SPECIFICATION 502

STONE MASTIC ASPHALT

REVISION REGISTER			
Clause Number	**Description of Revision**	**Authorised By**	**Issue Date**
502.02, 502.26.02.2, 502.32.3, 502.35	Inclusion of Ignition Oven WA 730.2 Test Method and requirements for mix design submission	BPC	17/09/2024
502.22 & 502.42.4	Paving Tape reference to Specification 511 updated		
502.55.2	Updated Test Method Reference	BPC	04/04/2022
502.03	New Clause to align with other Specifications	MME	05/08//2021
502.05	New Clause to align with other Specifications		
502.32.8	Maximum temperature reduced with Workability Additive and formatting change to new Table		
502.34 & 502.35.8	Updated as Workability Additive and requirements for use of Sasobit and Evotherm		
502.35.1	Test method T660 removed to align with other Specifications		
502.35.7 & 502.55.3	Rewording of Test Report distribution		
502.41.2	Hold Point removed to align with other Specifications		
502.42.4	Added Flexiseal Tape HD 250mm wide		
502.46.1	Clause updated with Table to align with other Specifications		
502.48.1 & 502.49.3	Rewording to vertical face		
502.54.4	Updated wording on roller water		
502.55.3	Minimum time before coring added		
Guidance Note	Rewording to Manager Materials Engineering.		
Guidance Note	Included MTV to align with other Specifications		
Whole Document	Removal of Test Method T660		
Whole Document	Rewording Sasobit to Workability Additive		
Whole Document	Formatting Table numbering updated		
Whole Document	Reformatted	SCO	22/05/2017

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SPECIFICATION 502

STONE MASTIC ASPHALT

GENERAL

502.01 SCOPE

1. The work under this specification consists of the supply and application of stone mastic asphalt (hereafter referred to as asphalt) as a pavement wearing course.

2. Details of the location and extent of asphalt work are either summarised at Annexure 502A, or are shown on the Drawings. ***Details***

3. The works shall include surface preparation, supply of materials, production, hauling, placing and compaction of asphalt to the areas as shown in the Drawings, or as otherwise directed by the Superintendent, but not including correction of existing pavement surfaces. Correction shall be done using a 10 mm dense graded asphalt meeting the requirements of Specification 504 DENSE GRADED ASPHALT WEARING COURSE.

502.02 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 2150	Hot Mix Asphalt

Australian/New Zealand Standards

AS/NZS 2891.10	Moisture Content of Asphalt
AS/NZS 2891.11	Degree of Particle Coating

MAIN ROADS Test Methods

WA 210.1	Particle Size Distribution of Aggregates
WA 313.2	Surface Shape Using a Straightedge
WA 313.4	Surface Profile: ARRB TR Walking Profiler
WA 701.1	Sampling and Storage of Asphalt
WA 730.1	Bitumen Content and Particle Size Distribution of Asphalt and Stabilised Soil: Centrifuge Method
WA 730.2	Bitumen Content and 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

AUSTROADS Test Methods

AG:PT/T234	Asphalt Binder Content (Ignition Oven Method)
AG:PT/T235	Asphalt Binder Drain-off

Australian Asphalt Pavement Association

Advisory Note 7	Guide to the heating and storage of binders for asphalt manufacture

MAIN ROADS Specifications

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

502.03 DEFINITIONS

Terminology

1. Unless otherwise detailed in the Contract, the meaning of terms and definitions in this Specification are as follows:

   (a) “Asphalt course” comprises one or more layers of a single asphalt type.

   (b) “Asphalt layer” comprises a single paving run of uniform asphalt.

   (c) “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.

   (d) “Asphalt pavement” is a pavement, the predominate structural strength of which is provided by asphalt layers.

   (e) “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.

502.04 NOT USED

502.05 SUSTAINABILITY CONSIDERATIONS

1. Materials for road pavements shall be managed under the sustainability hierarchy of REDUCE, REUSE and RECYCLE.

Reduce

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.

Reuse

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. 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. ***Recycle***

PRODUCTS AND MATERIALS

502.06 BITUMINOUS BINDER

1. Polymer modified binder used in the production of asphalt shall be A20E conforming to the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

502.07 BITUMEN EMULSION

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

502.08 AGGREGATE

1. Crushed aggregate, including its source rock, shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS. Coarse and fine aggregates used to manufacture the asphalt shall only consist of crushed materials sourced from quarries within the Perth region.

502.09 FIBRES

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

502.10 MINERAL FILLER

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

502.11 ADHESION AGENT

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

502.12 GRITTING AGGREGATE

1. Where the use of surface grit is specified in Annexure 502B the following materials shall be used. The nominal size of the grit shall be 3 mm.

   (a) Black granite from Barossa Quarries, South Australia

   (b) Grey Calcined Bauxite from Guyana

502.13 – 502.21 NOT USED

502.22 PAVING TAPE

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

502.23 – 502.25 NOT USED

MIX DESIGN

502.26 MIX DESIGN

502.26.01 DESIGN PARAMETERS

1. All asphalt produced shall be assessed in accordance with the standard procedures laid down for the Marshall method of design as shown in Table 502.1.

TABLE 502.1 DESIGN PARAMETERS

Description	Test Method
Stability & Flow of Asphalt: Marshall Method	WA 731.1
Maximum Density of Asphalt: Rice Method	WA 732.2
Bulk Density & Void Content of Asphalt	WA 733.1

2. The design shall produce asphalt which satisfies the limiting values of the various properties listed in Table 502.2.

TABLE 502.2 MARSHALL PROPERTIES – STONE MASTIC ASPHALT (50 BLOW COMPACTION)

Parameter	Min	Max
Marshall Stability	6.0 kN	-
Marshall Flow	2.00 mm	5.00 mm
Air Voids:		
nominal 10 mm	3.5 %	5.5 %
nominal 7 mm	3.0 %	5.0 %
Voids in Mineral Aggregate:		
nominal 10 mm	18.0 %	-
nominal 7 mm	19.0 %	-

3. In addition to achieving all the specified property values, all asphalt shall have an adequate workability and shall be suitably resistant to segregation during handling and placing. ***Workability***

502.26.02 CONFORMING MIX DESIGN FOR STONE MASTIC ASPHALT

1. The conforming mix design described in this clause is for asphalt produced using granite aggregates from the Perth region. ***Perth Mix Only***

2. The asphalt shall consist of a mixture of coarse and fine aggregates, fibres, hydrated lime, mineral filler and polymer modified binder. The materials shall be measured and then mixed in such proportions as to satisfy the properties in Table 502.3.

TABLE 502.3 CONFORMING SIZES FOR PERTH AREA: PARTICLE SIZE DISTRIBUTION AND BINDER CONTENT

Australian Standard Sieve (AS 1152) mm	**Percentage Passing**	
	Nominal 7 mm Granite	**Nominal 10 mm Granite**
13.20	-	100
9.50	100	90 – 100
6.70	90 – 100	25 – 40
4.75	25 – 40	18 – 30
2.36	15 – 28	15 – 28
1.18	13 – 24	13 – 24
0.600	12 – 21	12 – 21
0.300	10 – 18	10 – 18
0.150	9 – 14	9 – 14
0.075	8 – 12	8 – 12
Binder Content (by percentage mass of whole mixture)	6.5 – 7.5	6.0 – 7.0
Hydrated Lime (by percentage mass of total aggregate)	1.5	1.5
Fibre Content (by percentage mass of whole mixture)	0.3 min	0.3 min
Binder Drain-off at 185°C	0.3 max	0.3 max

3. Where an ignition oven can be utilised to determine the binder content, a submission shall include: ***Ignition Oven Offset***

   (a) Offset determination in accordance with WA 730.2 and AG:PT/T234 Appendix A excluding fibre content.

(b) Samples to satisfy AG:PT/T234 Appendix A to be provided to Materials Engineering Branch.

(c) Offset determination in accordance with WA 730.2 and AG:PT/T234 Appendix A including nominal amount of fibre content.

502.27 – 502.30 NOT USED

MANUFACTURE AND TRANSPORT

502.31 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. ***Plant***

2. 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. ***Binder Sampling Cocks***

3. 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.

502.32 MANUFACTURE OF ASPHALT

1. The quantities of coarse and fine aggregates, fibres, mineral filler, adhesion agent and binder shall be accurately and positively controlled so as to produce the asphalt specified for use in the Works. Reclaimed asphalt pavement (RAP) shall not be included in the production of any stone mastic asphalt. ***Control***

2. 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 process shall be such that there are no clumps of aggregate and/or binder is present in the asphalt. Cellulose fibres shall be dry mixed with the aggregates for sufficient time to ensure uniform distribution of the fibres. Cellulose fibres shall not be added to aggregates that are at a temperature of greater than 190°C. ***Mixing***

3. The particle size distribution and the percentage of binder shall be within the limits as specified in Table 502.3 when tested in accordance with WA 730.1 or WA 730.2. ***PSD and Binder Content***

4. The air voids, VMA, stability and flow shall be in accordance with Table 502.2 when tested in accordance with WA 731.1 and 733.1. ***Marshall Properties***

5. 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***

6. The binder drain off shall be within the limits as specified in Table 502.3 when tested in accordance with AG:PT/T235. ***Binder Drain Off***

7. 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. ***Volume of Material***

8. 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 502.4. ***Temperature at Discharge Point***

TABLE 502.4 TEMPERATURE AT DISCHARGE POINT

	Hot Asphalt (max)	Asphalt Mixture with Workability Additive (max)	Warm Mix Asphalt (min)
Polymer Modified Binder	170°C	170°C	Not Applicable

502.33 STORAGE AND HANDLING

1. Binder 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 after delivery shall binder be heated to a temperature greater than 180°C. ***Storage Temperature***

502.34 WORKABILITY ADDITIVIES

1. Approved workability additives may be used in the production of stone mastic asphalt in the applications shown in Table 502.5. ***Use of Additives***

TABLE 502.5 USE OF WORKABILITY ADDITIVES

	Long Distance Transport	Reduced Pavement Temperature	Warm Mix Asphalt
Distance to be Transported (Note 1)	Maximum 300 km	Maximum 150 km	Not Applicable
Asphalt Transport Equipment (Note 2)	Single truck or trailer units shall be used	Single truck or trailer units shall be used	Not Applicable
Additive (Note 3)	Sasobit or Evotherm	Sasobit or Evotherm	Not Applicable

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. ***Mixing***

502.35 TESTING

1. The asphalt producer 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 the National Association of Testing Authorities of Australia (NATA) to perform the following tests: ***Testing Laboratory***

   WA 210.1, 212.1 or 212.2, 701.1, 705.1, 730.1 or 730.2, 731.1, 732.2, 733.1, AS/NZS 2891.10, AS/NZS 2891.11 and AG:PT/T235.

2. The laboratory shall be equipped with all testing equipment necessary to perform these tests. The asphalt producer 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)
   - Degree of Particle Coating (AS/NZS 2891.11)
   - Asphalt Binder Drain Off (AG:PT/T235)

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 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. ***First Sample***

6. If any result of a 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. Results of testing 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 the Main Roads Materials Engineering mailbox (MEBAsphaltreports@mainroads.wa.gov.au). ***Reporting***

8. 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***

502.36 NON-CONFORMANCE

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

502.37 TRANSPORT

1. The asphalt shall be transported from the asphalt plant to the Works in metal bodied trucks previously cleaned of all foreign materials. In long distance haul situations the asphalt should be transported in insulated vehicles sufficient to ensure arrival of the asphalt 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 502.32.8. ***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***

502.38 – 502.40 NOT USED

PLACING OF ASPHALT

502.41 GENERAL

1. **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***

2. Asphalt shall not be placed if the truck delivery docket does not include a printout of the date, time and temperature of asphalt when the truck was dispatched.

3. Asphalt with workability additive shall be delivered to the work site at temperatures between 155°C and 170°C. ***Delivery Temperatures***

4. If a delay occurs of more than 30 minutes between successive truck deliveries to the paver, the paver shall be moved clear of the laid asphalt and a proper transverse joint formed. ***Delays***

5. 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. ***Screed to be Preheated***

6. 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. ***Damage***

502.42 SURFACE PREPARATION

1. Prior to the placement of asphalt, the Contractor shall carry out preparation work as detailed in the following clauses.

2. The Contractor shall sweep all road 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 material against kerbing shall be removed by handwork if necessary. The surface to be paved shall be dry. ***Sweeping***

3. Where the surface to be covered is asphalt, all depressions more than 20 mm deep shall be filled with a nominal 10 mm dense graded asphalt meeting the requirements of Specification 504 DENSE GRADED ASPHALT WEARING COURSE and shall be screeded or raked and then compacted to similar density as the remainder of the surface to be paved. ***Surface Correction***

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***

502.43 EQUIPMENT

1. The 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 optical sensors, a ski or mobile stringline 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. ***Asphalt Paver***

2. Where the use of a material transfer vehicle (MTV) is specified at Annexure 502C 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***

502.44 TACK COAT

1. A tack coat shall be applied to the prepared surface at the rate of 0.6 litres/m^2 of the dilute emulsion or as directed by the Superintendent. ***Emulsion Type***

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 asphalt paver 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 such contamination shall be removed by the Contractor at no cost to the Principal. ***Contamination***

502.45 NOT USED

502.46 WEATHER CONDITIONS

1. 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 502.6 and rain is not imminent. ***Pavement Temperature***

TABLE 502.6 PAVEMENT TEMPERATURE 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
SMA	A20E with workability additive	15°C	20°C

2. The Superintendent may, if the weather or surface conditions are considered to be unsuitable, instruct the Contractor to cease laying operations. Any asphalt laid after this instruction is given will not be paid for and is to be removed at no cost to the Principal.

502.47 JOINTS

1. 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***

2. 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.

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

4. 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***

502.48 LONGITUDINAL JOINTS

1. Longitudinal joints shall be continuous and parallel to the pavement lane markings. Joints shall be offset by at least 150 mm from joints in an underlying layer of asphalt. Joints shall be located away from traffic wheel tracks. Where possible, joints shall be located beneath traffic line marking. The vertical face of the previous run shall be lightly tack coated before the paving of the adjacent run proceeds. ***Position***

2. Unconfined edges of a paving run shall be compacted using an edge compaction device to form a bevelled smooth hard edge. ***Edge Compaction***

3. Where echelon paving occurs with a second paver placing asphalt on an adjacent paving run, edge compaction of the asphalt in the first paving run is not required if the temperature of the asphalt in the first paving run is greater than 100°C. ***Echelon Paving***

4. 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***

502.49 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 lightly 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***

502.50 TERMINAL JOINTS

1. Terminal joints between the new and existing surfaces shall be formed by ramping with a nominal 5 mm dense graded asphalt meeting the requirements of Specification 504 DENSE GRADED ASPHALT WEARING COURSE. The ramp shall extend over a sufficient distance to provide a slope of at least 1:100.

502.51 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 502.7.

TABLE 502.7 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

502.52 – 502.53 NOT USED

502.54 COMPACTION

Rollers

1. Rollers shall be self-propelled steel wheeled rollers meeting the requirements of AS 2150 equipped with a watering system to ensure that the entire area of each wheel is wet. Only steel wheeled rollers shall be used for the compaction of stone mastic asphalt. The breakdown roller working immediately behind the paver shall have a mass not less than ten (10) tonnes whilst other rollers shall have a mass of not less than seven (7) tonnes.

2. Unless otherwise directed by the Superintendent rolling shall commence immediately after placing and compacting with the vibrating or tamping screed. The rolling shall start longitudinally at the sides and proceed towards the centre of the pavement, overlapping on successive passes by at least 150 mm. Successive passes of the roller shall be of slightly different lengths.

Roller Stop/ Starts

3. 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. To prevent asphalt from adhering to the roller, all wheels shall be kept properly moistened and excess water shall be avoided.

Moistened Wheels

4. 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 only 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.

Vibratory Compaction

5. 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 502.55.

6. The Contractor shall ensure the protection of services and property from deterioration or damage due to the works. ***Protection***

7. 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***

8. A sufficient number of rollers shall be available on site commensurate with the rate of supply of asphalt and the output of the paving machine. ***Number of Rollers***

9. 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 roller. ***Joints***

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***

11. 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***

12. Where specified in Annexure 502B surface grit shall be applied using a mechanical spreader to achieve a minimum spread rate of 1.5 kg/m^2. ***Surface Grit***

13. The surface grit shall be applied during finish rolling when the asphalt is still warm such that the grit is rolled into the surface voids of the asphalt.

502.55 DENSITY REQUIREMENTS

1. The Characteristic Percent Marshall Density (Compaction) for any lot shall be deemed to be conforming if it attains a value of 95.0% or greater. Payment for conforming work shall be at the scheduled rate.

2. Density shall be calculated on the basis of the results of tests of core samples of asphalt sampled from an asphalt layer, after laying and compaction, in accordance with WA 701.1. The density of the samples shall be determined in accordance with WA 733.1 – Section 5.1.2 and expressed as a percentage of the mean Marshall Density of all asphalt results from the same production shift in accordance with WA 731.1 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 density results directly to, amongst others, the Contractor, the Superintendent and the Materials Engineering Branch mailbox (MEBAsphaltreports@mainroads.wa.gov.au). ***Testing and Reporting of Results***

4. Where the Characteristic Percent Marshall Density is less than the specified density the Quality Level shall be deemed to be either Non-conformance or Conditional Conformance depending on the difference between the Characteristic Percent Marshall Density and the specified

density. The tolerances applicable to conditional conformance are given in Table 502.8. A Pay Factor, as shown in Table 502.8, shall be applied for work at the appropriate conformance level in accordance with these tolerances. The Pay Factor shall reflect the lower level of serviceability of conditionally conforming asphalt.

TABLE 502.8 DENSITY REQUIREMENTS

Characteristic Percent Marshall Density Rc (%)	Quality Level	Pay Factor
95.0 or greater	Conformance	1.0
Less than 95.0 and greater than or equal to 93.0	Conditional Conformance	0.15 Rc – 13.25
Less than 93.0	Non-conformance	N/A

5. Where the contract does not include a separate scheduled rate for the placement of asphalt the asphalt will be considered to either conform, where the Characteristic Percent Marshall Density Rc is greater than or equal to 95.0%, or be Non-conforming where the Rc is less than 95.0%. ***Scheduled Rates Not Included***

6. 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 or replaced at no cost to the Principal. ***Non-conformance***

502.56 SURFACE REQUIREMENTS

1. The surface of the compacted asphalt shall be smooth and 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 metre straightedge, in accordance with WA 313.2, the shape of the compacted asphalt shall be deemed to be conforming when the maximum deviation from the 3 metre straightedge, placed in any position on the surface of a layer, does not exceed the limits specified in Table 502.09. A 3 metre straightedge shall be provided with each paver. ***Shape: 3 metre straightedge***

3. When using the ARRB TR Walking Profiler, in accordance with WA 313.4, the shape of the compacted asphalt shall be deemed to be conforming when the maximum deviation, measured in any direction and within any 3m long section of the surface does not exceed the limits specified in Table 502.09. ***Shape: ARRB Profiler***

TABLE 502.9 SURFACE SHAPE

Direction of Measurement	Maximum Deviation	Maximum rate of Change of Deviation
Longitudinal	3 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 shall be within 5 mm of the final design levels. For construction work the thickness of the compacted asphalt layers shall be within 5 mm of the specified thickness. On resurfacing works where the underlying levels vary, the minimum thickness of compacted asphalt shall be within 5 mm of the specified thickness. The thickness of a Lot of asphalt shall be determined from the mean thickness of core samples taken for compaction testing. Thickness shall be measured in accordance with WA 705.1. ***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 materials 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***

502.57 OPENING FINISHED WORKS TO TRAFFIC

1. Traffic shall not be allowed on to the completed asphalt if any portion of the work to be opened has a temperature greater than 63°C. The temperature shall be measured on a surface free of surface moisture using a thermometer designed for the measurement of surface temperature.

2. **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***

502.58 – 502.80 NOT USED

AS-BUILT AND HANDOVER REQUIREMENTS

502.81 – 502.90 NOT USED

CONTRACT SPECIFIC REQUIREMENTS

502.91 – 502.99 NOT USED

ANNEXURE 502A

STONE MASTIC APPLICATION RECORDS

Section		Length (m)	Width (m)	Area (m^2)	Depth (mm)	Nom Agg. Size (mm)
From	To					

(Insert appropriate details of asphalt treatments. Supplement with drawings, diagrams, etc. where necessary.)

ANNEXURE 502B

STONE MASTIC ASPHALT ADDITIONAL TREATMENTS

SURFACE GRITTING					
Section		Length (m)	Width (m)	Area (m^2)	Delete shaded column
From	To				

(Insert details of surface gritting as required. Refer to the guidance notes for advice on the use of SMA or gritting.)

ANNEXURE 502C

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.

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1. GUIDANCE ON THE USE OF STONE MASTIC ASPHALT

1.1 Engineering Road Note No. 10 *Stone Mastic Asphalt* provides guidance on the selection and use of SMA including tie in to an existing surfacing or pavement.

2. ASPHALT MIX DESIGNS (refer Clause 502.21)

2.1 Under the Section MIX DESIGN, the Specification only allows the use of the specified conforming mix design for stone mastic asphalt produced in metropolitan Perth asphalt plants. Alternative Job Mix Designs must not be considered in the Specification.

3. ANNEXURE 502B (use of surface grit)

3.1 The use of surface gritting to improve skid resistance and its extent needs to be decided and included in the annexure. Where used surface grit should be applied for the full width of each lane. Guidance on the need for gritting is available in Main Roads document number 71-06-1359 *Initial Skid Resistance of Stone Mastic Asphalt*.

4. USE OF A MATERIAL TRANSFER VEHICLE

4.1 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.

4.2 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.

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***

2. Insert text (Main Table SP)

XXX.XX SUB-HEADING (H2 SP)

1. Insert text (Main Table SP)

2. Insert text (Main Table SP)

AMENDMENT CHECKLIST

Specification No. **502** Title: **STONE MASTIC ASPHALT** Revision No: _____

Project Manager: _____ Signature: _____ Date: _____

Checked by: _____ Signature: _____ Date: _____

Contract No: _____ Contract Name: _____

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

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