



SPECIFICATION 510

ASPHALT INTERMEDIATE COURSE

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| REVISION REGISTER | | | |
|---|---|---------------|------------|
| Clause Number | Description of Revision | Authorised By | Issue Date |
| 510.02, 510.26.03.4, 510.32.6 & 510.35 | Inclusion of Ignition Oven WA 730.2 Test Method for production testing and in requirements for mix design submission | BPC | 17/09/2024 |
| 510.22 & 510.42.4 | Paving Tape details replaced with reference to Specification 511 | | |
| 510.55.2 | Updated Test Method Reference | BPC | 06/04/2022 |
| 510.02 & 510.06 510.05 510.26, 510.31 & 510.32 510.32& 510.35 510.32.1 510.32.9 510.34 & 510.35.10 510.35.8 & 510.55.3 510.41 510.48.1 & 510.49.02 Table 510.6 Guidance Note Whole Document Whole Document Whole Document | Updated references New Clause to align with other Specifications New clauses to include Level 2 and 3 RAP mix design Inclusion of production modulus Rewording removal of pigment Formatting change to new Table Updated as Workability Additive and requirements for use of Sasobit and Evotherm Rewording of Test Report distribution New HOLD POINT to match other MRWA Specifications on subbase compliance Rewording to vertical face Included mix type Rewording to Manager Materials Engineering. Rewording changed to Workability Additive Removal of Test Method T660 Formatting Table numbering updated | MME | 06/08/2021 |
| 510.05 510.55.3 510.54.2 | New Clause on Sustainability Minimum time before coring added Updated wording on roller water | BPC | 17/05/2021 |

CONTENTS

| Clause | Page No |
|--|-----------|
| GENERAL | 5 |
| 510.01 Scope..... | 5 |
| 510.02 References..... | 5 |
| 510.03 Definitions | 7 |
| 510.04 NOT USED | 7 |
| 510.05 Sustainability Considerations | 7 |
| MATERIALS..... | 8 |
| 510.06 Binder | 8 |
| 510.07 Bitumen Emulsion | 8 |
| 510.08 Aggregate | 8 |
| 510.09 Mineral Filler | 8 |
| 510.10 Adhesion Agent..... | 8 |
| 510.11 Reclaimed Asphalt Pavement | 8 |
| 510.12 – 510.21 NOT USED..... | 8 |
| 510.22 Paving Tape..... | 9 |
| 510.23 – 510.25 NOT USED..... | 9 |
| ASPHALT MIX DESIGN | 9 |
| 510.26 Asphalt Mix Design | 9 |
| 510.27 – 510.30 NOT USED..... | 15 |
| MANUFACTURE AND TRANSPORT | 15 |
| 510.31 Mixing Plant | 15 |
| 510.32 Manufacture of Asphalt | 16 |
| 510.33 Storage and Handling | 17 |
| 510.34 Use of Workability Additive..... | 17 |
| 510.35 Testing | 18 |
| 510.36 Non-conformance..... | 20 |
| 510.37 Transport | 20 |
| 510.38 – 510.40 NOT USED..... | 20 |
| PLACING OF ASPHALT | 20 |
| 510.41 General..... | 20 |
| 510.42 Surface Preparation | 21 |
| 510.43 Method of Placement | 22 |
| 510.44 Tack Coat | 22 |
| 510.45 NOT USED | 23 |
| 510.46 Weather Conditions..... | 23 |

| | | |
|--|---|-----------|
| 510.47 | Joints | 23 |
| 510.48 | Longitudinal Joints | 24 |
| 510.49 | Transverse Joints..... | 24 |
| 510.50 | Asphalt Construction Drawings | 24 |
| 510.51 | Spreading | 25 |
| 510.52 – 510.53 | NOT USED..... | 25 |
| 510.54 | Compaction..... | 25 |
| 510.55 | In-situ Air Void Content | 26 |
| 510.56 | Surface Requirements | 27 |
| 510.57 | Opening Finished Works to Traffic | 28 |
| 510.58 – 510.80 | NOT USED..... | 28 |
| AS-BUILT AND HANDOVER REQUIREMENTS..... | | 28 |
| 510.81 – 510.90 | NOT USED..... | 28 |
| CONTRACT SPECIFIC REQUIREMENTS..... | | 28 |
| 510.91 – 510.99 | NOT USED..... | 28 |
| ANNEXURE 510A | | 29 |
| Schedule of Works | | 29 |
| ANNEXURE 510B | | 30 |
| Specific Contract Requirements | | 30 |

SPECIFICATION 510

ASPHALT INTERMEDIATE COURSE

GENERAL

510.01 SCOPE

1. The work under this specification consists of the supply and application of 14 mm and 20 mm dense graded asphalt (hereafter referred to as asphalt) for the construction of an asphalt intermediate course. The supply and application of asphalt wearing courses is addressed in Specification 504 DENSE GRADED ASPHALT WEARING COURSE.
2. Details of the location and extent of the asphalt are either summarised at Annexure 510A, or are indicated on the Drawings.
3. The Works shall include surface preparation, supply of materials, production, hauling, placing and compaction of asphalt to the areas as shown in Annexure 510A or the Drawings, or as otherwise directed by the Superintendent.

Details

510.02 REFERENCES

1. Australian Standards, Main Roads Western Australia Test Methods, Main Roads Western Australia Standards and Main Roads Western Australia Specifications are referred to in abbreviated form (e.g. AS 1234, MRS 67-08-43 or WA 123). For convenience, the full titles are given below:

Australian Standards

- | | |
|---------|--|
| AS 1160 | Bituminous emulsions for the construction and maintenance of pavements |
| AS 2150 | Asphalt – A guide to good practice |

Australian/New Zealand Standards

- | | |
|------------------|---|
| AS/NZS 2891.2.1 | Sample preparation – mixing, quartering and conditioning of asphalt in the laboratory |
| AS/NZS 2891.2.2 | Sample preparation – compaction of asphalt test specimens using a gyratory compactor |
| AS/NZS 2891.8 | Voids and density relationships for compacted asphalt mixes |
| AS/NZS 2891.10 | Moisture content of asphalt |
| AS/NZS 2891.11 | Degree of particle coating |
| AS/NZS 2891.13.1 | Determination of the resilient modulus of asphalt – indirect tensile method |

MAIN ROADS Test Methods

- | | |
|----------|--|
| WA 210.1 | Particle Size Distribution of Aggregates |
|----------|--|

| | |
|----------|--|
| WA 212.1 | Aggregate Moisture Content: Convection Oven Method |
| WA 212.2 | Aggregate Moisture Content: Microwave Oven Method |
| WA 313.2 | Surface Profile: Three Metre Straightedge |
| WA 313.4 | Surface Profile: ARRB Profiler |
| WA 341.1 | Colour Saturation of Laterite Asphalt |
| WA 701.1 | Sampling and Storage of Asphalt |
| WA 705.1 | Preparation of Asphalt for Testing |
| WA 730.1 | Bitumen Content & Particle Size Distribution of Asphalt and Stabilised Soil: Centrifuge Method |
| WA 730.2 | Bitumen Content & Particle Size Distribution of Asphalt: Ignition Oven Method |
| WA 731.1 | Stability and Flow of Asphalt: Marshall Method |
| WA 732.2 | Maximum Density of Asphalt: Rice Method |
| WA 733.1 | Bulk Density and Void Content of Asphalt |

Department of Transport and Main Roads Queensland Test Methods

| | |
|-------|--|
| Q304A | Permeability of Asphalt (Ponding Method) |
| Q304B | Assessment of Asphalt Permeability |

AUSTROADS Test Methods

| | |
|------------|---|
| 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/T234 | Asphalt Binder Content (Ignition Oven Method) |
| AG:PT/T237 | Binder Film Index |

Australian Asphalt Pavement Association

| | |
|-----------------|---|
| Advisory Note 7 | Guide to the Heating and Storage of Binders for Asphalt Manufacture |
|-----------------|---|

MAIN ROADS Standards

| | |
|--------|--|
| ERN 9 | Engineering Road Note 9 – Procedure for the Design of Road Pavements |
| ERN 13 | Engineering Road Note 13 – Asphalt Mix Design |

MAIN ROADS Specifications

| | |
|-------------------|-------------------------------------|
| Specification 201 | QUALITY MANAGEMENT |
| Specification 504 | DENSE GRADED ASPHALT WEARING COURSE |
| Specification 511 | MATERIALS FOR BITUMINOUS TREATMENTS |

510.03 DEFINITIONS

1. Unless otherwise detailed in the Contract, the meaning of terms and definitions in this specification are as follows:
- (a) "Asphalt base course" is one or more layers of asphalt within a full depth asphalt pavement immediately below the asphalt intermediate course.
 - (b) "Asphalt course" comprises one or more layers of a single asphalt type.
 - (c) "Asphalt intermediate course" is that part of a pavement which rests on the asphalt base course, sub-grade, improved sub-grade or sub-base and is below the asphalt wearing courses.
 - (d) "Asphalt layer" comprises a single paving run of uniform asphalt.
 - (e) "Asphalt pavement" is a pavement, the predominate structural strength of which is provided by asphalt layers.
 - (f) "Asphalt wearing course" is that part of the pavement upon which the traffic travels including any dense graded asphalt course immediately below a course of open graded asphalt.
 - (g) "Full depth asphalt pavement" is a pavement in which asphalt is used for all courses above the sub-grade, improved sub-grade or sub-base.
 - (h) "Reclaimed asphalt pavement (RAP)" is the material reclaimed from an asphalt wearing or intermediate course by cold planning and re-processed by crushing and/or screening for recycling into new asphalt.

Terminology

510.04 NOT USED

510.05 SUSTAINABILITY CONSIDERATIONS

- 1. Materials for road pavements shall be managed under the sustainability hierarchy of REDUCE, REUSE and RECYCLE.
- 2. Unless defined otherwise, the materials described in this specification shall be sourced from quarries of natural materials, and shall be crushed or processed as applicable to produce a homogenous material. These materials are a finite resource and waste shall be reduced to a minimum.
- 3. Where practical, redundant pavement materials should be recovered and reused, or otherwise recycled to the highest level use practical, Reused materials shall be processed to produce a homogenous material and shall meet the specified applicable requirements for asphalt.
- 4. This specification also includes manufactured materials sourced from recycled asphalt. Recycled materials for pavement construction shall be blended, crushed or processed as applicable to produce a homogenous material by a recycling premises licensed by DWER. Recycled materials shall only be included in materials which are designated as recycled.

Reduce

Reuse

Recycle

MATERIALS

510.06 BINDER

1. Binder used in the production of 20 mm dense graded asphalt shall be as shown on drawings. Where not shown Class 320 bitumen, Class 600 bitumen or A15E polymer modified binder, as required in accordance with Engineering Road Note 9 (ERN 9), conforming to the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS shall be used.

**20 mm Dense
Graded
Asphalt**

2. Binder used in the production of 14 mm dense graded asphalt shall be as shown on drawings. Where not shown A15E polymer modified binder conforming to the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS shall be used.

**14 mm Dense
Graded
Asphalt**

3. **Prior to the use of binder the Contractor shall demonstrate compliance with the properties of the binder for each batch used on the Contract. Audit testing undertaken by the Principal shall not be used to demonstrate compliance.**

HOLD POINT

510.07 BITUMEN EMULSION

1. Bitumen emulsion to be used as the tack coat during the preparation of the surface prior to the laying of asphalt shall be Cationic Slow Setting emulsion grade CSS/170-60 or Cationic Rapid Setting emulsion grade CRS/170-60, both conforming to AS 1160, mixed 50:50 by volume with water.

510.08 AGGREGATE

1. Crushed aggregate, including its source rock, and natural sand shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS. Coarse and fine aggregate used in the manufacture of asphalt shall consist of crushed rock material.

510.09 MINERAL FILLER

1. Mineral filler shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

510.10 ADHESION AGENT

1. The adhesion agent shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

510.11 RECLAIMED ASPHALT PAVEMENT

1. RAP shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS, including preparing and storing RAP prior to its use.

510.12 – 510.21 NOT USED

510.22 PAVING TAPE

1. The Paving Tape shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

510.23 – 510.25 NOT USED

ASPHALT MIX DESIGN

510.26 ASPHALT MIX DESIGN

1. This clause specifies the requirements for the design of 14mm and 20mm intermediate asphalt course.
2. Where greater than 10% RAP is to be included in 14 mm or 20 mm asphalt these will be known as level 2 or level 3 asphalt mix designs which will be designed to this Specification and additional requirements in Engineering Road Note 13 (ERN 13).
3. Where a mix design requires the incorporation of RAP it shall be known as aggregate in this Specification.

**Level 2 and 3
RAP**

510.26.01 GENERAL

1. The asphalt manufacturer shall be responsible for the development of an asphalt mix design and its approval by Main Roads. This clause specifies the properties and design process for nominal 14 mm and 20 mm asphalt.
2. The asphalt shall incorporate aggregates, binder, filler and adhesion agent to produce an asphalt mix design that satisfies all specified requirements, shall be resistant to segregation during handling and placing, shall have low permeability and shall have adequate workability to achieve the specified levels of compaction in the asphalt pavement.
3. For the purpose of asphalt mix design Class 320 bitumen shall be used for the design of both 14 mm and 20 mm dense graded asphalt. For RAP mixes in accordance with ERN13 an equivalent binder grade to Class 320 bitumen is required for mix design.
4. For the volumetric component of the design the mix shall be compacted using a Marshall hammer with 75 blows on each face.
5. The asphalt mix design shall be based on the use of crushed rock as the coarse and fine aggregates and the inclusion of 1.5% by mass of the total aggregate of hydrated lime. The mix design may include the use of sand not derived from crushed rock up to a limit of 10% of the total mass of aggregates in the mix design.
6. Mix designs for asphalt to be placed within the Perth metropolitan area shall be produced using granite rock from quarries in the Perth region.
7. All tests shall be performed in laboratories accredited with the National Association of Testing Authorities of Australia (NATA) to perform the tests and the results shall be presented on NATA endorsed test reports.

**Class 320
Bitumen to be
used**

**75 Blow
Marshall**

Perth Rock

NATA

8. Asphalt mix designs shall not be designed including RAP, warm mix additives or other materials not specified unless required in ERN13.
9. For the purpose of asphalt mix design the bulk density of laboratory prepared specimens shall be determined in accordance with WA 733.1. Bulk density by presaturation in accordance with AS/NZS 2891.9.2 shall not be used.

**Bulk Density
Test Method**

510.26.02 DESIGN CRITERIA

1. Aggregates, binder, filler and adhesion agent shall be apportioned to produce a design target PSD and design target binder content that complies with all of the requirements of Table 510.2 for either 14 mm or 20 mm dense graded asphalt. The gradation of the combined aggregates shall be continuous with a smooth grading curve passing through all of the sieves listed in Table 510.1. The design target binder content of the asphalt mix design shall produce an asphalt mix design that meets the requirements of this specification.

TABLE 510.1 DESIGN TARGET PSD

| AS Sieve Size (mm) | Percentage Passing by Mass | |
|---------------------------|-----------------------------------|------------------|
| | 14 mm Mix | 20 mm Mix |
| 26.5 | 100 | 100 |
| 19.0 | 100 | report |
| 13.2 | report | report |
| 9.5 | report | report |
| 6.7 | report | report |
| 4.75 | report | report |
| 2.36 | report | report |
| 1.18 | report | report |
| 0.60 | report | report |
| 0.30 | report | report |
| 0.15 | report | report |
| 0.075 | Max 5.5 | Max 5.5 |

TABLE 510.2 MIX PROPERTIES

| Property | Test Method | Minimum | Maximum |
|---|---------------------------|-----------------------|----------------|
| Air Void Content | | | |
| Design target PSD | WA 733.1 | 4.2% | 4.8% |
| Production range | | 3.5% | 5.5% |
| After 350 cycles gyratory compaction (applicable for design target only) | | 2.0% | - |
| Voids in Mineral Aggregate | WA 733.1 | 14.0% | - |
| Binder Content (by percentage volume of total mix) | WA 730.1 | | |
| 14 mm | | 10.5% | - |
| 20 mm | | 10.0% | - |
| (applicable for design target only) | | | |
| Stability | WA 731.1 or AS/NZS 2891.5 | 8.0 kN | |
| Flow | WA 731.1 or AS/NZS 2891.5 | 2.0 mm | 4.0 mm |
| Binder Film Index (applicable for design target only) | Note 1 | 8.0 | - |
| Permeability of Asphalt (applicable for design target only) | Q304A and Q304B (Note 2) | Report (Note 2) | |
| Deformation Resistance (applicable for design target only) | AG:PT/T231 | Maximum 4.0 mm | |
| Resilient modulus (applicable for design target only) | AS/NZS 2891.13.1 | Report value (Note 3) | |

Note 1 – calculate the binder film index using the formula in test methods AS/NZS 2891.8 or AG:PT/T237.

Note 2 – report the linear regression relationship in accordance with Q304B. The air void content of the test specimens shall be determined in accordance with AS/NZS 2891.9.2 and the water absorption of each test specimen shall be reported to the nearest 0.1%.

Note 3 – determined using the standard reference test conditions in the test method on at least three test specimens compacted in a gyratory compactor with an air void content of $5 \pm 0.5\%$ determined in accordance with WA 733.1 or AS/NZS 2891.9.2.

510.26.03 ASPHALT MIX DESIGN PROCESS

1. Mixes shall be manufactured in a laboratory to a consistent condition and shall be fully coated with binder. All mixes shall be conditioned in accordance with AS/NZS 2891.2.1 after mixing has been completed. The particle size distribution (PSD) of each mix produced in a laboratory shall not vary from the target PSD or binder content or the outer PSD limits for PSD and binder content by more than the limits shown below.
 - (a) $\pm 2\%$ for ≥ 2.36 mm sieve
 - (b) $\pm 1\%$ for < 2.36 mm sieve
 - (c) $\pm 0.1\%$ for binder content
2. A mix shall be prepared at the design target PSD and design target binder content and tested for all properties listed in Table 510.2 plus binder content and PSD. The average result for air voids of each mix shall be $4.5\% \pm 0.3\%$.
3. Mixes shall be prepared to the “outer PSD limits” as described below. These mixes shall be tested for PSD, binder content, stability, flow, binder film index, voids within the production range and VMA.
 - (a) Fine PSD high binder – the fine PSD shall be prepared by adding the positive production tolerance values shown in Table 510.3 on to the design target PSD. The binder content shall be the design target binder content plus 0.3% binder.
 - (b) Fine PSD low binder – the fine PSD shall be prepared by adding the positive production tolerance values shown in Table 510.3 on to the design target PSD. The binder content shall be the design target binder content minus 0.3% binder.
 - (c) Coarse PSD low binder – the coarse PSD shall be prepared by adding the negative production tolerance values shown in Table 510.3 on to the design target PSD. The binder content shall be the design target binder content minus 0.3% binder.
 - (d) Coarse PSD high binder – the coarse PSD shall be prepared by adding the negative production tolerance values shown in Table 510.3 on to the design target PSD. The binder content shall be the design target binder content plus 0.3% binder.

**Manufacture of
Mixes**

**Outer PSD
Limits**

TABLE 510.3 PRODUCTION TOLERANCES

| Particle Size Distribution AS Sieve Size (mm) | Tolerances on Percentage by Mass Passing | |
|--|--|--------|
| | 14 mm | 20 mm |
| 19.00 | Not applicable | -3 + 7 |
| 13.20 | -3 ± 7 | ± 7 |
| 4.75 and 6.7 and 9.5 | ± 7 | ± 7 |
| 2.36 and 1.18 | ± 5 | ± 5 |
| 0.6 and 0.3 | ± 4 | ± 4 |
| 0.150 | ± 2.5 | ± 2.5 |
| 0.075 | ± 1.5 | ± 1.5 |

4. Where an ignition oven is proposed to be used to determine the binder content during production, the submission shall include:
- (a) Offset determination in accordance with WA 730.2 and AG:PT/T234 Appendix A.
 - (b) Samples to satisfy AG:PT/T234 Appendix A to be provided to Materials Engineering Branch.

***Ignition Oven
Offset***

510.26.04 APPROVAL OF ASPHALT MIX DESIGNS

1. The asphalt manufacturer shall be responsible for submitting the following information to:

Manager Materials Engineering
Materials Engineering Branch
Main Roads Western Australia
5-9 Colin Jamieson Drive
Welshpool WA 6106

- (a) The nominal size of the asphalt mix design;
- (b) Identification of the manufacturing plant where the asphalt will be produced;
- (c) A detailed description of all of the materials to be used in the manufacture of the asphalt mix design including a geological description of all of the aggregates or sand to be used. The source of those materials shall be provided along with the proposed proportioning of the aggregates or sand;
- (d) Test reports showing the latest results for the aggregates and sand to be used against all test properties in Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS;

- (e) The source of the C320 bitumen used for the asphalt mix design assessment;
 - (f) The design target binder content for the proposed asphalt mix design \pm 0.3%;
 - (g) A PSD based on the design target PSD with production tolerances shown in Table 510.3.
2. The asphalt manufacturer shall be responsible for submitting NATA endorsed test reports demonstrating compliance with all properties shown in Clause 510.26.02 for the following mixes:
- (a) Design target PSD and design target binder content. All other results used to establish the optimum binder content for the target PSD shall be reported.
 - (b) Fine PSD high binder
 - (c) Fine PSD low binder
 - (d) Coarse PSD low binder
 - (e) Coarse PSD high binder
3. If all of the asphalt mix design requirements of the specification have been met the Materials Engineering Branch of Main Roads will issue a certificate for an Approved Asphalt Mix Design including the following information:
- (a) Identification number of the Approved Asphalt Mix Design.
 - (b) Date of approval.
 - (c) Identification of the asphalt manufacturer.
 - (d) Identification of the manufacturing plant at which the asphalt shall be produced.
 - (e) Source of aggregates to be used for the Approved Asphalt Mix Design.
 - (f) Nominal proportions of the aggregates to be used.
 - (g) The PSD in the format shown in Table 510.1 with the lower and upper limits of the PSD applied using tolerances from Table 510.3 to the design target PSD.
 - (h) The binder content as the design target binder content \pm 0.3%.

Reports

Certificate

4. An Approved Asphalt Mix Design shall have a lifetime of three years. To renew an existing Approved Asphalt Mix Design the asphalt manufacturer shall submit an electronic version of a spreadsheet showing all production test results for the Approved Asphalt Mix Design since it was approved or last renewed. The spreadsheet shall have test results from at least 50 test samples of the Approved Asphalt Mix Design. Materials Engineering Branch will review the results of the production records for consistency to specified properties and advise whether the Approved Asphalt Mix Design will be renewed. If there are less than 50 results the Approved Asphalt Mix Design will not be renewed.
5. Use of the Approved Asphalt Mix Design shall be for only those ranges in the mix proportions and the types and sources of materials nominated with the Approved Asphalt Mix Design.

Renewal

510.26.05 USE OF ASPHALT MIX DESIGN

1. **The Contractor shall provide proof to the Superintendent that the asphalt mix design has been approved by the Principal before any asphalt is manufactured in accordance with that Approved Asphalt Mix Design and placed in the Works.**

HOLD POINT

510.27 – 510.30 NOT USED

MANUFACTURE AND TRANSPORT

510.31 MIXING PLANT

1. Asphalt shall be manufactured in a central mixing plant by either, batch mixing, continuous mixing or drum mixing. All mixing plant and equipment and associated facilities shall conform to the requirements of AS 2150 and shall be such as to prevent segregation of the asphalt at all stages.
2. The plant used to manufacture RAP Level 2 and 3 asphalt mixes shall be capable of blending the component materials to produce asphalt that has consistent appearance and test properties. The plant shall be capable of adding the processed RAP to the virgin aggregates immediately before the mixing stage. RAP and virgin aggregates shall not come into contact prior to this stage.
3. A sampling cock shall be installed in the inlet pipe between the road tanker and binder storage tanks. An additional sampling cock shall be installed for sampling at the time of asphalt production, between the binder tank and the mixing chamber to facilitate the sampling of any binder being used for asphalt production.
4. For the verification of weights or proportions and character of materials and determination of temperatures used in the preparation of the asphalt, the Superintendent shall have access at any time to all parts of the plant subject to safety considerations.

Plant

RAP

**Binder
Sampling
Cocks**

510.32 MANUFACTURE OF ASPHALT

1. The quantities of coarse and fine aggregates, sand, mineral filler, adhesion agent, bitumen and RAP, when used, shall be accurately and positively controlled so as to produce the asphalt specified for use in the Works. The quantity of bitumen in the asphalt shall include that portion that comes from the use of RAP in the asphalt. **Control**
2. A Management Plan shall be prepared detailing amongst other things the stockpiling, processing, storage, testing and plant mixing requirements of RAP. Where RAP is used in the manufacture of asphalt the RAP shall not come into contact with hot virgin aggregates until the mixing stage. **RAP**
3. Up to 10% of RAP by mass of the total aggregate may be used in the production of 14 mm or 20 mm asphalt. The quantity of hydrated lime added as an adhesion agent shall be based on the total mass of aggregate and RAP.
4. For RAP Level 2 and 3 asphalt mix designs the following shall apply: **Use of RAP**
 - (a) For each Lot of processed RAP the viscosity of the blended RAP binder(s) and virgin binder remains within the specified binder viscosity range of Class 600 in accordance with Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.
 - (b) All fractions in a RAP Level 3 mix design shall be heated to a temperature greater than 100°C prior to the mixing stage.
5. The mixing process shall be such as to produce a uniform distribution of aggregate sizes and a uniform coating of binder on a minimum of 95% of aggregate particles when tested in accordance with AS/NZS 2891.11. The mixing and drying processes shall be sufficient to ensure that moisture in asphalt that includes RAP is not greater than specified. **Coating**

The mixing process shall be as such to produce asphalt that when tested in accordance with AG:PT/T232 will have values of greater than the following:

 - (a) Tensile Strength Ratio $\geq 80\%$
 - (b) Dry strength greater than 850 kN
 - (c) Wet strength after freeze/thaw conditioning greater than 750 kN
6. The particle size distribution and the percentage of binder shall be in accordance with the Approved Asphalt Mix Design when tested in accordance with WA 730.1 or WA 730.2. **Particle Size Distribution**
7. The air voids, VMA, stability and flow shall be in accordance with Table 510.2 when tested in accordance with WA 731.1 and 733.1. **Marshall Properties**
8. The moisture content of the asphalt at the completion of the mixing process shall not be greater than 0.15% by mass when measured in accordance with AS/NZS 2891.10. **Moisture Content**

- | | |
|---|--|
| <p>9. The Resilient Modulus shall be determined using the standard reference test conditions in the test method on at least three test specimens compacted in a gyratory compactor with an air void content of $5 \pm 0.5\%$ determined in accordance with WA 733.1 or AS/NZS 2891.9.2. An associated sample of binder during production shall be sampled and tested to the requirements in Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS and asphalt mix properties to Clause 510.32.5.</p> <p>10. In a batch mixer the volume of material shall be limited to an amount allowing the paddle tips to be seen when passing through the top vertical position during mixing.</p> <p>11. The production temperature of the mixed asphalt shall be measured and recorded at the discharge point of the pugmill or mixing drum. The temperature of the asphalt shall meet the requirements of Table 510.4.</p> | <i>Production Resilient Modulus</i> <i>Volume of Material</i> <i>Temperature at Discharge Point</i> |
|---|--|

TABLE 510.4 TEMPERATURE AT DISCHARGE POINT

| | Hot Asphalt (Max) | Asphalt Mixture with Workability Additive (Max) | Warm Mix Asphalt (Min) |
|-------------------------|--------------------------|--|-------------------------------|
| Bitumen Class 320 | 170°C | 170°C | 140°C |
| Bitumen Class 600 | 175°C | 175°C | 145°C |
| Polymer Modified Binder | 185°C | 185°C | 155°C |

510.33 STORAGE AND HANDLING

1. Binders shall be heated and stored to meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS and the AAPA Advisory Note 7. At no time shall binder be heated to a temperature greater than 180°C.

Binders**510.34 USE OF WORKABILITY ADDITIVE**

1. Approved workability additives may be used in the production of dense graded intermediate mix asphalt in the applications shown in Table 510.5.

Use of Additives

TABLE 510.5 USE OF WORKABILITY ADDITIVES

| | Long Distance Transport | Reduced Pavement Temperature | Warm Mix Asphalt |
|---|---|---|---|
| Distance to be Transported (Note 1) | | | |
| Bitumen Class 320 or 600 | Maximum 400 km | Maximum 150 km | Maximum 150 km |
| Polymer Modified Binder | Maximum 300 km | Maximum 150 km | Maximum 150 km |
| Asphalt Transport Equipment (Note 2) | Multiple trailers can be used when using bitumen. Single truck or trailer units shall be used when using PMB | Single truck or trailer units shall be used | Single truck or trailer units shall be used |
| Additive (Note 3) | Sasobit Evotherm | Sasobit Evotherm | Sasobit Evotherm |

Note 1 – the Contractor must consider the driving time, delays on site and road temperatures amongst other factors to ensure the asphalt has adequate workability on site to meet specified requirements.

Note 2 – the asphalt must be tipped direct into the paver from the cartage vehicle unless an MTV is being used.

Note 3 – the dosage rate of additive shall be determined in accordance with this specification.

2. The asphalt supplier shall determine the dosage rate and method of dosing of the additive to ensure that the manufactured asphalt has adequate workability to achieve all specified requirements including surface shape and compaction.

510.35 TESTING

1. The asphalt manufacturer shall provide and maintain at a suitable location at the site of the mixing plant for the duration of the Contract a suitably equipped air conditioned testing laboratory accredited by NATA to perform the following tests:

Testing Laboratory

WA 210.1, 212.1 or 212.2, 701.1, 705.1, 730.1, 731.1, 732.2, 733.1,
AS/NZS 2891.10, AS/NZS 2891.11, WA 730.2, AG:PT/T232 and
AS/NZS 2891.2.2 where applicable.

2. The laboratory shall be equipped with all testing equipment necessary to perform these tests. The asphalt manufacturer shall operate and maintain the equipment in good condition in accordance with NATA requirements.

Testing Equipment

3. Asphalt shall be tested for the properties and at the testing frequency shown in Specification 201 QUALITY MANAGEMENT. Tests to be undertaken include:

Testing Requirements

Routine Testing – Full Test

- PSD and Bitumen Content (WA 730.1 or WA 730.2)
- Maximum Density of Asphalt Rice Method (WA 732.2)
- Bulk Density and Void Content of Asphalt (WA 733.1)

- Stability and Flow of Asphalt Marshall Method (WA 731.1)

Routine Testing – Partial Test

- PSD and Bitumen Content (WA 730.1 or WA 730.2)
- Maximum Density of Asphalt Rice Method (WA 732.2)

Periodic Testing

- Moisture Content (AS/NZS 2891.10)
- Uniform Coating of Binder (AS/NZS 2891.11)
- Stripping Potential of Asphalt – Tensile Strength Ratio Test (AG:PT/T232) – using freeze/thaw conditioning
- Determination of the Resilient Modulus of Asphalt – Indirect Tensile Method (AS/NZS 2891.13.1)

4. Asphalt shall be sampled in accordance with WA 701.1 with samples tested immediately they are taken. The number of tests undertaken shall be evenly spread across the entire period of production for each asphalt mix being tested within a shift.

**Sample
Testing
Frequency**

5. The first sample of asphalt in a shift shall be taken from the first 50 tonnes of asphalt manufactured in the shift for each type of mix being manufactured.

First Sample

6. If the result of any test sample does not conform to any specified requirements another sample of asphalt shall be taken immediately and tested immediately for a Full Test.

7. For the Stripping Potential of Asphalt – Tensile Strength Ratio, test specimens shall be compacted at the site testing laboratory prepared without reheating of the test sample or test portion. After preparation of the test specimens the Stripping Potential of Asphalt – Tensile Strength Ratio test may be completed in the site laboratory or another laboratory away from the site of the asphalt plant.

**Preparation of
TSR
Specimens**

8. Results of testing, except for TSR, shall be reported on a NATA endorsed test report within 24 hours of a sample being taken. The testing laboratory shall send all results directly to, amongst others, the Contractor, the Superintendent and Materials Engineering Branch mailbox (MEB Asphalt reports MEBAAsphaltreports@mainroads.wa.gov.au).

Reporting

9. For the resilient modulus test, test specimens shall be compacted at the site testing laboratory prepared without reheating of the test sample or test portion. Test specimens shall be compacted in accordance with AS/NZS 2891.2.2 to an air void content of about 5% determined in accordance with AS/NZS 2891.9.2 and AS/NZS 2891.8. After preparation of the test specimens the Resilient Modulus test may be completed in the site laboratory or another laboratory away from the site of the asphalt plant. In accordance with AS/NZS 2891.13.1 test specimens shall be tested for resilient modulus within 7 days of being compacted.

**Preparation of
Modulus
Specimens**

10. When a workability additive is used in the asphalt the temperature for the compaction of Marshall and Gyratory test specimens needs to be determined for each additive used and for each dose rate of the additive. Refer to Section 6.1 of test method WA 731.1 or in test method AS/NZS 2891.2.2 for details on determining the compaction temperature.

Workability Additive

510.36 NON-CONFORMANCE

1. A hold point will apply when any mix test result indicating a non-conformance occurs. This hold point shall also apply to a mix produced prior to the non-conforming test result, but which has not been placed.

HOLD POINT

510.37 TRANSPORT

1. The asphalt shall be transported from the asphalt plant to the Works in metal bodied trucks or trailers previously cleaned of all foreign materials. In long distance haul situations the material should be transported in insulated vehicles sufficient to ensure arrival of the material on site in a conforming condition.

Vehicle Type

2. The temperature of the asphalt in each truck load and each trailer load shall be measured using a calibrated digital probe thermometer before the truck leaves the site of the asphalt manufacturing plant. The thermometer shall have a digital display readable to 1°C and have a measurement of uncertainty of not more than 3°C. Infrared thermometers shall not be used to measure temperature. The temperature shall comply with the requirements of Clause 510.32.9.

Temperature in Truck

3. The temperature of the asphalt shall be recorded on a printout showing date, time and asphalt temperature for each truck load and each trailer load of mix dispatched. The printout shall be provided with the load delivery docket.

Temperature Record

4. Each load shall be covered with suitable material of sufficient size to prevent loss of heat from the asphalt.

Heat Loss

5. The asphalt shall be delivered at a uniform rate within the capacity of the placing and compacting plant.

Delivery Rate

510.38 – 510.40 NOT USED

PLACING OF ASPHALT

510.41 GENERAL

1. Prior to placement of the first layer of asphalt on the granular sub-base the Contractor shall certify that the sub-base meets all specified requirements including levels.
2. Prior to commencing asphalting, the Contractor shall submit to the Superintendent the proposed number and widths of asphalt runs, and the proposed joint layout.

HOLD POINT

HOLD POINT

- | | |
|---|------------------------------------|
| 3. Asphalt shall not be placed if the truck delivery docket does not include a printout of the date, time and temperature of asphalt from the discharge point. | <i>Delivery Temperatures</i> |
| 4. Asphalt shall be delivered to the work site at temperatures between: | |
| (a) For 14 mm and 20 mm asphalt with Class 320 bitumen 140°C to 170°C | |
| (b) For 14 mm and 20 mm asphalt with Class 600 bitumen 150°C to 175°C | |
| (c) For 14 mm and 20 mm asphalt with A15E binder 160°C to 185°C | |
| (d) For asphalt produced as warm mix asphalt 125°C to 155°C | |
| 5. If a delay occurs of more than 30 minutes between successive truck deliveries to the paver, the machine shall be moved clear of the laid asphalt and a proper transverse joint formed. | <i>Delays</i> |
| 6. Prior to commencing each day's operations, and also after any delay exceeding half an hour during the day, the screed shall be preheated for at least 15 minutes in order to eliminate drag marks and imperfections in the finished mat. | <i>Screed to be Preheated</i> |
| 7. All kerbs, gullies, grates and other structures shall be protected at all times from damage or defacement by asphalt placement Works and the site shall be left in a clean and tidy condition. | |
| 8. A sprayed seal shall be applied to the uppermost layer of 14 mm asphalt intermediate course no more than 2 working days after completion of the uppermost layer of 14 mm asphalt intermediate course. The seal shall comply with: | <i>Seal on Intermediate Course</i> |
| (a) Apply a single seal in accordance with Specification 509 POLYMER MODIFIED BITUMINOUS SURFACING. | |
| • S35E binder at 1.4 L/m ² and 10 mm aggregate at 150 m ² /m ³ | |
| (b) In cold or cooler months, when the seal will be trafficked (construction traffic or public traffic) or where specified apply a double double seal in accordance with Specification 503 BITUMINOUS SURFACING. | |
| • first coat CRS/170-60 bitumen emulsion at 0.9 L/m ² of emulsion and 10 mm aggregate at 140 m ² /m ³ | |
| • second coat CRS/170-60 bitumen emulsion at 1.1 L/m ² of emulsion and 5 mm aggregate at 250 m ² /m ³ | |

510.42 SURFACE PREPARATION

- | | |
|--|-----------------|
| 1. Prior to the placement of asphalt, the Contractor shall carry out preparation work as detailed in the following clauses. | <i>General</i> |
| 2. The Contractor shall sweep all surfaces on which asphalt is to be placed under this contract to a clean condition with no appreciable amounts of loose materials or any other foreign matter remaining. Loose surface | <i>Sweeping</i> |

material against kerbing shall be removed by handwork if necessary. The surface to be paved shall be dry.

3. The pavement layer below the first layer of asphalt shall have a uniform texture with a tightly bonded surface and be primed. The texture of this surface should key the asphalt to the surface and resist any tendency for “slippage” failures.

Surface Condition

4. Where paving tape is shown in asphalt drawings the tape shall be applied to a surface that is clean, dry and all loose material has been removed beyond the width of the tape to be applied. Joins of the tape shall be overlapped and any air bubbles or creases in the tape shall be cut and flattened.

Paving Tape on Joints

5. Paving tape shall be applied to the area of the joint around a drainage structure. The tape shall be placed over the intermediate course asphalt where it flush joins with the cementitious material backfill around the drainage structure.

Paving Tape Drainage Structures

510.43 METHOD OF PLACEMENT

1. Asphalt must be placed by a self-propelled paver equipped with the ability to be operated with automatic thickness control and automatic joint matching facility. The paver must be equipped with a ski or laser control system and cross fall controller to maintain levels, and also suitable sensing equipment to provide longitudinal joint matching. It shall further be equipped with a vibrating or tamping screed capable of achieving 85% of final compaction.

Paver

2. Where the use of a material transfer vehicle (MTV) is specified at Annexure 510B the MTV shall be a self-propelled machine capable of receiving asphalt from delivery trucks, storing the asphalt, heating asphalt in storage and transferring the asphalt to the paver without any contact with the paver. The MTV must have a minimum storage capacity of 15 tonnes and the paver must be fitted with a bin in its hopper to transfer asphalt directly to the feed conveyor of the paver.

Material Transfer Vehicle

510.44 TACK COAT

1. A tack coat shall be applied to the prepared surface at the rate of 0.6 litres/m² of the dilute emulsion or as directed by the Superintendent. The tack coat shall be sprayed in a uniform film over the entire surface including all longitudinal and transverse joints. An additional application of tack coat shall be applied at the same rate to a width of 300 mm over any longitudinal joint.

Composition

2. No asphalt shall be placed on the tack coat until the emulsion has broken and the water has substantially evaporated.

3. The Superintendent may direct the pavement area ahead of the spreader to be resprayed and may specify the time to be allowed between the spraying of tack coat and the placing of asphalt. However, this area shall not exceed the requirements for half a day's placing of asphalt.

Respraying

4. The tack coat shall be applied with care to reduce the possibility of concrete kerbs, driveways and footpaths being sprayed with bitumen. Any

Contamination

such contamination shall be removed by the Contractor at no cost to the Principal.

510.45 NOT USED

510.46 WEATHER CONDITIONS

- Asphalt placement shall not commence or continue upon a surface which is not clean and dry and only when the pavement temperature meets the requirements shown in Table 510.6.

Pavement Temperature

TABLE 510.6 PAVEMENT TEMPERATURES FOR PLACEMENT

| Mix Type | Binder in Mix | Minimum pavement temperature when wind speed < 20 km/hr | Minimum pavement temperature when wind speed ≥ 20 km/hr |
|----------|---|---|---|
| 20 mm | C320 Bitumen | 5°C | 10°C |
| 20 mm | C600 Bitumen | 10°C | 20°C |
| 20 mm | C600 Bitumen with Workability Additive | 5°C | 10°C |
| 20 mm | Polymer Modified Binder | 15°C | 20°C |
| 20 mm | Polymer Modified Binder with Workability Additive | 10°C | 15°C |
| 14 mm | Polymer Modified Binder | 20°C | 25°C |
| 14 mm | Polymer Modified Binder with Workability Additive | 10°C | 15°C |

- Where asphalt intermediate course is exposed to rainfall or surface water before the sprayed seal is applied to the 14 mm asphalt intermediate course and the in-situ air void content has an upper characteristic value greater than 5.0% the moisture content of the asphalt within the affected Lot shall be sampled and determined in accordance with WA 701.1 and WA 705.1. Where the moisture content within the Lot is greater than 0.5% the Lot shall be removed and replaced, at no cost to the Principal.

510.47 JOINTS

- The number and extent of joints in asphalt layers shall be kept to a minimum and the paving pattern shall be designed accordingly in advance of the work.

Paving Pattern

- The main paving runs shall be laid first and any smaller or irregular adjacent areas later so that they can be matched to the main run.

- Each joint shall be neat, thoroughly compacted, and have a surface finish equal in quality to that of the surrounding asphalt layer.

Surface Finish

- Where the edge of the previously laid work has become distorted it shall be cut back a sufficient distance to provide the true cross section.

Edges

510.48 LONGITUDINAL JOINTS

1. Longitudinal joints shall be continuous and parallel to the lane markings. The vertical face of the previous run shall be tack coated before the paving of the adjacent run proceeds. Longitudinal joints in asphalt intermediate courses shall be offset from layer to layer by not less than 150 mm and shall be within 150 mm of the traffic lane line or the centre of traffic lane. Joints shall be located away from traffic wheel paths. Where new pavement abuts an existing pavement, the existing pavement shall be removed in steps to achieve an offset from layer to layer of not less than 150 mm. **Position**
2. Unconfined edges of a paving run shall be compacted using an edge compaction device. The outer 75 mm in width from the top of the compacted asphalt layer shall be removed using a cutter or cold planer except for edges of the pavement that will not form a joint. The cost of the asphalt and its removal shall be at no cost to the Principal. **Edge Compaction**
3. When the adjacent paver run is placed the uncompacted asphalt shall be placed to overlap the compacted asphalt of the previous run by between 25 and 75 mm in width of loose asphalt. The loose asphalt shall be pushed back using a lute to form a ridge along the edge of the joint. Excess asphalt in forming the ridge shall be removed before rolling. **Next Paver Run**
4. Where echelon paving occurs with a second paver placing asphalt on a second paving run when the temperature of the first paving run is greater than 100°C cutting back of the asphalt is not required. Overlap of the first paving run shall occur as specified at Clause 510.48.3. **Echelon Paving**
5. Temporary longitudinal ramps shall be provided for any asphalt course that has not been completed to the full carriageway width and is subjected to traffic. These ramps shall be cut back before the adjacent lane is laid. **Temporary Ramps**

510.49 TRANSVERSE JOINTS

1. Transverse joints shall be at right angles to the direction of paving. They should be staggered by at least one (1) metre between successive layers and between adjacent runs.
2. The vertical face of the previous run shall be tack coated before the paving of the next run proceeds. **Tack Coat**
3. Temporary transverse ramps shall be provided where traffic is to use the newly laid work prior to a run being completed. These ramps shall be cut back before the next run is laid. **Temporary Ramps**

510.50 ASPHALT CONSTRUCTION DRAWINGS

1. Unless otherwise specified details for transverse joints, longitudinal joints and profiles shall be in accordance with the asphalt construction drawings available on the Main Roads website as listed in Table 510.7.

TABLE 510.7 LIST OF ASPHALT CONSTRUCTION DRAWINGS

| Drawing Number | Title |
|----------------|--|
| 201331-0031 | Pavement Series – Typical details full depth asphalt transverse joints |
| 201331-0032 | Pavement Series – Typical details Granular transverse joints |
| 201331-0033 | Pavement Series – Typical details full depth asphalt longitudinal joints and profile |
| 201331-0035 | Wearing Course Series – Typical details OGA/DGA transverse joints |
| 201331-0036 | Wearing Course Series – Typical details DGA transverse joints |
| 201331-0037 | Wearing Course Series – Typical details SMA transverse joints |
| 201331-0038 | Wearing Course Series – Typical details longitudinal joints |

510.51 SPREADING

1. All asphalt shall be spread with a paver except for small areas where use of a paver is not practicable. Where specified, in Annexure 510A two pavers in echelon shall be used in locations where a full carriageway wider than 6 m is available clear of traffic.

2. The uppermost layer of asphalt intermediate course shall be 14 mm dense graded asphalt intermediate course. Unless approved otherwise by the Superintendent, other layers of asphalt intermediate course shall be constructed using 20 mm asphalt intermediate course.

*Uppermost
Intermediate
Course Layer*

3. Nominal 20 mm asphalt intermediate course shall be placed in layers of compacted thickness not less than 60 mm and not greater than 90 mm. Nominal 14 mm asphalt intermediate course shall be placed in layers of compacted thickness not less than 45 mm or greater than 55 mm.

*Layer
Thickness*

4. Asphalt intermediate course other than the uppermost layer of asphalt intermediate course shall be covered with the next layer of asphalt intermediate course no more than 2 working days after completion of rolling of the layer to be covered.

*Maximum Time
Between
Layers*

5. A layer of asphalt intermediate course or wearing course shall not be placed over the preceding layer until the maximum surface temperature at any point on the surface of the preceding layer has cooled to 63°C or less. The temperature shall be measured on a surface free of surface moisture. The requirement is not applicable where the work will not be opened to public traffic for at least 12 hours.

*Temperature of
Previous Layer*

510.52 – 510.53 NOT USED**510.54 COMPACTION**

1. Self-propelled steel wheel rollers and pneumatic tyred rollers meeting the requirements of AS 2150 shall be used. Vibratory pneumatic tyred rollers may be used. All rollers shall be fitted with reticulation to water wheels or tyres to prevent pick up of asphalt and be fitted with scrapers to clean the wheels or tyres. The steel wheeled rollers shall be fitted with additional equipment to assist with compaction of unsupported edges of the paver

Equipment

run. The edge compaction device shall stop asphalt from moving away from the wheel of the roller by placing pressure on the edge of the asphalt by means of an arm pneumatically or hydraulically powered.

2. Roller speed shall be uniform. Stops and starts shall be controlled so that displacement (shoving) of the asphalt does not occur when changing direction. Any shoving occurring as a result of changing direction, or from any other cause, shall be corrected at once by the use of rakes and of fresh asphalt when required.

Procedures

3. To prevent adhesion of asphalt to the roller, all wheels shall be kept properly moistened but excess of water shall be avoided. The use of potable water or potable water with water softener shall be used to moisten tyres and/or drums. Products that cut or clean bitumen shall not be used, including but not limited to any petroleum based, diesel based or solvent products. Minimal water softener products can be utilised within the parameters of this clause.

Moistened Wheels

4. Vibratory compaction shall be discontinued in areas where it is considered such vibrations could cause damage to adjacent buildings or structures. Under these conditions, initial compaction of the asphalt shall be achieved using the self-propelled static steel wheeled rollers of appropriate mass to meet the compaction requirements in Clause 510.55.

Vibratory Compaction

5. Rollers shall be kept in continuous operation as much as practicable and in such a manner that all parts of the pavement receive substantially equal compaction. In the event of a delay in the laying operation, rolling is to be carried out as close as practicable to the paving machine. Rollers shall not be parked on work carried out the same day.

Continuous Operations

6. The number of rollers on site shall be commensurate with the rate of supply of asphalt and the output of the paving machine.

Number of Rollers

7. All joints must be filled and edges adjacent to kerbing and such other hand work as may be necessary must be rolled with a suitable pedestrian-type roller.

Joints

8. At places not accessible to the roller, thorough compaction must be ensured by means of hot tampers and at all joints with structures the surface mixture must be effectively sealed.

Hot Tampers

9. The Contractor shall ensure the protection of services and property from deterioration or damage due to the Works.

Protection

10. Finish rolling shall be carried out while the material is still warm enough for the removal of tyre marks. Steel wheeled rollers shall be used.

Finish Rolling

510.55 IN-SITU AIR VOID CONTENT

1. The Characteristic In-situ Air Void content for any lot shall be deemed to be conforming if it attains a value complying with Table 510.8. The Characteristic In-situ Air Voids shall be determined for each layer of intermediate course asphalt placed within an asphalt pavement, in accordance with Specification 201 QUALITY MANAGEMENT.
2. Air Voids shall be calculated on the basis of the results of tests of core samples of asphalt sampled from an asphalt layer after laying and

In-situ Air Void

compaction in accordance with WA 701.1. The density of the core samples shall be determined in accordance with WA 733.1 – Section 5.1.2. The air voids shall be calculated using the mean Maximum Density of all asphalt results from the same production shift in accordance with WA 732.2 and WA 733.1.

3. Core samples shall be taken three (3) hours post completion of the lot and within 24 hours of placement of a lot of asphalt. Results of testing shall be reported on a NATA endorsed test report within 48 hours of the core samples being taken. The testing laboratory shall send all results directly to, amongst others, the Contractor, the Superintendent and Materials Engineering Branch mailbox (MEBAsphaltreports@mainroads.wa.gov.au).

Testing and Reporting of Results

TABLE 510.8 IN-SITU AIR Voids REQUIREMENTS

| Mix Type | Characteristic Value (%) | |
|---------------------------------------|---------------------------------|----------------|
| | Minimum | Maximum |
| All layers of 14 mm and 20 mm asphalt | 3.0 | 6.0 (Note) |

Note – the aim is for asphalt suppliers to be able to consistently achieve a characteristic in-situ air void content of 3 – 6%. To allow for asphalt suppliers to implement new asphalt mix designs and construction practices to achieve this outcome and until a transition is fulfilled the maximum characteristic value for in-situ air voids is 7.0%.

4. Where any lot of asphalt work is deemed non-conforming the Contractor shall apply remedial action in accordance with the procedures contained in Specification 201 QUALITY MANAGEMENT, and the lot shall be removed and replaced with fresh asphalt and retested. Removal shall be carried out so as not to damage the underlying layers or any road furniture such as gully gratings. Any such damage shall be repaired at no cost to the Principal.

Non-conformance

510.56 SURFACE REQUIREMENTS

1. The surface of the compacted asphalt shall be smooth, true to the specified crown and grades, be of uniform appearance, free of dragged areas, cracks, open textured patches and roller or paver marks. Any section of asphalt that is loose or broken, mixed with dirt or other impurities, or is in any way defective, shall be removed and replaced.
2. When using the 3 m straightedge, in accordance with WA 313.2, the shape of the top of the compacted asphalt intermediate course shall be deemed to be conforming when the maximum deviation from a 3 metre straight edge, placed in any position on the surface of the asphalt intermediate course does not exceed the limits specified in Table 510.9. A 3 m straightedge shall be provided with each paver.
3. When using the ARRB TR Walking Profiler, in accordance with WA 313.4, the shape of the top of the compacted asphalt intermediate course shall be deemed to be conforming when the maximum deviation, measured in any direction and within any 3 m long section of the surface does not exceed the limits specified in Table 510.9.

Shape: 3 m Straightedge

Shape: ARRB Profiler

TABLE 510.9 SURFACE SHAPE

| Direction of Measurement | Maximum Deviation | Maximum rate of Change of Deviation |
|--------------------------|-------------------|-------------------------------------|
| Longitudinal | 5 mm | 1.0 mm per 240 mm |
| Transverse | 5 mm | 1.0 mm per 240 mm |

4. For construction works, the upper surface of the compacted asphalt intermediate course shall be within +5 mm and -10 mm of the design level. **Level and Thickness**
5. The plan location of the outer edge of the asphalt shall be within +25 mm of its true location and the rate of change of the edge from its true plan position shall not exceed 1 in 40. **Position**
6. The Contractor shall test for compliance with the specified lines, levels, thickness and surface finish immediately after initial compaction. Any variations shall be corrected by removing or adding asphalt as may be necessary. Rolling shall then be continued as specified. After final rolling out, the smoothness of the course shall be checked again. **Compliance**
7. Where work is deemed non-conforming the Contractor shall apply remedial action in accordance with the procedures contained in Specification 201 QUALITY MANAGEMENT, and the lot shall be removed and replaced with fresh asphalt and retested. **Non-conformance**

510.57 OPENING FINISHED WORKS TO TRAFFIC

1. Prior to opening the finished asphalt surface to traffic, the Contractor shall certify to the Superintendent that the final road surface is completed in accordance with the specification, and that the Works are properly delineated and safe for public use. **HOLD POINT**

510.58 – 510.80 NOT USED**AS-BUILT AND HANDOVER REQUIREMENTS****510.81 – 510.90 NOT USED****CONTRACT SPECIFIC REQUIREMENTS****510.91 – 510.99 NOT USED**

ANNEXURE 510A

SCHEDULE OF WORKS

(Insert appropriate details of asphalt treatments: for Main Roads Policy, refer Guidance Note 1. Supplement with drawings, diagrams, etc. where necessary.)

ANNEXURE 510B

SPECIFIC CONTRACT REQUIREMENTS

1. MATERIAL TRANSFER VEHICLE

A material transfer vehicle is required to be used for the following layers:

| Location | Yes | No |
|----------|-----|----|
| | | |
| | | |
| | | |
| | | |

2. ECHELON PAVING

Echelon paving is required to be used for the following areas:

| Location | Yes | No |
|----------|-----|----|
| | | |
| | | |
| | | |
| | | |

GUIDANCE NOTES

FOR REFERENCE ONLY – DELETE GUIDANCE NOTES FROM FINAL DOCUMENT

1. All edits to this specification are to be made using track changes, to clearly show added/deleted text.
2. If **all** information relating to a clause is deleted, the clause number should be retained and the words "**NOT USED**" should be inserted.
3. The proposed document with tracked changes must be submitted to the Project Manager for review, prior to finalising the document.
4. Once the Project Manager's review is complete, accept all changes in the document, turn off track changes and refresh the Table of Contents.
5. The Custodian of this specification is Manager Materials Engineering.

1. USE OF A MATERIAL TRANSFER VEHICLE

- 1.1 The requirement to use an MTV has to be specified at Annexure 502C. MTVs facilitate continuous paving by having a truck come in contact with the MTV to empty its load whilst asphalt is transferred into the paver by conveyor. Removing contact between a truck and paver overcomes bumps from the stop/start of the paver and reduces the likelihood of mix segregation near the end of a truckload. The outcome is more uniform temperature of the asphalt which will result in improved and more uniform compaction, improved ride and less incidence of segregated areas of asphalt.

MTVs are not suited to all asphalting applications as shown below. Where an MTV must be used includes:

- On a project where there will be high daily production outputs of asphalt, e.g. widening of Tonkin and Leach Highways near Perth Airport (Gateway WA Project).
- Where there are long paving runs, e.g. Kwinana Fwy widening Roe to Armadale and Armadale to Russell.
- Where improved ride quality is required, e.g. Great Eastern Hwy from Graham Farmer Fwy to Tonkin Hwy (City East Alliance).
- Where asphalt is to be placed in adverse weather conditions such as low temperatures or strong winds, e.g. winter paving.
- When paving thin layers of asphalt containing a polymer modified binder.

MTVs may not be suited for the following scenarios:

- On a project where there will be small daily production outputs of asphalt, e.g. small minor improvement works.
- Where there are confined spaces.

- Small areas of widening such as intersection channelisation including short turn pockets.

2. SEAL ON ASPHALT INTERMEDIATE COURSE

- 2.1 The aim of the seal is to waterproof the surface of the uppermost layer of the 14 mm asphalt intermediate course. Details of the binder, aggregate type, binder application rate and aggregate spread rate should be included in Specification 503 or 509 as appropriate. The amount of binder applied will dictate how effective the seal will be at waterproofing the surface.

Single coat seals using 5 mm and 7 mm cover aggregate will have low binder application rates and will not provide sufficient waterproofing, therefore the smallest size aggregate specified for a single coat seal is 10 mm nominal size applied to S35E modified binder at the following application rate:

| | Binder Application Rate @ 15°C (L/m ²) | Aggregate Spread Rate (m ² /m ³) |
|--------------------------------------|---|--|
| 10 mm single coat seal using S35E | 1.4 | 150 |

Where an emulsified binder is used it is not practical to apply the seal as a single coat of 10 mm aggregate. The specification requires that where an emulsion seal is to be applied over the 14 mm intermediate course it has to be a 10/5 mm two coat seal.

| | Binder Application Rate @ 15°C (L/m ²) | Aggregate Spread Rate (m ² /m ³) |
|---------------------------------|---|--|
| First coat – 10 mm aggregate | 0.9 | 140 |
| Second coat – 5 mm aggregate | 1.1 | 250 |

3. MINOR WORKS CONTRACTS

- 3.1 Where this document is used in a Minor Works Contract with dense graded wearing course asphalt as the sole or primary work required, Authors should ensure that the following specifications are also included in the tender documentation:
- Specification 100 GENERAL REQUIREMENTS
 - Specification 604 PAVEMENT MARKINGS (if required)
- 3.2 Contract Specific Requirements – include any details provided or required by the Principal, such as:
- Setting Out information
 - Working Hours and Days (if not already included in the tender document)
 - Surface Preparation – e.g. normally sweeping only, but may include localised surface correction requirements

- (d) Record Forms – to include any required details of proof and origin of asphalt supply, etc.

Insert appropriate Annexures and reference to Annexures to suit in conjunction with these additional provisions.

CONTRACT SPECIFIC REQUIREMENTS

The following clauses are to be placed under the CONTRACT SPECIFIC REQUIREMENTS, as required. After inserting the clause, change the clause number and heading to style “H2 SP” so it appears in the Table of Contents.

XXX.XX SUB-HEADING (H2 SP)

1. Insert text (Main Table SP) XXXX

Insert text (Main Table SP)

XXX.XX SUB-HEADING (H2 SP)

1. Insert text (Main Table SP)

Insert text (Main Table SP)

AMENDMENT CHECKLIST

Specification No. **510** Title: **ASPHALT INTERMEDIATE COURSE** Revision No: _____

Project Manager: _____ Signature: _____ Date: _____

Checked by: _____ Signature: _____ Date: _____

Contract No: _____ Contract Name: _____

| ITEM | DESCRIPTION | SIGN OFF |
|--|---|----------|
| <i>Note: All changes/amendments must be shown in tracked changes until approved.</i> | | |
| 1. | Project Manager has reviewed the Specification and identified additions and amendments. | |
| | Standard clauses amended? MUST SEEK approval from the Specification Custodian. | |
| | Any unlisted materials/products proposed and approved by the Project Manager? If "Yes" provide details at 16. | |
| | Deleted clauses shown as " NOT USED ". | |
| | Ensure appropriate INSPECTION AND TESTING parameters are included in Specification 201 (test methods, minimum testing frequencies verified). | |
| | AS-BUILT AND HANDOVER requirements addressed. | |
| | CONTRACT SPECIFIC REQUIREMENTS addressed? Contract specific materials, products, clauses added? (refer Specification Guidance Notes). | |
| | ANNEXURES completed (refer Specification Guidance Notes). | |
| | Estimates Manager has approved changes to SMM . | |
| | Project Manager certifies completed Specification reflects intent of the design. | |
| | Independent verification of completed Specification arranged by Project Manager. | |
| | Project Manager's review completed. | |
| | SPECIFICATION GUIDANCE NOTES deleted. | |
| | TABLE OF CONTENTS updated. | |
| | FOOTER updated with Document No., Contract No. and Contract Name. | |
| | Supporting information prepared and submitted to Project Manager. | |

Additional information or further action:

Signed: _____ (*Project Manager*) Date: _____