



Australian Asphalt Pavement Association

Performance-based Airport Asphalt Model Specification

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Preface

This AAPA national model specification is intended as a guide for asset owners in the creation of technical specifications for the supply of 14 mm maximum sized airport asphalt mixes. The design criteria in this model specification were widely consulted and are based on best current practice. The document brings together years of experience with the supply of asphalt surfacing for airports in Australia.

The content of this specification builds on information traditional specifications maintained by various Government Roads and Aerodromes Branches, practices recommended by the US Federal Aviation Administration, as well as contemporary asphalt research in Australia and overseas.

Acknowledgements

The development of this model specification is a result of a collaborative effort between representatives from Airport Companies, Consultants and the Asphalt Industry. The specification document was drafted by the University of the Sunshine Coast.

Disclaimer

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

Suggestions for improvements are welcomed, please forward suggestions to the AAPA head office using the contact details provided at aapa.asn.au.

Performance-based Airport Asphalt Specification

Preamble

This specification is for the supply and construction of nominal 14 mm maximum sized airport asphalt surfaces design based on performance properties. The intent is to allow asphalt suppliers more flexibility to innovate for better performing asphalt surfaces in return to performance guarantees regarding the asphalt and its construction. The specification is based on dense graded asphalt for surface and near-surface layers. Alternate asphalt types are not covered by this specification.

The following complimentary elements are recommended to be provided for in the tender documents and/or the contract documents, however it is noted that this Preamble is not part of the technical Specification and therefore these items do not form part of the Specification:

- **Preliminaries.** An overarching specification containing preliminary requirements including:
 - Access and security.
 - Laydown and site compound requirements.
 - Working hours and restrictions.
- **Tender schedules.** The tender schedules are recommended to require the Contractor to provide the following documentation as part of the tender, which should form a significant component of the non-cost evaluation of tenders and any issues or anomalies should form part of the contractual negotiation, noting that when a tender is accepted, these items should also be deemed to be accepted (where they are submitted with the tender), unless agreed through tender negotiations to be modified or rejected (and presumably re-priced) as a tender clarification:
 - Mixture Design Report (as detailed in 6.3 Mixture Design Procedure).
 - Construction Procedures (as detailed in 4.6 Construction Procedures).
 - Inspection and Test Plans (as detailed in 4.3 Inspection and Test Plans).
- **Contract form.** The Works Contract should be a Design and Construction or be a Construct Only contract with provision for the asphalt mixture to be designed by the Contractor.
- **Fully compliant tender.** The works tender should require a fully-compliant submission, with any deviation addressed through alternate offers. Permitting deviation from the requirements of this specification is recommended within the compliant tender offer.
- **Warranty Schedule.** The Works Contract should include a warranty schedule for a performance guarantee by the Contractor.
- **Risk and Maintenance Pricing.** The tender pricing schedules should require the tenderer to transparently identify dollar values for risks associated with compliance with this specification, the performance guarantee and the provision of maintenance services during the performance period.
- **Maintenance provisions.** The Works Contract should include a provision for the Contractor to be involved in the planning and/or execution of maintenance during the warranty period.
- **Prerequisites to Completion.** The Works Contract should mandate, as a minimum, submission to the Principal of the following, as prerequisites to granting of Practical Completion or Completion, as defined in the Works Contract:
 - All complete Lot submissions (as detailed in Clause CI 26).
 - All complete Process Control Records (as detailed in 4.4 Process Control Records) in Excel format.
 - Surface completion certification (as detailed in 12.5 Completion Certification).
 - Retained bitumen sample register (as detailed in Clause CI 202 a).

Due to the intended requirement for tenderers to include mixture designs, construction procedures and ITPs in the tender submission, a minimum of eight weeks (excluding the period 20 December to 10 January) should be provided for tendering.

The cost of preparing performance-based asphalt mixture designs during the tender period is significant for tendering organisations. It is recommended where mixture designs are required to be included in tenders, the airport considers providing financial compensation to the short-list of companies invited to tender. It is recommended that \$10-20 k per tenderer is appropriate.

It must be recognised that this specification covers only the design, production and construction of the asphalt surface layer(s). Where distress results from structural pavement failure, deficiency in underlying pavement layers or gross overloading of the pavement, the performance guarantee associated with this specification likely to be voided.

This specification is intended to make the Contractor responsible for self-delivery of the works to a high quality. The Principal should, directly or utilising the assistance of an external professional services provider, administer the Contractor and superintend the works. This includes the provision of a full-time and suitably experienced presence on site during all work periods to release Hold Points and Witness Points and to verify the Contractor undertakes all sampling and testing requirements within the specification and the approved Construction procedures.

This specification requires the Contractor to retain and deliver to the Principal binder samples collected throughout the works. These samples should be retained by, or on behalf of, the Principal, for a period of five years (the Performance Period). The Principal should maintain a covered and secure facility for binder sample storage and retain a register of all samples.

It is emphasised that the above contractual and tendering recommendations are intended to provide guidance for airports, and their representatives, procurement airport asphalt based on this Specification. However, this Preamble does not perform part of the Specification and the above recommendations are in no way mandatory or binding.

The Specification also includes a number of testing requirements where the limit is 'report only'. In some cases, this relates to mixture design parameters to which tolerances are applied during construction but in other cases the results are intended to allow a catalogue of airport asphalt data that will allow future research and specification refinement in the future. At no stage should a specific project or airport apply limits to items that are specified as 'report only'.

This Specification was prepared collaboratively between asphalt contractors, design consultants and airport company representatives. It is intended to present industry best practice for airport asphalt design, production and construction and to reduce the risk of failures to the extent reasonably practicable. However, like any Specification or Standard, its use can not guarantee the avoidance of defects or distresses in the resulting product.

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Performance-based Airport Asphalt Specification

Specification

1. Scope

1.1. General

CI 1. This specification sets out the performance requirements for the design, materials, manufacture, supply, placement, compaction, quality assurance and acceptance for airport asphalt surface layer(s). The Contractor is responsible for the design of the asphalt mixture and guarantees the performance of the asphalt surface layer(s) for the performance period.

1.2. Contractor’s responsibilities

CI 2. Without limiting the Contractor’s liabilities, the Contractor is responsible for the:

- a. Supply of all materials, labour, plant and equipment.
- b. Asphalt mixture design.
- c. Production and construction trials.
- d. Asphalt production and process control testing.
- e. Delivery, paving, compaction and finishing of asphalt.
- f. Achieving all compliance requirements.
- g. Repair or replacement of rejected asphalt.
- h. Protection and cleaning of the pavement during construction.
- i. Monitoring the asphalt throughout the performance guarantee period.

1.3. Basis of asphalt performance requirement

CI 3. The most critical regular aircraft expected to utilise the aircraft pavement being surfaced or resurfaced is prescribed in the Project Particulars. Occasional use of the aircraft pavement being surfaced or resurfaced may also be made by the alternate aircraft prescribed in the Project Particulars.

CI 4. The surface layer of asphalt may be grooved for aircraft skid resistance. Where prescribed in the Project Particulars, the asphalt mixture must be resistant to groove closure. Underlying layers of asphalt will not be grooved.

2. Definitions

CI 5. Table 1 defines terms utilised in this specification.

Table 1 Definition of Terms

Term	Definition
AASHTO	American Association of State Highway and Transportation Officials
AC	Advisory Circular
AS	Australian Standard
BBI	Boeing Bump index
Contractor	The Contractor responsible for the design, supply, production, construction of the asphalt surface layer(s)
Principal	The asset owner or other entity, or their contractually nominated representative, responsible for contracting the Contractor to perform the works, as may be defined by the Works Contract.
ITP	Inspection and Testing Plan
MOS	Manual of Standards
MSDS	Material Safety Data Sheet
NATA	National Association of Testing Authorities
NZS	New Zealand Standard

Term	Definition
Performance guarantee	The Contractor's guarantee that the asphalt will not suffer from significant, excessive and life shortening rutting, shoving, cracking or ravelling during the performance period.
Performance period	Five years from the date of Practical Completion or Completion, as defined in the contract
RAP	Recycled Asphalt Pavement
TSR	Tensile Strength Ratio
VFB	Voids Filled with Binder
VMA	Voids in the Mineral Aggregate
Works Contract	Overarching contract for the construction works

3. Reference document

CI 6. Table 2 summarises documents referenced in this specification.

Table 2 Referenced Documents

Document	Description
AC 150/5380-9	Federal Aviation Administration, Advisory Circular Number 150/5380-9, Guidelines and Procedures for Measuring Airfield Pavement Roughness
AASHTO TP 70	Standard Method of Test for Multiple Stress Creep Recovery (MSCR) Test of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)
AG:PT/T101	Method of Sampling Polymer Modified Binders, Polymers and Crumb Rubber
AG:PT/T111	Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel)
AG:PT/T122	Torsional Recovery of Polymer Modified Binders
AG:PT/T131	Softening Point of Polymer Modified Binders
AGPT/T190	Specification Framework for Polymer Modified Binders
AG:PT/T231	Deformation Resistance of Asphalt Mixtures by the Wheel Tracking Test
AG:PT/T232	Stripping Potential of Asphalt - Tensile Strength Ratio
AG:PT/274	Characterisation of Flexural Stiffness and Fatigue Performance of Bituminous Mixes
AS 1141.5	Methods for sampling and testing of aggregates Particle density and water absorption of fine aggregate
AS 1141.6.1	Methods for sampling and testing aggregates - Particle density and water absorption of coarse aggregate
AS 1141.11	Methods for sampling and testing aggregates Particle size distribution - Sieving method
AS 1141.12	Methods for sampling and testing of aggregates Materials finer than 75 micrometre in aggregates (by washing)
AS 1141.15	Methods for sampling and testing aggregates Flakiness index
AS 1141.22	Methods for sampling and testing aggregates Wet/dry strength
AS 1141.23	Methods for sampling and testing aggregates Los Angeles value
AS 1141.24	Methods for sampling and testing aggregates Aggregate soundness - Evaluation by exposure to sodium sulphate solution
AS 1141.26	Methods for sampling and testing aggregates Secondary minerals content in basic igneous rocks
AS 1141.32	Methods for sampling and testing aggregates Weak particles (including clay lumps, soft and friable particles) in coarse aggregates
AS 1160	Bituminous emulsions for the construction and maintenance of pavements
AS 1289.1.4.2	Methods of testing soils for engineering purposes Sampling and preparation of soils - Selection of sampling or test sites - Stratified random number method
AS 1672.1	Limes and limestones Limes for building
AS 2008	Bitumen for pavements
AS 2150	Hot mix asphalt - A guide to good practice
AS/NZS 2891.1.1	Methods of sampling and testing asphalt Sampling - Loose asphalt

Document	Description
AS/NZS 2891.2.2	Methods of sampling and testing asphalt Sample preparation - Compaction of asphalt test specimens using a gyratory compactor
AS/NZS 2891.3.1	Methods of sampling and testing asphalt Binder content and aggregate grading - Reflux method
AS/NZS 2891.3.2	Methods of sampling and testing asphalt Binder content and aggregate grading - Centrifugal extraction method
AS/NZS 2891.3.3	Methods of sampling and testing asphalt Binder content and aggregate grading - Pressure filter method
AS/NZS 2891.5	Methods of sampling and testing asphalt Compaction of asphalt by Marshall method and determination of stability and flow - Marshall procedure
AS/NZS 2891.7.1	Methods of sampling and testing asphalt Determination of maximum density of asphalt - Water displacement method
AS/NZS 2891.7.2	Methods of sampling and testing asphalt Determination of maximum density of asphalt - Trichloroethane displacement method
AS/NZS 2891.8	Methods of sampling and testing asphalt Voids and volumetric properties of compacted asphalt mixes
AS/NZS 2891.9.1	Methods of sampling and testing asphalt Determination of bulk density of compacted asphalt - Waxing procedure
AS/NZS 2891.10	Methods of sampling and testing asphalt Moisture content of asphalt
AS/NZS 2891.13.1	Methods of sampling and testing asphalt Determination of the resilient modulus of asphalt - Indirect tensile method
AS/NZS 2891.14.2	Methods of sampling and testing asphalt Field density tests - Determination of field density of compacted asphalt using a nuclear thin-layer density gauge
AS 3582.1	Supplementary cementitious materials for use with portland and blended cement Fly ash
ISO 9001	Quality management systems – Requirements
ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories
MOS 139	Manual of Standards Part 139 - Aerodromes, Civil Aviation Safety Authority

4. Quality Plan requirements

4.1. General

CI 7. The Contractor must maintain a quality system with regard to the constituent materials, production of asphalt and construction of the asphalt surface, as well as the conformance testing.

CI 8. The quality system must be certified as compliance with ISO 9001 or equivalent.

CI 9. The Contractor must produce, maintain and follow a quality plan for the supply of constituent materials, production and construction of asphalt, as well as any maintenance (where applicable) of the surface during the performance period.

CI 10. All laboratory testing required as a part of this specification must be undertaken by a laboratory holding ISO/IEC 17025 (NATA) accreditation for the applicable test methods. For test methods that are not included in the Contractor's NATA accreditation, the Contractor must submit a test method statement and details of the technician's experience for approval by the Principal.

4.2. Hold and Witness Points

CI 11. The mandatory Hold and Witness Points listed in Table 3 apply to the work covered by this specification and must be incorporated into the Contractor's ITPs.

CI 12. Where prescribed in the Project Particulars, additional Hold and Witness Points are mandatory for this project.

Table 3 Summary of Mandatory Hold and Witness Points

Clause	Hold Point	Witness Point
CI 14	ITP submission	
CI 61	Tack coat materials details	
CI 68	Mixture design changes	
CI 81	Mixture Design Report	
CI 122	Production and Construction Trial report	
CI 133	Steps to rectify non-conforming asphalt production	
CI 137	Cold weather paving plan	
CI 138	Existing surface inspection	
CI 198		Point of delivery binder sampling
CI 204	Point of delivery binder testing results	
CI 216		Rolling patterns
CI 216		Surface texture away from joints
CI 216		Surface texture at joint
CI 257	Point of delivery binder testing out of tolerance disposition	

4.3. Inspection and Test Plans

CI 13. The Contractor must prepare one or more ITPs covering all quality requirements of the supply of constituent materials, production of asphalt and construction of the asphalt surface, as well as the conformance testing.

CI 14. Not less than 14 days prior to the Asphalt Production trial (8.2 Asphalt Production trial), the Contractor must submit templates of all ITPs to the Principal. **HOLD POINT**.

CI 15. Within seven days of submission, the Principal will either approve or reject (for modification or resubmission) the Contractor's ITP templates.

CI 16. Each Lot of asphalt must have a separate set of ITP(s) completed by the Contractor.

CI 17. The ITPs must include all Hold and Witness Points required by this specification, as well as general construction quality processes, including but not limited to:

- a. Aggregate supply, stockpiling, sampling and testing.
- b. Bitumen supply, handling, heating/re-heating, sampling, testing or sample storage.
- c. Existing surface inspection and preparation.
- d. Texturing/milling, cleaning and tack coating.
- e. *Asphalt production, handling, transportation to site, sampling and testing.*
- f. *Asphalt delivery to the paver, paving, rolling and finishing.*

4.4. Process Control Records

CI 18. Process Control Reports tabulate of graph one or more particular material or mixture properties over the duration of the project.

CI 19. Process Control Records must be prepared and maintained by the Contractor for constituent material properties, mixture production properties and asphalt construction parameters with specification limits of production tolerances under this specification, including but not limited to:

- a. Coarse Aggregate properties (Table 12):
 - i. For each aggregate fraction, the percentage of material passing the 0.075 mm AS sieve.

- ii. For each aggregate fraction, the percentage of material passing the 4.75 mm AS sieve.
 - iii. For each aggregate fraction of nominal 10 mm maximum size and larger, the percentage of material passing the 6.7 mm AS sieve.
 - iv. For each aggregate fraction of nominal 14 mm maximum size and larger, the percentage of material passing the 9.5 mm AS sieve.
- b. Fine Aggregate properties (Table 14):
 - i. For each aggregate fraction, the percentage of material passing the 0.075 mm AS sieve.
 - ii. For each aggregate fraction, the percentage of material passing the 0.300 mm AS sieve.
 - iii. For each aggregate fraction, the percentage of material passing the 1.18 mm AS sieve.
- c. Modified Binder production properties reported on the production certificate of compliance, (0 11.2.4.1 Certificate of Compliance) and as a minimum:
 - i. Viscosity at 165°C.
 - ii. Torsional recovery at 25°C, 30 s.
 - iii. Softening point.
- d. Modified Binder additional production properties (0 11.2.4.2 Addition Production Testing) reported on the test certificate:
 - i. Jnr(0.1) at 64 C, 70 C and 76 C.
 - ii. Jnr(3.2) at 64 C, 70 C and 76 C.
- e. Modified Binder Point of Delivery Properties (0 11.2.4.4 Point of delivery testing):
 - i. Viscosity at 165°C.
 - ii. Torsional recovery at 25°C, 30 s.
 - iii. Softening point.
- f. Asphalt mixture properties (Clauses CI 210 and CI 214):
 - i. Percentage of the combined aggregate passing each AS sieve.
 - ii. Maximum density.
 - iii. Binder content.
 - iv. Air Voids content.
 - v. VMA and VFB.
 - vi. Moisture content
 - vii. Marshall Stability.
 - viii. Marshall Flow.
- g. Surface construction parameters (Clauses CI 219 and CI 220):
 - i. Individual test location air voids content away from joints.
 - ii. Individual test location air voids content on longitudinal joints.
 - iii. Average Lot air voids content away from joints.
 - iv. Average Lot air voids content on longitudinal joints.

CI 20. Process Control Records may be either Process Control Charts or Process Control Registers, or a combination of the two, as detailed in the detailed in the approved Construction Procedures.

CI 21. Process Control Registers must include:

- a. Results for individual tests.
- b. Average of individual test results by Lot, where applicable.
- c. Specification limits, where applicable.

- d. Mixture design target values, where applicable.
- CI 22. Process Control Charts must indicate:
- a. Results for individual tests.
 - b. Mean, Standard Deviation and Coefficient of Variation over the progress of the job.
 - c. Average of individual test results by Lot, where applicable.
 - d. Specification limits, where applicable.
 - e. Mixture design target values, where applicable.
- CI 23. Process Control Records must be updated and submitted to the Principal not less than once per week.

4.5. Lots

- CI 24. A Lot is a portion of material or a section of the works which has been supplied, produced and constructed to the same mixture design, under essentially uniform construction conditions and contains material of essentially uniform quality.
- CI 25. A Lot of asphalt must not exceed that produced and constructed in a single work shift.
- CI 26. The Contractor must submit a Lot Submission to the Principal within 48 hours of completion of each Lot of asphalt. The Lot Submission must include, as a minimum but not limited to:
- a. Lot identification number and plan indicating the location of the Lot within the works.
 - b. Date, weather conditions, timing of works.
 - c. Paving plan and traceability of asphalt deliveries to the asphalt surface.
 - d. Constituent material production test results for materials incorporated into the Lot.
 - e. Compliance testing results applicable to Constituent Materials, Asphalt Production and Surface Construction, but excluding Surface Completion.
 - f. Summary of non-compliances, including disposition, prevention and remedial actions.
 - g. Demonstrative photographs of non-compliances or other issues arising.

4.6. Construction Procedures

- CI 27. The Contractor must prepare detailed Construction Procedures and submit to the Principal not less than 14 days prior to the Asphalt Production Trial (8.2 Asphalt Production trial).
- CI 28. The Principal will approve or reject (for modification or resubmission) the Construction Procedures within seven days of receipt.
- CI 29. The Construction Procedures must cover all the Contractor's activities regarding the supply and management of materials, production and construction, including but not limited to:
- a. Aggregate supply:
 - i. Aggregate supplier(s) and location.
 - ii. Crushing and screening processes.
 - iii. Pre-delivery production testing.

- iv. Delivery handling and stockpile management.
- v. Sampling for compliance testing.
- b. Reclaimed asphalt pavement management:
 - i. Source and type of RAP.
 - ii. Crushing, screening and homogenisation processes.
 - iii. Stockpile management.
 - iv. Testing to ensure no adverse impact on asphalt properties.
- c. Added filler supply:
 - i. Supplier and location.
 - ii. Delivery and handling.
- d. Bitumen supply:
 - i. Unmodified bitumen supplier and location.
 - ii. Modified bitumen production plant and location.
 - iii. Pre-delivery production testing.
 - iv. Modified bitumen handling and transportation processes and timing.
 - v. Delivery transfer to asphalt production plant processes.
 - vi. Point of delivery storage (where applicable) handling, re-heating (where applicable), sampling and testing.
 - vii. Reject and Investigate tolerances for point of delivery testing results.
- e. Asphalt production:
 - i. Details of Asphalt Production and Construction trials, including timing, location, volumes and testing.
 - ii. Asphalt production plant details.
 - iii. Asphalt production plant calibration procedures and frequencies.
 - iv. Asphalt contamination management procedures.
 - v. Production temperatures.
 - vi. Production rates and times in relation to paving operations.
 - vii. Asphalt sampling and testing procedures.
 - viii. Details and number of trucks for delivery of asphalt to the paving operation.
- f. Surface construction:
 - i. Particular procedures for any patching or correction layers.
 - ii. List of construction equipment, including cold planers, pavers and rollers.
 - iii. Paving plans, including run lengths, run widths and sequences.
 - iv. Joint plans, including hot, warm and cold joints, as well as joint treatment.
 - v. Rolling processes, including patterns and sequencing behind paving.
- g. Compliance testing:
 - i. List of equipment for testing.
 - ii. Location and details of testing laboratory(s).
 - iii. Details of Friction Survey, including provider and equipment.
 - iv. Details of survey and BBI determination, including providers and methods.

CI 30. Where applicable, multiple methods must be detailed if different procedures are proposed for different areas of stages or the works.

CI 31. The Contractor must maintain the Construction Procedures throughout the work, including amendment following completion and approval of the Production Trial and Construction Trial.

CI 32. Any time that the Contractor changes the Construction Procedures, the proposed change must be submitted to the Principal without delay and the Principal must accept or reject the change without unreasonable delay.

5. Constituent Materials

5.1. General

CI 33. The asphalt mixture must incorporate coarse aggregate, fine aggregate, added filler (optional), binder and additives (optional) conforming with this specification. RAP may also be incorporated up to the maximum percentage (by mass of the aggregate) as prescribed in the Project Particulars.

CI 34. The Contractor must select the constituent materials to achieve the asphalt performance requirements.

5.2. Reclaimed Asphalt Pavement

CI 35. Mixture designs may include RAP up to portion prescribed in the Project Particulars, for the surface and sub-surface layers respectively.

CI 36. RAP may contain a combination of material obtained from milling or excavation of existing asphalt layers and asphalt discarded during production. RAP must be free of foreign material such as unbound granular base, broken concrete, or other contaminants. Asphalt containing tar must not be used.

CI 37. RAP must be crushed, homogenised and screened.

CI 38. RAP must be stored in stockpiles not exceeding 1,000 tonne and separately metered into the mixing process. The aggregate particles in the RAP must be 100% passing the 13.2 mm AS sieve.

CI 39. Management of RAP must be detailed in the Construction Procedures. The plan must include a statement detailing how variations in the aggregate grading, binder content and moisture content of the RAP material will be controlled, such that it will not affect the asphalt properties.

CI 40. The properties of the RAP material shown in Table 4 must be reported for every stockpile.

Table 4 RAP Characterisation Tests

Property	Test Method	Requirement
Binder content and grading	AS/NZS 2891.3.1, or AS/NZS 2891.3.2, or AS/NZS 2891.3.3	Report only
Moisture content	AS/NZS 2891.10	Report only

5.3. Coarse aggregate

CI 41. Coarse aggregate comprises particles retained on the 4.75 mm AS sieve.

CI 42. Coarse aggregates must be crushed from fresh quarried natural rock.

CI 43. The coarse aggregates must consist of clean, sound, hard, dense and durable fragments of uniform quality which are free from adherent coatings of dust, clay and silt and free from soft or weathered particles, organic matter and other deleterious material.

CI 44. Each coarse aggregate fraction must conform with the requirements in Table 5.

Table 5 Coarse Aggregate Tests and Test Limits

Test Property	Test Method	Requirement for Compliance
Particle Density Coarse Aggregate	AS 1141.6.1	Not less than 2300 kg/m ³
Water Absorption	AS 1141.6.1	Not more than 2.0%
Material Finer than 0.075 mm in Aggregates (by washing)	AS 1141.12	Not more than 2.0% for 10 mm and larger fractions Not more than 3.0% for 7 mm and larger fractions
Flakiness index (nominal 10 mm and larger maximum sized aggregate fractions)	AS 1141.15	Not more than 25%
Soundness (using Sodium Sulphate)	AS 1141.24	Not more than 3%
Wet Strength	AS 1141.22	Not less than 150 kN
Wet/Dry Strength Variation	AS 1141.22	Not more than 30%
Los Angeles Value	AS 1141.23, B or K Grading	Not more than 25% loss
Secondary Mineral Content	AS 1141.26	Not more than 20% (Basic rock types only)
Friable Particles	AS 1141.32	Not more than 0.2%

5.4. Fine aggregate

CI 45. Fine aggregate must consist of clean, non-plastic, sound, dense and durable particles free from coatings of dust, clay or silt or other matter deleterious to asphalt, the majority of which passes the AS 4.75 mm sieve and is retained on the AS 0.075 mm sieve.

CI 46. Natural sand must consist of grains of quartz or other hard durable rock, free from lumps of clay, organic matter and other deleterious matter. Fine natural sands must be washed.

CI 47. Crushed fine aggregate must consist of crushed natural stone from a source that complies with the coarse aggregate requirements given in Table 5 for:

- a. Particle Density Coarse Aggregate.
- b. Water Absorption.
- c. Soundness (using Sodium Sulphate).
- d. Wet Strength.
- e. Wet/Dry Strength Variation.
- f. Los Angeles Value.
- g. Secondary Mineral Content.

CI 48. Each fraction or source of crushed fine aggregate and natural sand must conform with the requirements given in Table 6.

Table 6 Individual Source Fine Aggregate requirements

Test Property	Test Method	Requirement for Compliance
Particle Density Fine Aggregate	AS 1141.5	Not less than 2300 kg/m ³
Water Absorption for: Crushed aggregate Uncrushed aggregate	AS 1141.5	Not more than 2.5% Not more than 2.0%
Soundness (using Sodium Sulphate)	AS 1141.24	Not more than 3%
Plasticity Index	AS 1289.3.3.1	Non-plastic

CI 49. Where one or more of the crushed fine aggregate sources do not meet the Plasticity Index requirement in Table 6, the combined fine aggregate must be non-plastic when tested in accordance with AS 1289.3.3.1.

5.5. Added filler

CI 50. Each type of added filler from each source must be mineral material, dry and free from lumps, organic material or other deleterious matter.

CI 51. Where used, added filler may be a Hydrated Lime (Calcium Hydroxide) conforming with the requirements of AS 2150 and AS 1672.1.

CI 52. Where used, added filler may be a fine or medium grade Fly Ash conforming with the requirements of AS 3582.1.

5.6. Binder

CI 53. Binder is to be modified with either elastomeric, or plastomeric polymers, or a combination of the two, manufactured from refined bitumen conforming to the requirements of AS 2008.

CI 54. The Contractor must nominate any existing or bespoke binder to meet the asphalt performance requirements.

5.7. Additives

CI 55. A warm mix asphalt additive (including bitumen foaming) may be added to the asphalt to assist the Contractor in achieving the asphalt performance and production requirements.

CI 56. The type and proportion of the warm mix additive must not adversely impact the performance of the asphalt mixture.

CI 57. An approved liquid anti-stripping agent may be added to the asphalt.

CI 58. The type and proportion of the adhesion agent must not adversely impact the performance of the asphalt mixture.

5.8. Tack coat

CI 59. Between the surface layer and the underlying layer, tack coat must be a modified bitumen emulsion nominated by the Contractor.

CI 60. Between the second and subsequent underlying layers, tack coat must be either rapid setting cationic bitumen emulsion conforming with the requirements of AS 1160 or the modified bitumen emulsion specified at Clause CI 59.

CI 61. Not less than 14 days prior to the Asphalt Production trial (8.2 Asphalt Production trial), the Contractor must submit details of the proposed tack coat materials to the Principal. **HOLD POINT**.

CI 62. Details must include the product type(s) or name(s), MSDS, technical specifications and nominated production test properties and limits.

CI 63. Within seven days of submission, the Principal will either approve or reject (for modification or resubmission) the Contractor's nominated tack coat.

CI 64. The submitted production test properties and limits nominated by the Contractor for the approved tack coat material(s) must be reflected in the production compliance requirements of the ITPs.

6. Mixture design

6.1. General

CI 65. The Contractor must design the asphalt mixture by incorporating coarse aggregate, fine aggregate, binder, added filler (optional) and additives (optional) conforming with this specification.

CI 66. The combined aggregate must be designed from not less than four size fraction, nominally:

- a. 14 mm.
- b. 10 mm.
- c. 7 mm.
- d. Fine aggregate.

CI 67. The Contractor must design the asphalt mixture to meet the performance requirements and other properties detailed in this specification.

6.2. Changes in Mixture Design

CI 68. Any change in the constituent materials or mixture design, occurring between the mixture design submission and the completion of all asphalt production, must be immediately reported to the Principal. The Contractor must detail the proposed mixture design verification testing to ensure that the performance of the asphalt has not been adversely impacted by the change. **HOLD POINT**.

CI 69. Within 24 hours of receipt of the Mixture Design report, the Principal will either accept the Contractor's proposal, or require the Contractor to undertake and resubmit a new Mixture Design Report, as detailed in Clauses CI 83 and CI 84.

CI 70. Changes in the constituent materials or mixture design include, but are not limited to:

- a. Change in the coarse or fine aggregate source, rock face incorporating different aggregate, crusher or screens.
- b. Change in the added filler or other additive type or supplier.
- c. Change in the polymer type, supplier or other change in binder formulation or production plant.
- d. Change in the target grading or bitumen content in the asphalt mixture.

6.3. Mixture Design Procedure

CI 71. The Contractor is to design the mixture using the Marshall method, as follows:

- a. A combined aggregate grading within the envelope specified at 6.4 Volumetrics.
- b. Maintaining the VMA and Air Voids specified at 6.4 Volumetrics.

- c. To achieve the asphalt performance requirements specified at 6.5 Asphalt performance requirements.
- d. And then reporting the resulting Marshall properties specified at 6.4 Volumetrics.

6.4. Volumetrics

CI 72. The aggregate fractions must be combined to achieve an aggregate particle size distribution conforming with the limits contained in Table 7.

CI 73. The combined aggregate grading designed by the Contractor must not move from the upper third of one the envelope for one AS sieve size to the lower third of the envelope for the next larger or smaller AS sieve size.

Table 7 Combined Aggregate Grading

AS Sieve Size (mm)	Percentage Passing by Volume	
	Minimum	Maximum
19.0	100	100
13.2	96	100
9.5	76	88
6.7	66	74
4.75	56	64
2.36	40	48
1.18	29	37
0.600	21	28
0.300	13	19
0.150	7	13
0.075	4	6

CI 74. The Contractor is to design the asphalt mixture volumetrics to also conform with the requirements contained in Table 8 following 75 blow Marshall compaction.

Table 8 Additional Volumetric Requirements

Test Property	Test Method	Requirement
VMA (by volume)	AS/NZS 2891.8	13-17%
Air voids	AS/NZS 2891.8	3.5-4.5%
VFB (by volume)	AS/NZS 2891.8	Report only
Marshall Stability	AS/NZS 2891.5	Report only
Marshall Flow	AS/NZS 2891.5	Report only
Binder film thickness	AS/NZS 2891.8	Report only
Binder content (by mass)	N/A	Report only

CI 75. The Maximum Density, as determined in accordance with AS/NZS 2891.7.1 or 7.2, must be used to calculate the volumetric properties of the mixture in Table 8.

6.5. Asphalt performance requirements

CI 76. The Contractor must design the asphalt mixture to also conform with the requirements contained in Table 9.

Table 9 Asphalt Performance Requirements

Test Property	Test Method	Requirement
Indirect Tensile Strength Ratio (TSR)	AG:PT/T232	Not less than 80%
Indirect Tensile Strength (unconditioned)	AG:PT/T232	Report only
Wheel Tracking Test (Final rut depth after 10,000 cycles at 65°C)	AG:PT/T231	Not more than 2.0 mm
Resilient Modulus (at 25°C)	AS/NZ 2891.13.1	Report only
Fatigue life (at 20°C and 200 µm – three beams only)	AG:PT/T274	Not less than 500,000 cycles to 50% of initial flexural stiffness
Air Voids at Refusal density	AS/NZS 2891.2.2	Not less than 2.0%

6.6. Bitumen and Mastic Performance

CI 77. The Contractor must test a sample of the modified binder, produced from the nominated constituent materials, in accordance with AASHTO TP 70-12, at:

- a. 64 C.
- b. 70 C.
- c. 76 C.

CI 78. The Contractor must prepare mastic samples as follows:

- a. Prepare a sample of the proposed combined fine aggregate.
- b. Sieve the fine aggregate sample and retain a minimum 25 g of fine aggregate passing the AS 0.075 mm sieve.
- c. Heat 100±5 g of the proposed binder to 175±5°C and stir gently for 30 s.
- d. Pour 10 g of retained fine aggregate into 10 g of heated binder and stir gently for 30 s.

CI 79. Test the prepared mastic in accordance with AASHTO TP 70-12, at:

- a. 64 C.
- b. 70 C.
- c. 76 C.

CI 80. The Contractor must report the binder and mastic properties in Table 10 which may be utilised by the Principal as a benchmark in the event of changes in the asphalt mixture design constituent materials (6.2 Changes in Mixture Design).

Table 10 Binder and Mastic Performance Requirements

Material	Test Property	Requirement
Binder	Jnr(0.1)	Report only
Binder	Jnr(3.2)	Report only
Mastic	Jnr(0.1)	Report only
Mastic	Jnr(3.2)	Report only

6.7. Mixture design report

CI 81. For each mixture design proposed, the Contractor must submit to the Principal a Mixture Design Report, not less than 14 days prior to the Asphalt Production trial (8.2 Asphalt Production trial). **HOLD POINT.**

CI 82. The Mixture Design Report must contain, as a minimum:

- a. A covering commentary detailing:
 - i. Source of aggregates and reason(s) for their selection.
 - ii. Selection and details of the supplier and location of production of binder, and reason(s) for the selection.
 - iii. Statement of compliance or proposed deviation from the volumetric, asphalt performance and bitumen/mastic performance requirements specified.
 - iv. Certification by a suitably qualified engineer or technician confirming that the Contractor is satisfied that the mixture design meets the asphalt performance requirements and is suitable for use on the aircraft pavement(s) to be surfaced.
- b. Mixture design summary sheet, summarising on one page:
 - i. Mixture designation (by project and mixture design).
 - ii. Source, rock type, apparent density, absorption and grading of each coarse and fine aggregate fraction.
 - iii. Plasticity Index for the fine aggregate.
 - iv. Source, type and grading of each added filler.
 - v. Portion (by volume) of each fraction.
 - vi. Combined aggregate grading.
 - vii. Combined aggregate particle density.
 - viii. Binder type, grade and/or name.
 - ix. Bitumen content (by mass).
 - x. Asphalt mixture maximum and bulk density.
 - xi. VMA, VFB, air voids and binder film index.
 - xii. Marshall Stability and Marshall Flow.
 - xiii. TSR, Wheel tracking final rut depth and Fatigue life.
- c. Details of the coarse aggregate, including:
 - i. Source of each fraction.
 - ii. Petrological description of the source rock.
 - iii. Test certificates demonstrating compliance with all specified requirements.
- d. Details of the fine aggregate, including:
 - i. Source of each fraction.
 - ii. Petrological description of the source rock.
 - iii. Test certificates demonstrating compliance with all specified requirements.
- e. Details of the binder, including:
 - i. Grade and supplier of unmodified binder.
 - ii. Binder grade or name nominated by the Contractor.
 - iii. Where an AS 2008 or AG:PT/T190 grade of binder is nominated by the Contractor, test certificates demonstrating compliance with all specified requirements.

- iv. Where a proprietary or project-specified binder formulation is nominated, the suppliers product information and test certificates demonstrating compliance with all specified requirements.
- f. Binder properties, including:
 - i. Viscosity at 165°C according to AG:PT/T111.
 - ii. Torsional recovery at 25°C, 30 s according to AG:PT/T122.
 - iii. Softening point according to AG:PT/T131.
- g. Details of the mastic and bitumen performance, including:
 - i. Binder Jnr(0.1) and Jnr(3.2) at each of 64°C, 70°C and 76°C.
 - ii. Mastic Jnr(0.1) and Jnr(3.2) at each of 64°C, 70°C and 76°C.
- h. Test certificates demonstrating compliance with all asphalt performance requirements.

CI 83. Where the Mixture Design Report demonstrates that the asphalt mixture meets all the requirements of this specification, the Principal will accept the Mixture Design Report within seven days of receipt of the Mixture Design Report.

CI 84. Where the Mixture Design Report does not demonstrate that the asphalt mixture meets all the requirement of this specification, the Principal may either reject the Mixture Design Report and require the Contractor to resubmit following additional of modification, or may accept the Mixture Design Report based on the Contractor's recommendation that notwithstanding that non-compliance(s), the asphalt mixture is suitable for the airport pavements being surfaced.

7. Production Plant and Equipment

7.1. Minimum equipment requirements

CI 85. The Contractor must provide and utilise the minimum number of operational pavers detailed in the Project Particulars.

CI 86. Where prescribed in the Project Particulars, the Contractor must supply and operate one Material Transfer Vehicle, per operational paver, to transfer the asphalt between the delivery trucks and the paver(s).

CI 87. For each operational paver, the Contractor must supply and operate adequate steel drum and pneumatic tyred rollers to meet the requirements of this specification.

CI 88. The Contractor must supply and operate adequate asphalt delivery trucks to maintain the supply of asphalt to the paver(s) consistent with the production capacity of the production plant.

CI 89. The Contractor must supply and operate adequate and suitable cold planers, bitumen emulsion sprayers, hand tools, edge compactors, cutting wheels, coring machines, straight edges, thermometers and other equipment to complete the works in accordance with the approved Construction Procedures and the compliance requirements of this specification.

CI 90. Where it is prescribed in the Project Particulars that the aircraft pavements are to be returned to operational condition at the completion of each shift, the Contractor must provide back-up equipment, including but not limited to one each of:

- a. Cold planing machine.
- b. Asphalt paver.
- c. Steel drum roller.
- d. Pneumatic tyred roller.
- e. Material Transfer Vehicle (where specified as operational equipment).

CI 91. In all cases, the Contractor must provide and utilise all equipment, in a serviceable and operational conditional, as detailed in the approved Construction Procedures.

7.2. Production plant

CI 92. Where it is prescribed in the Project Particulars, an asphalt production plant must be located on the airport grounds at the location designated within the Works Contract documents.

CI 93. In all cases, the Contractor must provide and utilise the production plant nominated in the approved Construction Procedures.

CI 94. The production plant may be a batch plant or a drum plant and must be designed and constructed for the purpose of manufacturing hot or warm mixed asphalt, must be equipped with automatic proportioning facilities, must be in satisfactory working order and must be capable of producing asphalt in accordance with the requirements of this specification.

CI 95. The production plant must be of adequate capacity and/or contain adequate hot storage to supply the paving operation at a rate appropriate for the planned paving operation as detailed by the Contractor in the approved Construction Procedures.

CI 96. Where added filler is incorporated in the approved Asphalt Mixture Design, the production plant must meter the added filler into the aggregate prior to the bitumen being incorporated.

CI 97. The plant must be calibrated by the Contractor prior to the commencement of production trials and the calibration checked and reliably maintained throughout the entire production for the works as detailed in the approved Construction Procedures.

CI 98. The Contractor must provide and display certification that all weighing devices associated with the production of asphalt be calibrated.

CI 99. The plant must be equipped with facilities, which enable the operator to detect malfunctions or abnormal operating conditions which may cause the production of material not conforming with the specification.

CI 100. Where the production plant is located on at airport grounds, the asphalt production plant must not produce and supply other asphalt mixtures outside the project during the works, unless otherwise approved by the Principal.

CI 101. Where the production plant is located off airport grounds and is intended to produce, and supply other asphalt mixtures during the works, the Contract must include processes to ensure contamination does not occur within the Construction Procedures.

7.3. Testing Laboratory

CI 102. The Contractor must supply and operate an ISO/IEC 17025 (NATA) accredited testing laboratory, co-located with the asphalt production plant, for all testing required as part of the production and construction of the asphalt layer(s).

8. Production and Construction Trial

8.1. General

CI 103. Not less than 15 days before the asphalt paving is due to commence, all of the Contractor's mixing and paving plant and personnel proposed for use on the Works must be subject to Production and Construction Trials.

CI 104. The Asphalt Production trial must produce not less than 50 t of asphalt compliant with the requirements of this specification.

CI 105. The Asphalt Construction trial must produce not be less than 100 m in length and two adjacent runs of not less than 3.75 m in width, nominally 60 mm thick.

CI 106. The Asphalt Construction trial must follow the approved Asphalt Production and must be located as detailed in the Works Contract.

8.2. Asphalt Production trial

CI 107. The purpose of the Production Trial is to allow the Contractor to demonstrate the production of asphalt to the quality and tolerance limits required by this specification and the approved Construction Procedures.

CI 108. The Contractor must determine minimum mixing times to meet the requirements of this specification.

CI 109. The Asphalt Production trial must not commence until acceptable mixing plant calibration charts/records are provided to the Principal.

CI 110. The Contractor must sample and test the asphalt produced in the Asphalt Production trial in accordance with the requirements of 11.3 Asphalt production during asphalt production except that the Contractor must take and test not less than three representative samples, taken at approximately the quarter points in the Asphalt Production trial production and in accordance with AS 2891.1.1.

CI 111. If the test results indicate that the asphalt produced in the Asphalt Production trial does not conform to the properties of the submitted mix design in the approved Mixture Design Report and to the requirements of this specification, the Contractor must make all and any adjustments that are necessary to achieve the production properties requirements for the approved mixture design detailed in Clause CI 210, within the tolerances specified in 12.3 Asphalt production.

CI 112. If necessary, the Asphalt Production Trial must be repeated until asphalt conforming to the properties of the approved mixture design is consistently produced.

8.3. Asphalt Construction trial

CI 113. The Asphalt Construction trial must incorporate all placement, compaction, finishing and testing processes proposed to be carried out during the work, including construction of transverse and longitudinal joints, thickness control, checking of layer thicknesses, compaction and smoothness testing.

CI 114. The Contractor must subject all the placing, compaction and finishing equipment and operating and supervisory personnel proposed for use on the works to a trial using the Construction Procedures proposed for the work.

CI 115. The longitudinal joint between the lanes must be a warm or hot joint according to whichever the Contractor proposes to use in the works.

CI 116. Where prescribed in the Project Particulars, the Contractor must remove the trial sections within 10 days of being instructed to do so by the Principal.

CI 117. The trial section, which meets the requirements of this specification, must not be removed until approval is provided in writing by the Principal for their removal.

CI 118. The Contractor must test the asphalt density by nuclear density gauge, at not less than 12 locations away from paving joints and 4 locations on longitudinal joints, as agreed with the Principal. The Contractor must cut cores from the asphalt surface at the tested locations, and determine the core density in accordance with AS/NZS 2891.9.1

CI 119. The Contractor must utilise the measured core density to develop a mixture-specific calibration for the nuclear density gauge, in accordance with AS 2891.14.2 to be utilised for

compliance testing during the works. Alternatively, cores tested according to AS2891.9.1 can be used for compaction compliance.

CI 120. From the Asphalt Construction trial section, the Principal and Contractor must select a reference area/s that have the surface finishes at joints, and in the finished mat, that both consider to be the standard that is compliant with the specification and are to be achieved in the works.

CI 121. The reference area(s) for surface finish must be used by the Contractor and Principal as the basis of determining whether the surface finish achieved in the Works conform or do not conform to the surface finish requirements in the specification.

8.4. Production and Construction Trial Report

CI 122. Within 3 days of the Production and Construction Trials, the Contractor must provide the Principal with a Production and Construction Trial Report. **HOLD POINT.**

CI 123. The Production and Construction Trial Report must include, as a minimum but not limited to:

- a. Time, date, location and extent of the Production and Construction Trials.
- b. All compliance testing results for constituent materials, as detailed in 11.2 Constituent materials
- c. All compliance testing results for asphalt production, as detailed in 11.3 Asphalt production.
- d. All compliance testing results for surface construction, as detailed in 11.4 Asphalt construction.
- e. Nuclear density gauge calibration as detailed in Clauses CI 118 and CI 119.
- f. Demonstrative photographs of the accepted surface finish reference areas.

CI 124. Within 7 Days of receiving the Production and Construction Trial Report, the Principal will either accept the Production and Construction Trial Report, which will release the Hold Point, or reject the Production and Construction Trial Report and outline the Clauses within this Specification that have not been satisfied.

CI 125. If rejected, the Contractor must resubmit revised versions of the Production and Construction Trial Report until such a time that the requirements of this Clause are satisfied, at which time the Principal shall release the Hold Point.

CI 126. If required, the Contractor must carry out additional trials to demonstrate that this Clause has been satisfied.

CI 127. Within 5 days of release of the Hold Point under this Clause, the Contractor must update the Construction Procedures to include the Production and Construction Trial results.

CI 128. Once the Hold Point has been released, the Contractor must not change the plant, equipment or methods without the written agreement from the Principal. Any changes will be considered on a case-by-case basis and may require additional trials and/or a further update to the Construction Procedures.

9. Asphalt Production

9.1. Production requirements

CI 129. The Contractor must produce asphalt to be consistent and uniform in temperature, and composition, consistent with the approved Construction Procedures to ensure all conformance and quality requirements detailed in this specification are achieved.

CI 130. The Contractor must monitor the bitumen consumed and must determine the average bitumen content of each asphalt mix produced during each continuous mixing period or work period based on the total quantity of bitumen used and total asphalt produced.

CI 131. During asphalt production, the Contractor must monitor and actively control, within the limits nominated in the approved Construction Procedures:

- a. Bitumen temperature.
- b. Aggregate temperature.
- c. Asphalt production temperature.
- d. Mixing time.

CI 132. For each truck delivery, the Contractor must visually check the asphalt to ensure that the coarse aggregate is fully coated with bitumen and there is no segregation of the asphalt mixture.

CI 133. Where the asphalt is not fully coated or is segregated, the asphalt must not be used in the works. The Contractor must advise the Principal of steps to be taken to remedy the non-conformance. **HOLD POINT.**

9.2. Non-conforming materials

CI 134. Any asphalt which is overheated, insufficiently heated or mixed, carbonised, contains free water or excess moisture or contains uncoated particles, must not be incorporated in the works and must be removed from site by the Contractor, at no additional cost to the Principal.

10. Asphalt Construction

CI 135. The Contractor must undertake the asphalt construction to achieve all the compliance requirements detailed in the specification and in accordance with the approved Construction Procedures.

10.1. Weather limitations

CI 136. Asphalt must not be produced and constructed during weather, or expected weather, that may be detrimental to the quality of the finished asphalt surface layer(s).

CI 137. Where the existing surface temperature is below 15°C, the Contractor must develop and submit cold weather construction procedures for the Principal's approval. **HOLD POINT.**

10.2. Surface preparation

CI 138. Asphalt must not be placed until the existing surface on which the asphalt is to be placed has been jointly inspected by the Principal and the Contractor, and it is agreed to be suitable. **HOLD POINT.**

CI 139. Existing asphalt surfaces must be milled to achieved the design surface 12.5s and minimum layer thicknesses, or textured to a minimum thickness of:

- a. With existing grooves. Minimum 7 mm.
- b. Without existing grooves. Minimum 3 mm.

CI 140. When the Project Particulars do not prescribe that the aircraft pavement(s) are required to be returned to operational condition at the end of each work period, the milling/texturing of the existing surface may be performed without restriction.

CI 141. When the Project Particulars prescribe that the aircraft pavement(s) are required to be returned to operational condition at the end of each work period, and:

- a. When the Project Particulars prescribed that texturing ahead is not permitted, the Contractor must perform all texturing and milling within the same work period as asphalt surfacing.
- b. When the Project Particulars prescribe that texturing ahead is permitted, the Contractor may texture the surface, not more than two work periods ahead of the asphalt surfacing operation.

CI 142. Notwithstanding texturing ahead of the asphalt surfacing operation, in Clause CI 141, the Contractor must maintain the textured surface in a state that is free-draining and compliant with the geometric constraints contained within MOS 139.

CI 143. Following all milling and/or texturing, the surface must be thoroughly cleaned by skid steer mounted broom, tractor broom and/or suction sweeper.

10.3. Tack coat

CI 144. Tack coat must be applied to the prepared surface at a rate of 0.2-0.3 l/m² of residual bituminous material, calculated at 25°C.

CI 145. Vertical faces of milled and excavated existing pavement must be thoroughly tack coated by hand lance or other method in accordance with the approved Construction Procedures.

CI 146. Tack coated surfaces must be protected from construction equipment trafficking to the extent reasonably achievable.

CI 147. Asphalt paving must not commence until the tack coat is substantially broken over more than 80% of the surface of the paving run.

10.4. Asphalt paving

CI 148. Lanes of asphalt must be placed continuously within each work period, following the general sequence detailed in the approved Construction Procedures.

CI 149. Asphalt must be placed using mechanical pavers. The mechanical paver must be adjusted and operated such as to continuously spread asphalt evenly and uniformly over the lane widths.

CI 150. The asphalt paver must be operated at a uniform continuous speed matched to the operating capacity of the mixing plant, the delivery of the asphalt, and the compaction process, and such that the paver does not stop between planned transverse joints.

CI 151. Each asphalt paver must be adjusted to ensure accurate operation using the computer level control system and joint matching equipment for the automatic control of levels.

10.4.1. Layer thicknesses

CI 152. Where the design is a variable asphalt thickness, asphalt must be paved to achieve the design surface level after compaction, using computer controlled paving equipment and joint matching devices.

CI 153. Where the design is a nominal asphalt thickness, the asphalt must be paved to target the nominated thickness.

CI 154. The thickness of individual layers of asphalt, after compaction, must be within the limits specified in Table 11.

Table 11 Individual Asphalt Layer Thickness Limits

Layer	Minimum Thickness	Maximum Thickness
Surface layer	40 mm	80 mm
Underlying layers	30 mm	100 mm

10.4.2. Compaction

CI 155. The Contractor must compact the asphalt while the mix is at a temperature above that nominated in the approved Construction Procedures.

CI 156. All the rolling must be actively supervised continuously by the Contractor for the duration of the work.

CI 157. All rolling must be as nominated in the approved Construction Procedures and verified during the Construction trials and to ensure the density and surface compliance requirement are met.

CI 158. The Contractor must modify the equipment and/or the operation of the rollers to ensure that pick-up on tyres and drums is prevented.

CI 159. Rollers must not be permitted to stand on the finished asphalt until it has cooled to ambient temperature throughout.

CI 160. In all areas not accessible to rolling, the asphalt must be thoroughly compacted using vibrating plate compacters, hot hand tampers or any other equipment as detailed in the approved Construction Procedures.

10.4.3. Edges and Tie-ins

CI 161. Free edges without adjacent lanes of asphalt must be tied-in flush or rolled over as prescribed in the Project Particulars and/or as prescribed in the Works Contract.

CI 162. Where temporary tie-ins are required between work periods, the gradient of the temporary tie-in ramp must not exceed:

- a. 0.5%, where the different between the existing surface level and design surface level is greater than 50 mm at the centreline of the aircraft pavement being surfaced.
- b. 1.0% where the different between the existing surface level and design surface level is 50 mm or less at the centreline of the aircraft pavement being surfaced.

10.4.4. Longitudinal Joints

CI 163. Longitudinal joints are joints between adjacent paving lanes, aligned parallel to the direction of paving.

CI 164. The Contractor must plan the work to minimise cold joints and to provide the highest density and quality longitudinal joints reasonably practicable.

CI 165. Where the adjacent lane is constructed while the initial lane exceeds 125°C, an uncompacted strip must be left and the strip must be compacted after the adjacent lane is paved, simultaneously with the adjacent lane of asphalt.

CI 166. Where the adjacent lane is constructed while the initial lane exceeds 110°C, the initial lane must be compacted by overhanging the roller, without collapsing the edge, and the free-edge shaped to a 45° to the vertical using steel lutes, or heated hand operated rollers or similar equipment. After placing of the adjacent lane, the initial passes with the rollers must overlap the previously placed lane by at least 50 mm.

CI 167. Where the adjacent lane is constructed when the initial lane is below 110°C, the initial lane must be compacted by overhanging the roller, without collapsing the edge. The free edge must be checked for shape loss at the rolled over edge. The free edge must be removed by cold planer by a minimum of 50 mm, or greater to remove any out of shape material. The vertical face must be treated with two uniform hand applications of tack coat before placing the adjoining asphalt.

CI 168. Notwithstanding the above minimum requirements, all longitudinal joints must be planned, constructed and treated in accordance with the approved Construction Procedures.

10.4.5. Transverse Joints

CI 169. Transverse joints are joints, generally between adjacent Lots, aligned perpendicular to the direction of paving.

CI 170. Where the Project Particulars require the aircraft pavement(s) to be returned to operational condition at the end of each work period, transverse joints must be finished as temporary tie-ins, flush with the existing surface level, in accordance with 10.4.3 Edges and Tie-ins, and removed by cold planning machine to a minimum of 2 m or to achieve the design surface level.

CI 171. The vertical face must be treated with two uniform hand applications of tack coat before placing the adjoining asphalt.

CI 172. Notwithstanding the above minimum requirements, all transverse joints must be planned, constructed and treated in accordance with the approved Construction Procedures.

10.4.6. Hand-work

CI 173. Hand-work must be minimised to the extent reasonably practicable.

CI 174. During unavoidable hand-work the Contractor must exercise care in handling and placing the asphalt to avoid segregation.

10.5. Protection of finished surface

CI 175. Finished asphalt surfaces must be protected from all non-essential construction traffic, as detailed in the approved Construction Procedures.

11. Compliance testing

11.1. General

CI 176. For the asphalt surface layer(s) to be deemed compliant with this specification and accepted by the Principal, all compliance testing requirements must be achieved and all test certificates, Lot reports and other quality assurance documentation must be submitted to the Principal as detailed in the approved Construction Procedures.

11.2. Constituent materials

11.2.1. Coarse aggregate

CI 177. All coarse aggregate to be used in the works and stockpiled at the quarry or pit must be tested and compliance confirmed, before delivery to the site/asphalt plant storage stockpiles.

CI 178. All coarse aggregate supplied to the mixing plant must be sampled and tested on a routine basis to determine their compliance with the specified properties.

CI 179. The frequency of sampling and testing must be such as to ensure that changes in quality of the aggregates are detected sufficiently in advance of the time aggregates are incorporated into the asphalt to reject, verify or otherwise take action to avoid the inclusion of non-conforming aggregates.

CI 180. The results of the tests on all coarse aggregate used in production of asphalt must be, at all times, available at a location approved by the Principal but within 100 m of the mixing plant, for inspection by the Principal. Each test property must be included in the Process Control Records for each coarse aggregate fraction as well as the specification limits.

CI 181. The frequency of sampling and testing for each coarse aggregate fraction must not be less than specified in Table 12.

Table 12 Coarse Aggregate Frequency of Testing

Test property	Test method	Test frequency
Particle size distribution (grading)	AS 1141.11	1 test per 500 tonnes aggregate
Material Finer than 0.075 mm in Aggregates (by washing)	AS 1141.11	1 test per 500 tonnes aggregate
Flakiness Index	AS 1141.15	1 test per 1000 tonnes aggregate
Weak particles (including clay lumps, soft and friable particles) in coarse aggregate	AS 1141.32	1 test per 1000 tonnes aggregate
Particle density	AS 1141.6.1	1 test per 2000 tonnes aggregate
Water absorption	AS 1141.6.1	1 test per 2000 tonnes aggregate

11.2.2. Fine aggregate

CI 182. All fine aggregate to be used in the works and stockpiled at the quarry or pit must be tested and compliance confirmed, before delivery to the site/asphalt plant storage stockpiles.

CI 183. All fine aggregate supplied to the mixing plant must be sampled and tested on a routine basis to determine their compliance with the specified properties. The frequency of sampling and testing must be such as to ensure that changes in quality of the aggregates are detected sufficiently in advance of the time aggregates are incorporated into the asphalt to reject, verify or otherwise take action to avoid the inclusion of non-conforming aggregates.

CI 184. The results of the tests on all fine aggregate used in production of asphalt must be, at all times, available at a location approved by the Principal but within 100 m of the mixing plant, for inspection by the Principal. Each test property must be plotted on a Process Control Chart for each fine aggregate fraction, or combined fine aggregate, as applicable, as well as the specification limits.

CI 185. The frequency of sampling and testing for each fine aggregate fraction must not be less than specified in Table 13.

CI 186. The frequency of sampling and testing for the combined fine aggregate must not be less than specified in Table 14.

Table 13 Individual Source Fine Aggregate Frequency of Testing

Test property	Test method	Test frequency
Particle size distribution (grading)	AS 1141.11	1 test per 500 tonnes aggregate
Particle density	AS 1141.5	1 test per 2000 tonnes aggregate
Water absorption	AS 1141.5	1 test per 2000 tonnes aggregate

Table 14 Combined Fine Aggregate Frequency of Testing

Test property	Test method	Test frequency
Plasticity index	AS 1289.3.3.1	1 test per 2000 tonnes aggregate

11.2.3. Added filler

CI 187. A test certificate which demonstrates that the added filler complies with the applicable AS must be supplied for every delivery to the asphalt mixing plant.

CI 188. The test certificate must be for the production batch of added filler from which the delivered quantity was supplied.

CI 189. The test certificate must be provided to the Principal with the Asphalt Lot submission immediately following the added filler delivery to site.

11.2.4. Binder

11.2.4.1 Certificate of Compliance

CI 190. A test certificate for bitumen which demonstrates that the binder complies with the Specification must be supplied for every delivery to the asphalt mixing plant.

CI 191. The test certificates must be provided to the Principal with the asphalt Lot submission immediately following the delivery to site.

11.2.4.2 Addition Production Testing

CI 192. A sample of the binder must be obtained from each production batch of binder, from the production facility.

CI 193. The Contractor must test the sample of the binder in accordance with AASHTO TP 70-12, at:

- a. 64 C.
- b. 70 C.
- c. 76 C.

CI 194. The Contractor must report the binder properties in Table 10 which may be used by the Principal to screen for changes in the binder constituent materials (6.2 Changes in Mixture Design).

Table 15 Additional Binder Production Testing

Material	Test Property	Requirement
Binder	Jnr(0.1)	Report only
Binder	Jnr(3.2)	Report only

CI 195. The test certificates must be provided to the Principal within 48 hours of binder production.

11.2.4.3 Point of delivery sampling

CI 196. Bitumen must be sampled from the asphalt production plant binder storage tank, delivery tanker vessel or cold transport container, as detailed in the approved Construction Procedures, by the Contractor for each delivery vessel/tank, not more than four hours prior to the commencement of asphalt production or transfer of binder to the asphalt product plant binder storage tank.

CI 197. Where the modified binder production plant and the asphalt production plant are co-located with a direct pipe-transfer capability, the binder may be sampled directly from the modified binder production plant or storage tank, not more than four hours prior to the binder being transferred to the asphalt production plant.

CI 198. All samples of bitumen must be obtained in accordance with AG:PT/T101. **WITNESS POINT.**

CI 199. A minimum of two samples, each not less than 0.5 L in volume, must be obtained. The sample containers must be new clean, dry, cylindrical, tin plated, airtight, steel paint cans with

purpose manufactured removable friction top lids of the same material. The lids must seal the cans airtight.

CI 200. The Contractor must number, log and register all samples to identify, in the register and on the sample tins:

- a. The project from which the sample was obtained.
- b. The binder manufacturer's batch number.
- c. The date and time the sample was obtained.
- d. The date of incorporation of the binder into asphalt production.

CI 201. Marking of sample tins must be durable and as detailed in the approved Construction Procedures.

CI 202. The Contractor must distribute the binder samples as follows:

- a. Deliver one sample to the Principal not later than 6 hours after sampling.
- b. Retain one sample for point of delivery testing by the Contractor and then retain the residual of the sample in a dedicated, undercover storage area, within 100 m of the asphalt production plant, until contractual practical completion is granted, at which time the samples may be retained by the Contractor or disposed of by the Contractor. At any time up to their disposal, the Principal may take possession and ownership of the samples from the Contractor.

11.2.4.4 Point of delivery testing

CI 203. The point of delivery sample, to be retained for point of delivery testing, must be tested by the Contractor, prior to the commencement of asphalt production for the work period, for:

- a. Viscosity at 165°C according to AG:PT/T111.
- b. Torsional recovery at 25°C, 30 s according to AG:PT/T122.
- c. Softening point according to AG:PT/T131.

CI 204. The test certificate(s) must be provided to the Principal prior to the commencement of asphalt production for the work period. **HOLD POINT.**

11.2.5. Tack coat

CI 205. A test certificate which demonstrates that the tack coat complies with AS 1160 or approved modified tack coat production properties, must be supplied for every delivery to site.

CI 206. The test certificate must be provided to the Principal with the asphalt Lot submission immediately following the delivery to site.

11.3. Asphalt production

CI 207. Routine sampling and testing of asphalt for compliance with the specified test properties must be carried out by the Contractor.

CI 208. Sampling must be carried out from delivery trucks in accordance with the method detailed in AS 2891.1.1.

CI 209. The number of samples and sets of tests on each nominal size of asphalt produced in the work period must not be less than that specified in Table 16.

Table 16 Number of Test Sets on Asphalt in Each Work Period

Tonnes of Asphalt in the Lot	Number of test sets
Not greater than 300 tonnes	2
300 to 600 tonnes	3
600 to 1,000 tonnes	4
Greater than 1,000 tonnes	5

CI 210. Each test set must be tested in the on-site laboratory for:

- a. Combined aggregate grading.
- b. Maximum Density.
- c. Bulk density.
- d. Binder content.
- e. VFB and VMA.
- f. Air Voids.
- g. Moisture content.
- h. Marshall Stability and Marshall Flow.

CI 211. The Reference Density for the production Lot must be calculated as the average of the Maximum Density values applicable to the asphalt Lot, as determined by Clause CI 209 and Clause CI 210, in accordance with AS/NZS 2891.7.1 or AS/NZS 2891.7.2

CI 212. The Reference Density, determined in Clause CI 211 must be used to calculate the volumetric properties of the production mixture, where applicable, in Clause CI 210.

CI 213. The results of all tests on asphalt production samples must be, at all times, available at a location approved by the Principal, for inspection by the Principal. Each test property must be plotted on a Process Control Chart for each combined aggregate grading sieve, and each other test result, along with the specification limits.

CI 214. In addition, the following must be calculated for each Lot.

- a. **Bitumen usage.** During each work period, the quantity of bitumen used in each production run for each nominal size of asphalt mix must be accurately recorded by dipping the bitumen storage tank or by recording the plant digital read-outs before and after each production run.
- b. **Mass of asphalt produced.** The mass of each nominal size of asphalt mix produced in each work period must be determined and recorded.
- c. **Average bitumen content.** By using the quantity of bitumen used in the production and the total mass of asphalt produced in each work period, the average bitumen content must be calculated and reported.

CI 215. All asphalt production test results must be reported in the Lot submission.

11.4. Asphalt construction

11.4.1. Construction processes

CI 216. During every period of asphalt construction, the following must be actively monitored and inspected, in conjunction with the Principal:

- a. Roller patterns and operation consistent with the Asphalt Construction trial (8.3 Asphalt Construction trial). **WITNESS POINT.**
- b. Surface texture within the paving lanes tight and consistent with the Asphalt Construction trial (8.3 Asphalt Construction trial). **WITNESS POINT.**
- c. Surface texture at the joints tight and consistent with the Asphalt Construction trial (8.3 Asphalt Construction trial). **WITNESS POINT.**

11.4.2. Compacted Air Voids

CI 217. Based on the calibration between the nuclear density gauge and the asphalt cores developed by the Contract during the Asphalt Construction trial (8.3 Asphalt Construction trial) the Contractor must measure the density of the compacted asphalt at the following frequency:

- a. Away from joints. Ten locations per Lot.
- b. On longitudinal joints. Four locations per Lot.

CI 218. The location of each in-situ density test must be chosen by a method of stratified random sampling, according to AS 1289.1.4.2.

CI 219. The Contractor must determine the Air Void content of the compacted asphalt layer as the ratio between the compacted asphalt density and the maximum density for the Lot, determined from Clause CI 210.

CI 220. The Contractor must monitor the Air Void content results using a Process Control Records.

11.4.3. Surface Smoothness

CI 221. The finished surface of the asphalt must be tested for smoothness by the Contractor using hand held and mobile straight edges within 48 hours of completion of compaction of the asphalt.

CI 222. The full extent of the junction with the asphalt constructed in the previous work period must be tested. The mobile straight edge must be operated by the Contractor at a speed not exceeding 5 km/hr, or at such slower speed that permits accurate detection of discontinuities, to detect any surface irregularities that exceed the smoothness requirements specified.

CI 223. Straight edge tests must be carried out on continuous longitudinal lines parallel to each other and to the centreline of the pavement along the approximate centre of each placing lane.

CI 224. The transverse smoothness must be tested at right angles to the centreline of the pavement using the mobile straight edge or hand held straight edges along the placing lanes and across longitudinal joints at intervals not exceeding 10 m.

11.4.4. Layer thickness

CI 225. The actual average compacted asphalt layer thickness must be compared to the theoretical average compacted asphalt layer thickness, based on the surveyed milled/textured surface, the design surface level and the area surfaced within the asphalt Lot.

CI 226. Where a variable thickness asphalt surface is constructed, the average compacted asphalt layer thickness must be determined by the Contractor based on the area surfaced within the Lot of asphalt, the tonnes of asphalt placed and the average density of the compacted asphalt determined in Clause CI 217.

CI 227. Where a nominal thickness asphalt surface is constructed, the average compacted asphalt layer thickness must be determined by the Contractor based on the area surfaced within the Lot of asphalt, the tonnes of asphalt placed and the average density of the compacted asphalt determined in Clause CI 217.

11.4.5. Surface level

CI 228. The Contractor must complete an engineering survey of the surface level on the same grid as the design surface level set-out.

CI 229. All finished surface levels must be surveyed by precise levelling to an accuracy of 2 mm with readings to 1 mm and the survey must be undertaken under the control of a licensed surveyor.

CI 230. The Contractor must provide the Principal with a record of the surface levels, design surface levels (applicable to the surface being constructed) and deviations between the finished and design surface levels for the Lot.

11.4.6. Reporting

CI 231. All asphalt construction test results must be reported in the Lot submission.

11.5. Surface completion

11.5.1. Surface level

CI 232. The Contractor must complete an engineering survey of the finished surface level on the same grid as the design surface level set-out, within 3 days of completion of all asphalt production.

CI 233. The level data must be provided in a 12D compatible model and in Excel, and must show deviations from the design level at every point by chainage and offset.

CI 234. All finished surface levels must be surveyed by precise levelling to an accuracy of 2 mm with readings to 1 mm and the survey must be undertaken under the control of a licensed surveyor.

CI 235. The Contractor must provide the Principal with a record of the finished surface levels and cross falls of the final asphalt surface, together with a summary indicating the magnitude of the departures from the specified finished surface levels and cross falls detailed in the Works Contract or the approved geometric design, within one day of completion of the survey.

11.5.2. Friction survey (for runways only)

CI 236. Where required by the Project Particulars, the Contractor must conduct a friction survey, with a continuous friction measuring device with a 1 mm water film self-wetting capability, permitted by MOS 139, within second days of completion of each of:

- a. Completion of construction of any runway pavement surface.
- b. Completion of runway grooving (where applicable).

CI 237. The survey must include measurement along the full runway length, even if only a portion of the runway length was surfaced, at:

- a. 3 m and 6 m offsets from the runway centreline.
- b. At both 65 km/hr and 95 km/hr test speeds.
- c. In both runway directions.

CI 238. Within 48 hours of completion of the friction survey, the Contractor must provide the Principal with a statement regarding the general compliance of the runway to MOS 139 minimum surface friction requirements.

CI 239. Within 14 days of completion of the friction survey, the Contractor must provide the Principal with a written report detailing the conducting of the survey undertaken and all friction results reported continuously, and as a 100 m rolling average, including graphical comparison to the MOS 139 minimum surface friction requirements.

11.5.3. Ride quality (for runways only)

CI 240. Where required by the Project Particulars, the Contractor must survey the finished surface level of the aircraft pavement(s) for ride quality within 24 hours of completion of construction of any runway pavement surface.

CI 241. All finished surface levels must be surveyed by precise levelling to an accuracy of 2 mm with readings to 1 mm and the survey must be undertaken under the control of a licensed surveyor.

CI 242. The survey must include the full runway length, even if only a portion of the runway length was surfaced, at:

- a. 4 m offsets on both sides of the runway centreline.
- b. At a longitudinal internal not greater than 1 m.

CI 243. Within seven days of completion of construction of any runway pavement surface, the Contractor must submit a report to the Principal detailing the BBI, according to the method described in AC 150/5380-9.

CI 244. The report must include:

- a. Tabulated finished surface levels by chainage and offset.
- b. Method for calculation of the BBI.
- c. BBI calculated for each 4 m offset, at bump lengths:
 - i. 2 m.
 - ii. 5 m.
 - iii. 10 m.
 - iv. 20 m.
 - v. 40 m.
 - vi. 60 m.
- d. BBI graphed separately for each 4 m offset, for all bump lengths, at an internal of 1 m, between 2 m and 60 m, colour coded to indicate BBI values:
 - i. not greater than 0.2,
 - ii. greater than 0.2 but not greater than 0.5,
 - iii. greater than 0.5 but not greater than 1.0, and
 - iv. greater than 1.0.

12. Acceptance criteria

12.1. General

CI 245. The Contractor must produce asphalt in accordance with the asphalt mixture design accepted by the Principal.

12.2. Constituent materials

12.2.1. Coarse aggregate

CI 246. When tested in accordance with, Table 12, conform with the material properties in Table 5.

CI 247. The particle size distribution of any individual sample of each coarse aggregate taken from stockpiles, deliveries, delivery vehicles, cold bins, feeders or conveyor belts must be consistent and must not vary from the particle size distribution of that aggregate which was used to produce the approved mixture design combined aggregate grading by more than the tolerances specified in Table 17.

Table 17 Coarse aggregate tolerances on AS sieves

AS Sieve Size (mm)	Tolerance
13.2	±8%
9.5	±8%
6.7	±8%
4.75	±8%

12.2.2. Fine aggregate

CI 248. When tested in accordance with, Table 13, conform with the material properties in Table 6.

CI 249. When tested in accordance with, Table 14, conform with the material properties in Clause CI 49.

CI 250. The particle size distribution of any individual sample of each fine aggregate taken from stockpiles, deliveries, delivery vehicles, cold bins, feeders or conveyor belts must be consistent and must not vary from the particle size distribution of that aggregate which was used to produce the approved mixture design combined aggregate grading by more than the tolerances specified in Table 18.

Table 18 Fine aggregate tolerances on AS sieves

AS Sieve Size (mm)	Tolerance
2.36	±6%
1.18	±6%
0.600	±5%
0.300	±5%
0.150	±5%
0.075	±2%

12.2.3. Added filler

CI 251. Where Hydrated Lime (Calcium Hydroxide) is used, conforming with the requirements of AS 2150 and AS 1672.1.

CI 252. Where a fine or medium grade Fly Ash is used, conforming with the requirements of conforming to AS 3582.1.

12.2.4. Binder

CI 253. When tested in accordance with 0 11.2.4.1 Certificate of Compliance, binder must conform with the material properties applicable to the grade of binder nominated by the Contractor.

CI 254. When tested in accordance with 0 11.2.4.4 Point of delivery testing, not vary from the results contained in the manufacturers certificate of compliance, for the same binder batch, by more than the Investigate tolerances nominated by the Contractor in the Construction Procedures.

CI 255. When a test result referred to in Clause CI 254 outside the Investigate tolerance but not outside the Reject tolerance, the Contractor must undertake further investigation as specified in Clauses CI 257 and f and/or the approved Construction Procedures.

CI 256. When a test result referred to in Clause CI 254 falls outside the Reject tolerance, the binder batch must be rejected, not included in the works and disposed of by the Contractor, at no additional cost to the Principal.

CI 257. The Contractor must prepare and submit to the Principal, a disposition regarding the binder point of delivery test result, including: **HOLD POINT**:

- a. The binder point of delivery test results for the batch.
- b. The Process Control Charts for binder point of delivery testing.
- c. The asphalt performance risks associated with acceptance of the binder batch.
- d. The Contractor's proposed disposition regarding acceptance or rejection of the binder batch.
- e. The Contractor's proposed additional testing, which may include:
 - i. Repeated testing of the binder batch.
 - ii. Performance-testing of the associated Lot of asphalt surface.
- f. The basis for acceptance of the Lot of asphalt.

CI 258. When the Contractor's propose additional testing, referred to in Clause CI 257 fails to meet with Contractor's proposed basis for acceptance, the binder batch and/or Lot of asphalt must be removed and replaced and disposed of by the Contractor, at no additional cost to the Principal.

12.2.5. Tack coat

CI 259. All deliveries of modified bitumen emulsion must conform with the production test requirements nominated by the Contractor.

CI 260. If used, all deliveries of rapid setting cationic bitumen emulsion must conform the requirements of AS 1160.

12.3. Asphalt production

12.3.1. Combined aggregate grading

CI 261. All asphalt produced in accordance with the approved mixture design, must conform with the combined aggregate grading tolerances shown in Table 19.

Table 19 Asphalt combined aggregate grading tolerances

AS Sieve Size (mm)	Tolerance
13.2	±6%
9.5	±6%
6.7	±6%
4.75	±6%
2.36	±5%
1.18	±5%
0.600	±3
0.300	±2
0.150	±2
0.075	±1.5

12.3.2. Volumetric properties

CI 262. All asphalt produced in accordance with the approved mixture design, must conform with the volumetric tolerances shown in Table 20.

Table 20 Asphalt volumetric tolerances

Test property	Tolerance
VMA	±2%
Air voids	±1.5%
Binder content, by mass	±0.3%

12.3.3. Marshall properties

CI 263. All asphalt produced in accordance with the approved mixture design, must conform with the Marshall property tolerances shown in Table 21.

Table 21 Asphalt Marshall property tolerances

Test property	Tolerance
Marshall Flow	±1.0 mm
Marshall Stability	±3.0 kN

12.3.4. Moisture content

CI 264. All asphalt produced must have a moisture content not exceeding 0.5% when testing in accordance with AS/NZS 2891.10.

12.4. Asphalt construction

12.4.1. Surface finish

CI 265. The finished surface of the asphalt surface layer(s) must be a tightly bonded, closed textured, surface of uniform appearance, free of dragged areas, cracks, segregation and open textured patches.

CI 266. Joints must be tightly closed.

CI 267. Surface texture must be consistent with the level achieved during the approved Asphalt Construction trial (8.3 Asphalt Construction trial).

12.4.2. Air Voids

CI 268. The Air Voids content of the asphalt layer(s) must conform with the limits in Table 22.

Table 22 Lot Air Voids content Limits

Parameter	Minimum	Maximum
Each individual test location away from joints	2.0%	8.0%
Each individual test location on longitudinal joints	2.0%	9.0%
Average of the Lot test locations away from joints	3.0%	6.5%
Average of the Lot test locations on longitudinal joints	3.0%	7.5%

12.4.3. Surface smoothness

CI 269. The finished surface of the surface layer must not deviate from the testing edge of an approved 3.5 m straight edge, by more than 4 mm (longitudinally) and 6 mm (transversely) on aircraft pavements, and 6 mm (longitudinally) and 7 mm (transversely) on shoulders.

12.4.4. Layer thickness

CI 270. The average compacted layer thickness for each Lot must not vary from the nominated layer thickness by more than ± 4 mm.

12.4.5. Surface Level

CI 271. In full strength pavement areas, no less than 95% of the deviations between design surface level and finished surface level for each Lot must be no greater than 7 mm.

CI 272. In shoulders and other non-full strength pavement areas, no less than 90% of the deviations between design surface level and finished surface level for each Lot must be no greater than 7 mm.

CI 273. On completion of the finished pavement surface, no less than 95% of the final finished surface deviations between design surface cross fall and finished surface cross fall must be no greater than 0.2%.

12.5. Completion Certification

CI 274. Inspection, review of Quality System documentation and Certification by a suitably experienced Technician or Engineer that the asphalt surface complies with the intent of this specification, the approved mixture design and the approved construction processes.

12.6. Non-conforming asphalt

CI 275. Unless explicitly allowed elsewhere in this specification, Lots or areas of asphalt assessed as non-conforming with respect to the requirements specified herein must be addressed by Contractor at no additional cost to the Principal.

CI 276. The Contractor must investigate the non-conformance and provide the Principal a disposition to address the non-conformance and to avoid similar non-conformances during the remainder of the works.

CI 277. The Principal may accept or reject the disposition and may instruct the Contractor how to address the non-conformance or require the Contractor to develop an alternate disposition.

13. Maintenance during the Performance period

13.1. Periodic inspection

CI 278. During the performance period, and at the frequency prescribed in the Project Particulars, the Contractor must inspect the asphalt surface in conjunction with the Principal.

CI 279. The Contractor must identify, mark with paint, photograph and record (including approximate chainage and offset) all distresses.

CI 280. Within 7 days of the inspection, the Contractor must submit a written report to the Principal, including as a minimum, but not limited to:

- a. The date, time, attendees and general sequence of the inspection.
- b. All distresses, including distress type, distress extent, a photo, chainage and offset.
- c. Recommended maintenance treatment(s).

d. Potential consequences of not affecting the recommended maintenance.

CI 281. Within 7 days of receipt of the written report, the Principal may either accept the report or reject the report for resubmission, with reasonable comments to be addressed by the Contractor.

CI 282. The Contractor must resubmit, taking into account the Principal's comments, within 7 days of receipt of the comments.

