for Course Levels

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

C245.33 SHAPE

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 C245.12. *Tolerances*

Course	Deviation from 3m Straight Edge (mm)
Corrective Course	15
Intermediate Course	10
Wearing Course	10

Table C245.12 - Deviation from 3m Straightedge

Surface irregularities exceeding the tolerances given in Table C245.12 for a particular course shall be corrected to comply with Table C245.12 before a subsequent course is placed. When the Constructor 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 C245.11 shall apply provided the deviations of the existing surface from a 3m straight edge do not exceed the tolerance specified in Table C245.12 for an intermediate course. Compliance with Table C245.12 shall be confirmed by the ARC Representative where the existing surface has been provided by others.

Surface Irregularities

C245.34 VOIDS

For dense graded asphalt mixes having voids outside the limits specified in Table C245.2, the Defects Liability Period or Maintenance Bond Period for Developer Infrastructure may be extended at the discretion of the ARC Representative.

Limits on Voids

C245.35 REMOVAL AND REPLACEMENT OF REJECTED MATERIAL

The sections of work that have been rejected under the preceding clauses of this Specification or as otherwise determined by the ARC Representative shall be removed within fifteen (15) working 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 ARC Representative.

Time Limit

If removal of the single nonconforming pavement strata is impossible, the affected area as determined by the ARC Representative, 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

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

Perimeter

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

Any damage to abutting layers, structures or utilities shall be rectified by the Constructor. All rectification costs shall be borne by the Constructor.

Constructor's Cost

The ARC Representative 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 affected area with the Approved Mix would produce nonconforming pavement as a result of non-continuous pavement structure.

Altered Design

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

Hold Point

All materials used in the reinstatement of the nonconforming area shall comply with the requirements of this Specification unless otherwise directed by the ARC Representative.

Replacement Material

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

Constructor's Costs

LIMITS AND TOLERANCES

C245.36 SUMMARY OF LIMITS AND TOLERANCES

The limits and tolerances applicable to the various clauses of this Specification are summarised in Table C245.13.

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.	C245.09(a)
	(b) Wet/Dry Strength Variation	< 35%.	C245.09(a)
	(c) Particle Shape.	Proportion retained on 9.50mm AS sieve: <ul style="list-style-type: none"> < 35% for calliper ratio 2:1. < 10% for calliper ratio 3:1. 	C245.09(a)
	(d) Fractured Faces	Proportion retained on 6.70mm AS sieve: <ul style="list-style-type: none"> > 75% of mass with at least 2 fractured faces. When used as a wearing course, shall have at least 90% by mass with at least 1 fractured face. 	C245.09(a)
	(e) Polished Aggregate Friction Value (PAFV)	> minimum value of 44.	C245.09(a)
2	Fine Aggregate		
	Fine Aggregate	Shall meet the requirements as specified for Coarse Aggregate as per Item 1 above.	C245.09(b)
3	Polymer Modified Bitumens		
	(a) Specified Properties	As per Table C245.1.	C245.11(c)
4	Reclaimed Asphalt Pavement		
	(a) Proportion of RAP	< 20% by mass.	C245.14
5	Design of Nominated Mix		
	(a) Dense Graded Limits	As per Table C245.2.	C245.15
	(b) Open Graded Limits	As per Table C245.3.	C245.15
6	Production Mix Variation		
	(a) Dense Graded Asphalt	As per Table C245.4.	C245.17
	(b) Open Graded Asphalt	As per Table C245.5.	C245.17
7	Asphalt		
	(a) Moisture Content	< 0.5% by mass.	C245.18
8	Temperatures for Manufacture of Asphalt		
	(a) Binder Temperature	As per Table C245.6.	C245.18
	(b) Asphalt Temperature	As per Table C245.6	C245.18
9	Preparation of Pavement		

Item	Activity	Limits/Tolerances	Spec Clause
	(a) Cleaning of Surface	> 300mm beyond the edge of proposed layer.	C245.22
10	Tack Coat		
	(a) Bitumen Emulsion	Application Rate > 0.10 and < 0.20 litres/m ²	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 Temperature		
	(i) Open Grade AC	< 140°C.	C245.24(c)
	(ii) Dense Grade AC	As per Table C245.8.	C245.24(c)
	(d) 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		
	(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 and rolling to be completed before the asphalt temperature falls below 80°C.	C245.27(b)
		Final 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		
15.	(a) Thickness	Maximum compacted thickness tolerance as per 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 C245.13 - Summary of Limits & Tolerances

ANNEXURE 245B - SCHEDULE OF DETAILS

Pavement Type _____

Sheet No. ____ of ____ Sheets

Location _____

Road No. _____

Segment Nos. _____

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)	Specific Control Method (when required)
Wearing						
Intermediate 1						
Intermediate 2						
Intermediate 3						
Intermediate 4						
Correction 1						
Correction 2						
Drainage Layer						

TO BE PROVIDED TO THE ARC DEVELOPER AND/OR DEVELOPER'S REPRESENTATIVE (FOR DEVELOPER INFRASTRUCTURE WORKS BY THE CONSTRUCTOR FOR EACH LOT

This is the last page of the document.