SPECIFICATION 517

CRUMB RUBBER GAP GRADED ASPHALT

REVISION REGISTER			
Clause Number	**Description of Revision**	**Authorised By**	**Issue Date**
517.02, 517.32.4 & 517.35	Inclusion of Ignition Oven WA 730.2 Test Method for production testing and in requirements for mix design submission	BPC	17/09/2024
Whole document	New specification	MME	23/02/2023

CONTENTS

Clause **Page No**

SPECIFICATION 517

CRUMB RUBBER GAP GRADED ASPHALT

GENERAL

517.01 SCOPE

1. The work under this specification consists of the supply and application of crumb rubber gap graded asphalt for pavement wearing courses. This specification does not cover the requirements for dense graded asphalt, open graded asphalt, stone mastic asphalt and intermediate course asphalt.

2. Details of the location and extent of asphalt work are summarised at Annexure 517A, or are indicated on the Drawings. ***Details***

3. The works shall include surface preparation, supply of materials, production, transportation, placing and compaction of asphalt to the areas as shown in the Drawings, or as otherwise directed by the Superintendent, including correction of existing pavement surfaces.

517.02 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 1141	Methods for sampling and testing aggregates
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	Methods of sampling and testing asphalt
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 2891.7.1	Determination of maximum density of asphalt – Water displacement method
AS/NZS 2891.8	Voids and volumetric properties of compacted asphalt mixes
AS/NZS 2891.9.1	Determination of bulk density of compacted asphalt – Waxing procedure
AS/NZS 2891.9.2	Determination of bulk density of compacted asphalt – Presaturation method

AS/NZS 2891.10	Moisture content of asphalt
AS/NZS 2891.11	Degree of particle coating

MAIN ROADS Test Methods

A complete list of Main Roads Test Methods is available on Main Roads' website at: Technical Library (mainroads.wa.gov.au)

Austroads Test Methods

AG:PT/T111	Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel)
AG:PT/T232	Stripping Potential of Asphalt – Tensile Strength Ratio
AG:PT/T234	Asphalt Binder Content (Ignition Oven Method)

ASTM Test Methods

ASTM D7741/7741M	Standard Test Methods for Measurement of Apparent Viscosity of Asphalt-Rubber or Other Asphalt Binders by Using Rotational Handheld Viscometer

MAIN ROADS Specifications

Specification 201	QUALITY MANAGEMENT
Specification 508	COLD PLANING
Specification 511	MATERIALS FOR BITUMINOUS TREATMENTS

517.03 DEFINITIONS

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

Asphalt Course	Single layer or multiple layers of asphalt material designed to perform a specific function in a pavement (e.g. wearing, binder, intermediate or base).
Asphalt Layer	Uniform thickness of asphalt material placed in a single paving operation.
Asphalt Wearing Course	Single layer or multiple layers of asphalt material designed to resist abrasion from traffic. May include different types, including open-grade overlying dense-grade asphalt.
DWER	Department of Water and Environmental Regulation, Western Australia.
Reclaimed Asphalt Pavement (RAP)	Material reclaimed from an asphalt course and/or accumulated plant surplus/waste that is re-processed by crushing and/or screening for recycling into new asphalt material.

Tack	Bituminous material applied to a prepared surface to promote bonding/adhesion. Commonly a dilute emulsion, as described in this specification. Does not provide waterproofing to underlying material.

517.04 NOT USED

517.05 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. ***Reduce***

3. Reused materials shall be processed to produce a homogenous material and shall meet the specified applicable requirements. Asphalt produced with crumb rubber modified binder may be reclaimed by cold planing and used as RAP. ***Reuse***

4. Recycled materials shall be processed to produce a homogenous material and shall meet the specified applicable requirements. The sourced rubber material shall be processed by shredding and screening of recycled scrap rubber to manufacture crumb rubber modified binder. ***Recycle***

PRODUCTS AND MATERIALS

517.06 BITUMINOUS BINDER

1. All binders shall conform to the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

517.07 BITUMINOUS EMULSION

1. Bitumen emulsion shall conform to the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

2. Bitumen emulsion to be used as tack coat shall be Cationic Slow Setting emulsion grade CSS/170-60 or Cationic Rapid Setting emulsion grade CRS/170-60, mixed 50:50 by volume with compatible water.

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

517.08 MODIFIED BINDER

1. The crumb rubber modified binder shall be Class 170 bitumen with a minimum quantity of 18% crumb rubber by mass of total binder.

2. Crumb rubber modified binder shall conform to the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

3. **Prior to the use of the crumb rubber modified 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***

517.09 NOT USED

517.10 AGGREGATE

1. Coarse and fine aggregate used in the manufacture of crumb rubber gap graded asphalt shall only consist of crushed rock material.

2. Source rock and crushed aggregate shall conform to the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

3. **Prior to the use of aggregate, the Contractor shall demonstrate compliance with the properties of the aggregate for each source used on the Contract. Audit testing undertaken by the Principal shall not be used to demonstrate compliance.** ***HOLD POINT***

517.011 – 517.12 NOT USED

517.13 ADHESION AGENT

1. Liquid adhesion agents may be used in addition to, but not in place of, the hydrated lime.

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

517.14 – 517.15 NOT USED

517.16 CRUMB RUBBER

1. Crumb rubber shall conform to the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

517.17 NOT USED

517.18 MINERAL FILLER

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

517.19 – 517.20 NOT USED

517.21 WORKABILITY ADDITIVE

1. Workability additives shall conform to the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

517.22 PAVING TAPE

1. Paving tape shall conform to the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

517.23 – 517.26 NOT USED

MIX DESIGN

517.27 CRUMB RUBBER GAP GRADED ASPHALT MIX DESIGN

517.27.01 GENERAL

1. The asphalt manufacturer shall be responsible for the development of a crumb rubber gap graded asphalt job mix design and its submission to Main Roads.

2. The job mix design shall:

   (a) Incorporate coarse and fine aggregates, crumb rubber modified binder, workability additive, filler and hydrated lime to produce asphalt that satisfies all specified requirements.

   (b) Be produced using granite rock from the Perth metropolitan area.

   (c) Not include natural sand or RAP.

   (d) Include a minimum of 1.0% by mass of the total aggregate of hydrated lime.

   (e) Include a workability additive preblended in the binder.

   (f) Meet all the requirements of Main Roads Engineering Road Note 13 ASPHALT MIX DESIGN.

3. The job mix shall be resistant to segregation during handling and placing, shall have low permeability, shall have adequate workability to achieve the specified level of compaction on the road and shall have good field performance.

4. All testing shall be performed in laboratories accredited by the National Association of Testing Authorities, Australia (NATA) to perform the specified methods and the results shall be presented on NATA endorsed reports. ***NATA***

517.27.02 DESIGN CRITERIA

1. Asphalt job mix designs shall conform to the specified criteria in Engineering Road Note 13 ASPHALT MIX DESIGN for crumb rubber gap graded asphalt. ***Mix Design***

517.27.03 APPROVAL OF ASPHALT MIX DESIGN

1. The asphalt manufacturer shall be responsible for submitting the job mix design with all supporting documentation, as nominated in Engineering Road Note 13 ASPHALT MIX DESIGN, to Main Roads Materials Engineering Branch for approval.

2. Where approval is granted, Main Roads Materials Engineering Branch will issue a certificate for Approved Asphalt Job Mix Design and will publish the Approved Asphalt Job Mix Design on the Main Roads webpage (Technical Library (mainroads.wa.gov.au)). ***Certificate***

3. The job mix design approval is valid for a period of three (3) years, when it will be reassessed by Main Roads Materials Engineering Branch for renewal in accordance with Engineering Road Note 13 ASPHALT MIX DESIGN.

517.27.04 USE OF ASPHALT MIX DESIGN

1. Only Approved Asphalt Job Mix Designs shall be used. Use of the Approved Asphalt Job Mix Design shall be for only those ranges in the mix proportions and the types and sources of materials nominated in the Approved Asphalt Job Mix Design.

2. **Prior to the incorporation of crumb rubber gap graded asphalt into the Works, the Contractor shall provide the Superintendent with a copy of the Approved Asphalt Job Mix Design certificate for all crumb rubber gap graded asphalt to be used in work under the Contract.** ***HOLD POINT***

517.28 – 517.30 NOT USED

MANUFACTURE AND TRANSPORT

517.31 MIXING PLANT

1. Asphalt shall be manufactured in a central mixing plant by either batch mixing, continuous mixing or drum mixing. All mixing plant, 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 the binder storage tank. An additional sampling cock shall be installed between the binder storage tank and the asphalt plant mixing chamber to facilitate sampling of binder during asphalt production. ***Binder Sampling Cocks***

3. The Contractor shall allow, or cause to allow, the Superintendent full access at any time to all parts of the plant, subject to reasonable safety considerations, and all records, without exception, pertaining to batching of asphalt for use in the work under the contract.

517.32 MANUFACTURE OF ASPHALT

1. The quantities of coarse and fine aggregates, mineral filler, adhesion agent and binder shall be accurately and positively controlled so as to produce the asphalt specified for use in the Works. ***Control***

2. The mixing process shall be such as to produce a uniform distribution of aggregate sizes and a uniform coating of binder when determined in accordance with Table 517.4. ***Mixing***

3. The moisture content of the asphalt at the completion of the mixing process shall meet the requirements of Table 517.4. ***Moisture Content***

4. The production criteria for particle size distribution and the percentage of bitumen shall be within the limits in the Approved Asphalt Job Mix Design when tested in accordance with WA 730.1 or WA 730.2. ***Particle Size Distribution***

5. The production criteria for Air Voids and VMA shall be in accordance with Table 517.4. ***Volumetric Properties***

TABLE 517.4 PRODUCTION CRITERIA

Property	Test Method	Requirement
Gyratory Air Voids at Nominated Mix Design Cycles	AS/NZS 2891.9.2	2.5 – 5.5%
Voids in Mineral Aggregate (14 mm size)	AS/NZS 2891.8	18.0 – 23.0%
Voids in Mineral Aggregate (10 mm size)	AS/NZS 2891.8	19.0 – 23.0%
Stripping Potential of Asphalt – Tensile Strength Ratio (one freeze thaw cycle required)	AG:PT/T232	Min. 80%
Maximum Density from Design	AS/NZS 2891.7.1	± 0.035
Uniform Coating of Binder	AS/NZS 2891.11	Min. 95%
Moisture Content of Asphalt	AS/NZS 2891.10	Max. 0.15%

6. 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***

7. The production temperature of the mixed asphalt shall be measured and recorded at the discharge point of the mixing chamber. The temperature of the asphalt shall conform to the requirements of Table 517.5. The temperature of the asphalt at discharge shall be printed on the loading docket. ***Temperature at Discharge Point***

TABLE 517.5 TEMPERATURE AT DISCHARGE POINT

Asphalt Mix Type	Hot Asphalt (Max.)	Asphalt Mixture with Workability Additive (Max.)	Warm Mix Asphalt (Min.)
Gap Graded Crumb Rubber	Not Applicable	160°C	Not Applicable

517.33 STORAGE AND HANDLING

1. At the time of manufacture, the crumb rubber modified binder shall conform to the requirements of Specification 511 MATERIALS FOR BITUMINOUS PRODUCTS, including preblended workability additive and after a reaction time of 60 minutes. ***Binder***

2. The crumb rubber modified binder shall be stored at the asphalt plant in a vertical insulated binder tank. The storage unit shall be able to maintain the temperature of the modified binder through electricity or hot oil and

keep the binder thoroughly agitated to prevent settling of the crumb rubber particles.

3. Crumb rubber modified binder must not be heated above 190°C. It may be maintained at a temperature between 165°C to 190°C for up to 10 hours (cumulative) following completion of the reaction period. It may be stored at a temperature below 165°C and reheated for later use up to the time limit nominated in the Approved Asphalt Job Mix Design binder profile. Crumb rubber modified binder must not be reheated more than once.

4. **Immediately prior to use of the crumb rubber modified binder for asphalt production a sample shall be taken from the storage tank and tested to ASTM D7741/D7741M and AG:PT/T111 at the temperature that was nominated with the approved asphalt mix design. The viscosity shall comply with Specification 511 MATERIALS FOR BITUMINOUS PRODUCTS.** ***HOLD POINT***

517.34 WORKABILITY ADDITIVE

1. Workability additive shall be used in the manufacture of crumb rubber gap graded asphalt to reduce production and placement temperatures.

2. The type and proportion of workability additive shall be determined in accordance with Section 6.1 of WA 731.1 or AS/NZS 2891.2.2.

517.35 TESTING

1. The asphalt manufacturer shall provide and maintain for the duration of the Contract a suitably equipped, air conditioned testing laboratory accredited by National Association of Testing Authorities of Australia (NATA) to perform the following methods:

   WA 210.1, 212.1 or 212.2, 701.1, 705.1, 730.1 or 730.2, AS/NZS 2891.2.2, AS/NZS 2891.7.1, AS/NZS 2891.8, AS/NZS 2891.9.2, AS/NZS 2891.10, AS/NZS 2891.11 and Austroads AG:PT/T232.

2. Asphalt shall be tested for the properties and at the frequency shown in Annexure A of Specification 201 QUALITY MANAGEMENT. ***Testing Requirements***

3. Asphalt shall be sampled in accordance with WA 701.1. 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 Distribution***

4. 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***

5. Results from conformance tests, including NATA endorsed sampling and testing reports, shall be submitted directly to, amongst others, the Contractor, the Superintendent and the Principal (email: MEBAsphaltreports@mainroads.wa.gov.au) within 24 hours of completing the test procedure. ***Reporting***

517.36 NON-CONFORMANCE

1. **Occurrence of a non-conforming test result at any point during manufacture of asphalt shall constitute a HOLD POINT in the related Works. The non-conformance and associated disposition shall apply to all mix of the same type produced during the same shift as the asphalt generating the non-conforming test result.** ***HOLD POINT***

517.37 TRANSPORT

1. The asphalt shall be transported from the asphalt plant to the Site in metal bodied trucks or trailers previously cleaned of all foreign materials. In long distance haul situations, the asphalt must be transported in insulated vehicles sufficient to ensure arrival of the asphalt on site at a conforming workable temperature condition. ***Vehicle Type***

2. Free liquids or any other materials shall not be present within the truck or trailer prior to loading.

3. 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 517.32.7. ***Temperature in Truck***

4. The temperature of the asphalt at manufacture shall be recorded on a printout of the load delivery docket showing date, time, mix identification, binder type, additives and production temperature for each truck load and each trailer load of mix dispatched. The truck shall not leave the plant without this printed information. ***Record of Manufacture***

5. Each load shall be entirely covered with a clean tarp or trailer cover in good condition immediately after loading until to facilitate in loading into the asphalt paver of MTV with no rips or tears to prevent heat loss. ***Heat Loss***

6. The asphalt shall be delivered to the site at a uniform rate within the capacity of the placing and compacting plant. ***Delivery Rate***

517.38 – 517.40 NOT USED

PLACING OF ASPHALT

517.41 GENERAL

1. **No later than twenty-four (24) hours prior to the placement of asphalt, the Contractor shall submit the proposed paving plan including, as a minimum, the number of runs, width of paving and joint layout, to the Superintendent.** ***HOLD POINT***

2. The Contractor shall ensure all asphalt delivered to site is accompanied by a delivery docket conforming to Clause 517.37.4 of this specification. Asphalt arriving without a conforming delivery docket shall not be placed.

3. Asphalt shall be delivered to Site for Crumb rubber gap graded asphalt with workability additive between 145°C to 160°C. ***Delivery Temperatures***

4. Asphalt temperature on delivery shall be determined on transfer from the truck/trailer to the paver using a calibrated digital probe thermometer. 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. ***Temperature Measurement***

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

6. Prior to commencing each shift's operations, and also after any delay exceeding half an hour during the shift, 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***

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 at the end of the shift. Any damage shall be rectified at no cost to the Principal within 30 days. ***Damage***

8. Where echelon paving occurs, the details are to be captured as specified at Annexure 517B. ***Echelon***

517.42 SURFACE PREPARATION

1. The Contractor shall ensure the surface on which asphalt is to be placed is clean, dry and free of any loose or deleterious material. The surface shall be swept before paving and any loose or deleterious material not collected by sweeping shall be manually removed. ***Sweeping***

2. Where the surface has been damaged the area is to be rectified as per Specification 508 COLD PLANING prior to commencement of the wearing course. ***Damage***

3. Where paving tape is shown in asphalt drawings, the tape shall be applied to a bituminous surface that is clean, dry, tack coated and free of loose or deleterious material. Joins of the tape shall be overlapped and any air bubbles or creases in the tape shall be cut and flattened. ***Paving Tape***

4. 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.

517.43 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. ***Paving Plant***

2. The paver must be equipped with a ski or laser control system and crossfall controller to maintain levels and suitable sensing equipment to provide longitudinal joint matching. It shall be equipped with a vibrating or tamping screed capable of achieving 85% of target compaction. ***Control System***

3. Where the use of a material transfer vehicle (MTV) is specified at Annexure 517B, the MTV shall be a self-propelled machine capable of receiving asphalt from trucks or trailers, storing the asphalt, maintaining asphalt temperature during storage and transferring the mix to the paver hopper without contacting 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***

4. Where sweeping is required a vacuum street sweeper truck shall be a mounted self-contained sweeper device with water for dust suppression and suction ability. The vacuum street sweeper shall be used in built up high traffic volume areas and where kerbing or barrier exist and where mechanical brooming will not be sufficient.

517.44 TACK COAT

1. A dilute emulsion tack coat shall be applied to the prepared surface at a rate of 0.6 l/m². The tack coat shall be sprayed in a uniform film over the entire surface with a mounted spray bar in a single operation. Hand spray equipment shall only be used for inaccessible areas, vertical faces and small patches. ***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 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 shift's placing of asphalt and must be completed and no cost to the Principal. ***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***

517.45 NOT USED

517.46 WEATHER CONDITIONS

1. Asphalt placement shall not commence or continue upon a surface which is not clean, dry and free of loose or deleterious material, when rain is imminent nor when the pavement temperature is below that shown in Table 517.6. ***Pavement Temperature***

TABLE 517.6 PAVEMENT TEMPERATURES FOR PLACEMENT

Minimum pavement temperature when wind speed < 20 km/hr	Minimum pavement temperature when wind speed ≥ 20 km/hr
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 materials laid after this instruction is given will not be paid for and are to be removed at no cost to the Principal.

517.47 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 removed by cutting or cold planing a sufficient distance to provide the true cross section. ***Edges***

517.48 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. Joints shall be located away from traffic wheel paths. ***Position***

2. All edges of a paving run shall be compacted using an edge compaction device. ***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 50 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. 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 removed by cutting or cold planning before the adjacent lane is laid. ***Temporary Ramps***

517.49 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 removed by cutting or cold planning before the next run is laid. ***Temporary Ramps***

517.50 TERMINAL JOINTS

1. Terminal joints between the new and existing surfaces shall be formed by ramping with a nominal 5 mm dense graded asphalt mix. The ramp shall extend over a sufficient distance to provide a slope of at least 1:100.

517.51 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 517.7. Crumb rubber gap graded asphalt shall be deemed equivalent to dense graded asphalt (DGA) in the drawings.

TABLE 517.7 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

517.52 – 517.53 NOT USED

517.54 COMPACTION

1. Self-propelled steel wheel rollers meeting the requirements of AS 2150 shall be used. Pneumatic tyred rollers shall not be used. All rollers shall be fitted with reticulation to prevent pick up of asphalt and be fitted with scrapers to clear the drum. ***Equipment***

2. 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 eight (8) tonnes.

3. 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 edges and proceed towards the centre of the run, overlapping on successive passes by at

least 150 mm. Successive passes of the roller shall be of slightly different lengths.

4. Roller speed shall be uniform. Stops and starts shall be controlled so that displacement (shoving) of the asphalt mix does not occur when changing direction. Any shoving occurring as a result of changing direction, or from any other cause, shall be immediately corrected by the use of rakes and placement of fresh asphalt when required. ***Roller Stop/Starts***

5. 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 any petroleum based, diesel based or solvent products. Minimal water softener products can be utilised within the parameters of this clause. ***Moistened Tyres/Drums***

6. 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 self-propelled static steel wheeled rollers of appropriate mass to meet the compaction requirements in Clause 517.55. ***Vibratory Compaction***

7. The Contractor shall ensure the protection of services and property from deterioration or damage due to the work under the Contract. ***Protection***

8. 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 any asphalt placed within the shift. ***Continuous Operations***

9. 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***

10. 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***

11. Finish rolling shall be carried out while the material is still warm enough for the removal of tyre marks. ***Finish Rolling***

12. 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***

13. Unless directed otherwise by the Superintendent, asphalt shall not be exposed to additional heat or flame from an alternate source.

14. Unless directed otherwise by the Superintendent, asphalt shall not be blinded with sand or other material.

517.55 COMPACTION REQUIREMENTS

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 517.8. The characteristic in-situ air voids shall be determined in accordance with Specification 201 QUALITY MANAGEMENT. ***In-situ Air Voids***

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 compaction in accordance with WA 701.1 and prepared in accordance with WA 705.1. The density of the core samples shall be determined in accordance with AS/NZS 2891.9.1. The air voids shall be calculated in accordance with AS/NZS 2891.8 using the mean Maximum Density of all asphalt results from the same production shift in accordance with AS/NZS 2891.7.1.

Testing and Reporting of Results

3. Core samples shall not be taken less than three (3) hours or more than 24 hours following completion of compaction of the Lot. Results from conformance tests, including NATA endorsed sampling and testing reports, shall be submitted directly to, amongst others, the Contractor, the Superintendent and the Principal (email: MEBAsphaltreports@mainroads.wa.gov.au) within 24 hours of completing the test procedure.

TABLE 517.8 CHARACTERISTIC IN-SITU AIR VOID REQUIREMENTS

Mix Type	Characteristic Value (%)	
	Minimum	Maximum
All 10 mm and 14 mm Crumb Rubber Gap Graded Asphalt	3.0	8.0

Non-conformance

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.

517.56 SURFACE REQUIREMENTS

1. The surface of the compacted asphalt shall be smooth and true to the specified crown and grade, be of uniform appearance and 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.

Shape: 3 m straightedge

2. When using the 3 m straightedge, in accordance with WA 313.2, the shape of the compacted asphalt shall be deemed to be conforming when the maximum deviation measured, placed in any position on the surface, does not exceed the limits specified in Table 517.5. A 3 m straightedge shall be provided with each paver.

Shape: ARRB Profiler

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 three metre long section of the surface, does not exceed the limits specified in Table 517.9.

TABLE 517.9 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. The upper surface of the compacted asphalt shall be within 5 mm of the final design level, when defined. ***Level***

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 under the Contract is deemed non-conforming the Contractor shall apply remedial action in accordance with the procedures contained in Specification 201 QUALITY MANAGEMENT. In the case of a Lot, the Contractor must submit to the Superintendent a proposed method for the rework, repair or removal of the non-conforming Lot to ensure conformance to the requirements of the relevant specification. ***Non-conformance***

517.57 OPENING FINISHED WORKS TO TRAFFIC

1. The Works shall be allowed to cool below a temperature of 63°C before opening to traffic. The temperature must be measured on a clean, dry surface free of loose or other deleterious material.

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

517.58 – 517.80 NOT USED

AS-BUILT AND HANDOVER REQUIREMENTS

517.81 – 517.90 NOT USED

CONTRACT SPECIFIC REQUIREMENTS

517.91 – 517.99 NOT USED

ANNEXURE 517A

SCHEDULE OF WORKS

Section		Length (m)	Width (m)	Area (m^2)	Depth (mm)	Asphalt Type (Dense/Open/ Intersection Mix)	Nom Agg. Size (mm)
From	To						

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

ANNEXURE 517B

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. GUIDANCE ON THE USE OF GAP GRADED CRUMB RUBBER ASPHALT

1.1 Main Roads document number 6706-04-154 Guide for Surfacing Type Selection provides guidance on the use of various types of asphalt surfacings in different scenarios and speed zones.

1.2 Gap Graded Crumb Rubber shall be used in similar locations as other dense graded asphalt mix types.

1.3 Gap Graded Crumb Rubber Asphalt is to be used where high fatigue resistance, high crack resistance or potential of cracking may be an issue.

1.4 When used the Main Roads Standard Method of Measurement must incorporate this specification.

2. USE OF A MATERIAL TRANSFER VEHICLE

2.1 The requirement to use an MTV has to be specified at Annexure 517B. 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.

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. **517** Title: **CRUMB RUBBER GAP GRADED 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.	
	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: _____