

Registration of Bituminous Mix Designs

1. Scope

This Code of Practice describes the process to be undertaken when registering bituminous mix designs to comply with the following VicRoads Standard Specification Sections for Roadworks and Bridgeworks:

- a) [Section 404 Stone Mastic Asphalt](#)
- b) [Section 405 Regulation Gap Graded Asphalt](#)
- c) [Section 407 Hot Mix Asphalt](#)
- d) [Section 409 Warm Mix Asphalt](#)
- e) [Section 417 Open Graded Asphalt](#)
- f) [Section 418 High Modulus Asphalt \(EME2\)](#)
- g) [Section 421 Bitumen Crumb Rubber Asphalt](#)
- h) [Section 427 Bituminous Slurry Surfacing](#)

All mixes shall be designed in accordance with the appropriate test methods listed in VicRoads Code of Practice RC500.16 and any referenced VicRoads Standard Specification Sections and Test Methods, and Australian Standard test methods. The order of precedence of documents for mix designs are:

- VicRoads Standard Specification Sections and Test Methods
- VicRoads Code of Practice

Registration under this Code of Practice does not attest to the production, delivery, placement or compaction of the mix and does not guarantee the handling properties or performance of the mix.

Registration of all mixes shall be produced in compliance with VicRoads Standard Specification Clauses 407.06, 407.07 and 407.08. Failure to demonstrate production in accordance with the relevant specification requirements may result in registrations being withdrawn.

2. Definitions

Stone Mastic Asphalt (SMA)

SMA is a gap graded wearing course mix with a high proportion of coarse aggregate which provides a textured surface and resistance to deformation. This asphalt incorporates a Polymer Modified Binder (PMB) which combines with the fines and filler to form a mastic that resists cracking.

Regulation Gap Graded Asphalt (RGGA)

RGGA is used as a thin regulating course under sprayed seals and asphalt overlays.

Dense Graded Asphalt (DGA)

DGA Types L, N, V, VP and H series mixes are primarily used for wearing and regulation courses, and Type S series mixes and EME2 are primarily used as structural mixes for intermediate and base courses. DGA's can be produced using either a hot mix or warm mix process.

Warm Mix Asphalt (WMA)

Asphalts incorporating warm mix technologies that allows the mix to be produced and placed at lower temperatures than conventional asphalts.

Open Graded Asphalt (OGA)

OGA is a wearing course principally used on freeways for its noise reduction properties and water spray reduction.

Bitumen Crumb Rubber Asphalt (BCRA)

An asphalt mix which has crumb rubber incorporated into the mix, which has a higher resistance to cracking.

Bituminous Slurry Surfacing

A mixture of fine graded aggregate, PMB emulsion and water of sufficient fluidity to be capable of being screeded over a road surface in a very thin layer without the need for heating or use of mechanical compaction equipment.

| Table 1 – Types of Bituminous Mixes | |
|--------------------------------------|---|
| Mix Designation | Description |
| Stone Mastic Asphalt | |
| SMA N | A Size 7 or 10mm asphalt wearing course with PMB for use in heavily trafficked pavements |
| SMA H | A Size 7 or 10mm asphalt wearing course with a heavily modified PMB for use in heavily trafficked intersections and pavements |
| Regulation Gap Graded Asphalt | |
| RGG | A Size 7mm or smaller asphalt regulating course |
| Dense Graded Asphalt | |
| L | A light duty Size 7 or 10mm wearing course with low air voids and higher binder content for use in very lightly trafficked pavements |
| N | A light to medium duty Size 7, 10 or 14mm wearing course or regulating course for use in light to moderately trafficked pavements |
| H | A heavy duty Size 7, 10 or 14mm asphalt wearing course or regulating course for use in most heavily trafficked pavements |
| V | A heavy duty Size 10 or 14mm asphalt wearing course for heavily trafficked intersections |
| HP | A high performance Size 10 or 14mm heavy to very heavy duty wearing course asphalt incorporating a PMB where a high resistance to deformation and flexural cracking is required |
| VP | A high performance Size 14mm heavy to very heavy duty wearing course asphalt incorporating a PMB for use in heavily trafficked intersections where a high resistance to deformation and flexural cracking is required |
| HG | A multipurpose heavy to very heavy duty Size 10 or 14mm wearing course asphalt incorporating Multigrade binder where a high resistance to deformation is required, particularly at heavily trafficked intersections. |
| SI | A multipurpose Size 14 or 20mm structural asphalt for intermediate course in heavy duty pavements or base course in medium duty pavements |
| SF | A fatigue resistant Size 20mm structural base course asphalt for heavy duty asphalt pavements with a total asphalt thickness of at least 175mm |
| SP | A high performance heavy to very heavy duty Size 20mm structural intermediate course asphalt incorporating a PMB for high resistance to deformation and flexural cracking |
| SS | A very stiff Size 20mm structural intermediate course asphalt sometimes used to increase pavement stiffness for very large scale heavy duty asphalt pavements |
| SG | A multipurpose heavy to very heavy duty Size 20mm structural intermediate course asphalt incorporating a Multigrade binder for high resistance to deformation particularly at very heavily trafficked intersections. |
| EME2 | A high modulus structural intermediate or base course asphalt with a high resistance to deformation |
| Open Graded Asphalt | |
| OGA | A heavy duty Size 10mm non-structural asphalt wearing course with high air voids and PMB binder for use in high speed environments such as freeways/highways |
| Bitumen Crumb Rubber Asphalt | |
| BCRA | A specialised Size 10mm or 14mm asphalt wearing course with crumb rubber incorporated into the mix for use in heavily trafficked pavements |
| Bituminous Slurry Surfacing | |
| | A Size 3,5,7 or 10mm slurry surface for use as a regulating course or wearing course in medium to heavily trafficked roads |

3. Mix Design

Stone Mastic Asphalt (SMA)

SMA mix designs shall comply with the requirements of VicRoads Standard Specification Section 404.05 Mix Design and 404.06 Mix Design Requirements.

Regulation Gap Graded Asphalt (RGGA)

RGGA mix designs shall comply with the requirements of VicRoads Standard Specification Section 405.04 Mix Design and 405.05 Mix Design Requirements.

Dense Graded Asphalt (DGA)

For any given suite of dense graded mixes for any asphalt plant, excluding EME2, one of the following mix design methods shall be used:

- The Austroads Mix Design Method as described in RC201.12 Design of Asphalt Mixes (Gyratory Compaction Method) and RC201.13 Performance Properties of Asphalt Mixes; or
- The Marshall Mix Design Method as described in RC201.01 Design of Asphalt Mixes (Marshall Method)

DGA shall comply with the requirements of VicRoads Standard Specification Section 407.

EME2 mix designs shall comply with the requirements of VicRoads Standard Specification Section 418.

Warm Mix Asphalt (WMA)

Asphalt mixes incorporating warm mix technologies shall comply with the requirements of VicRoads Standard Specification Section 409.

Open Graded Asphalt (OGA)

OGA mix designs shall comply with the requirements of VicRoads Standard Specification Section 417.

Bitumen Crumb Rubber Asphalt (BCRA)

BCRA mix designs shall be in accordance with VicRoads Standard Specification Section 421.

Bituminous Slurry Surfacing

For bituminous slurry surfacing, designs shall be in accordance with VicRoads Standard Specification Section 427.

4. Mix Registration

Applications to register a bituminous mix shall be submitted by the supplier to the VicRoads Asphalt Mix Mail Inbox (VicRoadsAsphaltMix@roads.vic.gov.au) at least two months prior to the proposed date for the commencement of supply of the mix and shall be accompanied by the information listed in Clause 5.

Mixes shall be current at the time of the commencement of the supply of the mix to a project.

The registration of a mix design shall remain current for a period of three (3) years subject to there being no changes to the

source or grading of aggregate components, source of filler components, or the type of binder. All mix designs registered with VicRoads are issued a status according to compliance as:

- **General**
Complies with the requirements of this Code of Practice.
- **Conditional**
Mixes which do not comply with one or more aspects of the requirements of this Code of Practice but which are considered appropriate for use subject to conditions attached to the registration.
- **Expired**
Registered mixes that have passed their registration date, but details are retained for record purposes.

The supplier will be advised in writing of the result of the application to register a mix. The supplier shall nominate a mix identification number for each mix and this number shall be used to identify the mix for all future communications and for job records.

The mix identification number for mixes designed by the Austroads method shall include the suffix "(A)" and mixes designed by the Marshall method shall include the suffix "(M)".

In addition to the above, the mix identification number for Warm Mix Asphalt (WMA) shall include the suffix "(W)".

If a registered mix has unsatisfactory handling or field performance, the supplier may request VicRoads to deregister the mix. Alternatively, VicRoads may de-register the mix pending a review and immediately advise the supplier of action taken.

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5. Information Required for Mix Registration

5.1 Dense Graded Asphalt

(a) Information Required

The following information shall be submitted for each new mix design:

- (i) Grading test results for each component
- (ii) Proportion of each component in the mix
- (iii) Grading of the mix
- (iv) Graphs of mix properties vs Bitumen Content for: Bulk Density, Max Density, Voids in Mineral Aggregate, Air Voids, and Binder Film Index
- (v) Unsound and marginal rock content of the coarse aggregate
- (vi) Flakiness Index of each separate coarse aggregate fraction of 10mm and above
- (vii) Degradation Factor and Plasticity Index for the crusher fines and manufactured sand components
- (viii) Sand Equivalent Value of washed sand and Plasticity Index of unwashed sand as applicable
- (ix) Class of binder and certificate of compliance
- (x) Source of added filler and certificate of compliance for added filler
- (xi) The Dry Compacted Voids of total combined filler
- (xii) Test information as shown in Table 2. For EME2 refer to VicRoads Standard Specification Section 418
- (xiii) Recycled Asphalt Pavement (RAP) nominal size and percentage of RAP used
- (xiv) Name, source, nominated proportions and material properties of any additives

All test results shall be current at the time of submission of the mix design and shall not be greater than 12 months old.

All components of the asphalt mix shall comply with VicRoads Standard Specification Section 407 or 418 clauses as appropriate.

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Table 2 – Test Information to be Submitted for each Mix for Registration

| Volumetric Tests | Bituminous Mix Size and Types | |
|--|--|--|
| | Austrroads Mixes | Marshall Mixes |
| Air Voids at Design Binder Content | All mixes Clause 6.1 (b) (i) | All mixes Clause 6.1 (b) (ii) |
| Air Voids at 250 Gyratory Cycles Clause 6.1 (b) Table 8 | All mixes except Type L and SF mixes (to be reported) | All mixes except Type L and SF mixes (to be reported) |
| Voids in the Mineral Aggregate Clause 6.1 (b) Table 9 | All mixes | All mixes |
| Bulk Density | All mixes | All mixes |
| Maximum Density (voids free density) | All mixes | All mixes |
| Minimum Binder Content Clause 6.1 (a) (v) Table 5 | All mixes | All mixes |
| Binder Film Index Clause 6.1 (a) (vi) Table 7 | All mixes | All mixes |
| Performance Tests | Austrroads Mixes | Marshall Mixes |
| Indirect Tensile Modulus Clause 6.1 (c) (i) | All mixes except Type L and 7 mm mixes | All mixes except Type L and 7mm mixes |
| Moisture Sensitivity Clause 6.1 (c) (ii) | All mixes except size 7mm mixes and Type L mixes | All mixes except size 7mm mixes, type SF mixes and Type L mixes |
| Wheel Tracking Depth Clause 6.1 (c) (iii) | All mixes except size 7mm mixes, Type L, N and SF mixes | All mixes except size 7mm mixes, Type L, N and SF mixes |
| Resistance to Fatigue Clause 6.1 (c) (iv) | Not applicable at this time pending further investigation | Not applicable at this time pending further investigation |

Notes on Table 2:

Conditional Use RAP mixes require additional performance testing (Table 4)

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(b) Binder used in Production

The class of binder for each asphalt type shall be as shown in Table 3.

| Asphalt Type | Binder Class |
|-----------------|--|
| L and N | C170 or C320 * |
| H, V, SI and SF | C320 |
| HG and SG | M500 |
| HP, VP and SP | A10E |
| SS | C600 |
| EME2 | 15/25 penetration grade 10/20 penetration grade |

Notes on Table 3

* C170 Binder shall be used for mixes that contain more than 10% RAP

(c) Additional Information Required for Mixes Manufactured Using WMA Technology

The following information is required for mixes manufactured using WMA technology

- (i) WMA technology describing the process of manufacture.
- (ii) Name, source, nominated proportions and material properties of any additives.
- (iii) Where foaming technology is used, specify the target rate for water and the acceptable variation for production.
- (iv) Documentation that demonstrates proven field performance of the WMA technology for at least two (2) years including the details of the field validation site, mixture volumetrics and field density ratio. Trials undertaken through Austroads, VicRoads and other State Road Authorities will be accepted. International data will be considered.

Where the Supplier meets the requirements of this clause and those described in Clause 6.1, Warm Mix Dense Graded Asphalt mixes shall be registered as 'GENERAL'. The same WMA technology can also be extended to other asphalt mixes except for mixes incorporating PMB or Multigrade

Where the Supplier cannot meet the requirements described in Clause 5.1 (c)(iv), VicRoads may permit the use of WMA. Additional testing, trials or validation of the mixes may be required. VicRoads may register the mix as 'GENERAL', once the proposed WMA technology has been successfully trialed in accordance with Clause 5 (c).

VicRoads may permit the use of any other new or untried WMA technologies including mixes incorporating PMB or Multigrade binders, subject to additional testing, trials or validation of the trial mixes and meeting the requirements as

described in Clauses 5 (c), 6.1 and 6.2. These mixes shall be registered as "CONDITIONAL".

(d) Additional Information Required for Mixes Containing RAP

The following information is required for mixes incorporating RAP:

- sieve analysis after extraction of binder; and
- binder content of RAP.

For mixes incorporating conditional use percentages of RAP, additional testing is required as shown in Table 4.

| DGA Types | | L (1) (5) | N, H (1) (5) | SI (5) | SF (5) |
|--|---|--------------------|--------------------|--------------------|-----------|
| Austroads or Australian Standard Test | Indirect Tensile Modulus | Yes ⁽²⁾ | Yes | Yes | Yes |
| | Fatigue Life | No | Yes | No | No |
| | Resistance to Deformation | No | Yes | Yes | No |
| | Moisture Sensitivity | Yes ⁽³⁾ | Yes ⁽³⁾ | Yes ⁽³⁾ | No |
| | Asphalt Particle Loss (Conditioned and Unconditioned) | Yes ⁽⁴⁾ | Yes ⁽⁴⁾ | Yes ⁽⁴⁾ | No |

Notes on Table 4

1. Excluding size 7mm mixes
2. Shall comply with the modulus limits of a Type N mix as specified in Table 10
3. Shall comply with the minimum Wet Tensile Strength and the minimum Wet to Dry Tensile Strength Ratio for a Type H mix as specified in Table 11
4. Shall not be more than Asphalt Particle Loss for either the moisture conditioned and unconditioned specimens for the same mix size and type without RAP inclusion
5. Shall comply with the test requirements from the applicable table unless otherwise specified

5.2 Information Required for Other Bituminous Mix Registrations

Stone Mastic Asphalt (SMA)

Refer to VicRoads Standard Specification Section 404.

Regulation Gap Graded Asphalt (RGGA)

Refer to VicRoads Standard Specification Section 405.

Open Graded Asphalt (OGA)

Refer to VicRoads Standard Specification Section 417.

High Modulus Asphalt (EME2)

Refer to VicRoads Standard Specification Section 418.

Bitumen Crumb Rubber Asphalt (BCRA)

Refer to VicRoads Standard Specification Section 421.

Bituminous Slurry Surfacing

Refer to VicRoads Standard Specification Section 427.

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6. Test Properties Required for Bituminous Mixes

6.1 Dense Graded Asphalt

(a) Material Test Properties

(i) Grading of Aggregates

The proportions of aggregate and binder in the mix and the grading of aggregates including any added filler after mixing but before compaction, shall lie within the limits specified in Table 6 for each size of asphalt unless otherwise approved by VicRoads.

(ii) RAP - General Requirements

RAP must comply with the requirements of VicRoads Standard Specification 407.

The incorporation of RAP in the design of asphalt mix Types V, VP, HP, HG, SS, SP, SG and EME2 is not permitted.

(iii) RAP- Unconditional Use

RAP may be incorporated in the design of the following mixes up to the proportions shown subject to meeting the mix design requirements as described in Clause 6.1.

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| | |
|----------|-------------------|
| Type L | Up to 20% by mass |
| Type N | Up to 15% by mass |
| Type H | Up to 10% by mass |
| Types SI | Up to 20% by mass |
| Type SF | Up to 30% by mass |

(iv) RAP - Conditional Use

VicRoads may permit the percentage of RAP to be increased by up to 10% above the limits specified in Clause 6.1 (a)(iii), subject to carrying out all tests specified in Table 4 and meeting the requirements as described in Clause 6.1.

(v) Minimum Design Binder Content

The binder content shall comply with the requirements of Table 5.

| Table 5 - Minimum Binder Content for Mix Designs (% by mass) | | | | |
|--|----------|-----------|-----------|-----------|
| | Size 7mm | Size 10mm | Size 14mm | Size 20mm |
| Binder | 5.0 | 4.5 | 4.5 | 4.0 |

Table 6 – Grading Limits for Aggregates (including any filler)

| Sieve Size AS (mm) | Percentage Passing (by mass) | | | | | |
|-----------------------|--------------------------------------|-------------|-------------|-------------|------------|-------------|
| | Type N, V, VP, H Series and S Series | | | | Type L | |
| | Size 7 Mix | Size 10 Mix | Size 14 Mix | Size 20 Mix | Size 7 Mix | Size 10 Mix |
| 37.5 | | | | | | |
| 26.5 | | | | 100 | | |
| 19.0 | | | 100 | 90 – 100 | | |
| 13.2 | | 100 | 85 - 100 | 75 - 88 | | 100 |
| 9.5 | 100 | 90 – 100 | 70 - 84 | 61 - 75 | 100 | 90 – 100 |
| 6.70 | 80 - 100 | 70 – 86 | 59 - 73 | 49 - 64 | 80 – 100 | 70 – 90 |
| 4.75 | 70 - 88 | 58 – 73 | 48 - 65 | 41 - 55 | 70 – 90 | 58 – 76 |
| 2.36 | 46 - 65 | 38 – 55 | 32 - 48 | 27 - 41 | 45 – 65 | 40 – 58 |
| 1.18 | 31 - 51 | 25 – 44 | 22 - 37 | 18 - 33 | 34 – 55 | 27 – 48 |
| 0.600 | 20 – 40 | 16 – 34 | 14 - 28 | 12 - 25 | 22 – 45 | 17 – 38 |
| 0.300 | 13 – 29 | 10 – 24 | 10 - 22 | 8 - 19 | 14 – 33 | 11 – 26 |
| 0.150 | 8 - 17 | 6 – 16 | 6 - 14 | 5 - 13 | 8 – 18 | 7 – 18 |
| 0.075 | 5 - 8 | 4 – 7 | 4 - 7 | 3 - 6 | 5 – 8 | 4 – 7 |

(vi) **Binder Film Index**

The binder film index shall comply with the requirements of Table 7.

| Table 7 - Binder Film Index | |
|-----------------------------|------------------------------------|
| Asphalt Type | Minimum Binder Film Index (micron) |
| N, H, HG, VP, SI, SS, SG | 8.0 |
| V | 7.5 |
| L, HP & SP | 8.5 |
| SF | 9.5 |
| N (Conditional use RAP) | 8.5 |
| L (Conditional use RAP) | 9.0 |

(vii) **Added Filler**

Wearing Course

Wearing course asphalt shall contain a minimum of 1% added filler. Added filler shall comply with the requirements of VicRoads Standard Specification Section 407. It may consist of hydrated lime, cement kiln dust, ground limestone, ground granulated blast furnace slag, Portland Cement or fly ash produced from the combustion of black coal but excludes crusher dust and plant recycled fines.

Acid Igneous Rocks

Any asphalt containing aggregates of coarse or medium grained acid igneous rocks (e.g. granite, adamellite, granodiorite, quartz porphyry) shall contain not less than 1% hydrated lime filler.

(b) **Volumetric Test Properties**

(i) **Austrroads Mix Design Method**

The laboratory compaction level and design air voids for all mixes shall comply with those specified in Table 8, using the same binder type used in production as the base binder.

The minimum Voids in the Mineral Aggregate (VMA) shall not be less than the limits specified in Table 9 and the Binder Film Index shall not be less than the limits specified in Table 7. The binder content for Type HP shall be derived from the air voids versus binder content plot for the three trial binder contents used to design the Type H mix at 120 gyratory compaction cycles.

Asphalt Types HG and SG shall be produced by direct substitution of the same mass of Multigrade binder for C320 binder in the Types H and SI mixes respectively.

Type SS shall be produced by direct substitution of the same mass of C600 binder for the C320 binder in the Type SI mix.

(ii) **Marshall Mix Design Method**

The test properties for Types L, N, V, VP, H and S Series mixes shall comply with Tables 7 and 9.

For Type H and SI mixes, the same binder type used in production shall be used in the base mixes for compliance with Table 9. The binder content of all other mixes may be derived from these mixes if they are the same in every respect other than binder class and content. All derived mixes must pass all other relevant volumetric test requirements for the mix using the production binder.

Type SF shall be derived from a Type SI asphalt mix with a design binder content of 1% by mass of total mix higher than the Type SI mix. Volumetric properties for the Type SF mix shall be derived for the specified increase in binder content.

Types HP and SP shall have a design binder content of 0.3% by mass of total mix higher than the Type H and Type SI mixes respectively. Volumetric properties for Types HP and SP shall be derived from the complying

volumetrics Type H and SI mixes respectively, for the specified increase in binder content. Film index of Type HP and SP mixes shall comply with Table 7.

Asphalt Types HG and SG shall be produced by direct substitution of the same mass of Multigrade binder for C320 binder in the Types H and SI mixes, respectively.

Type SS shall be produced by direct substitution of the same mass C600 binder for C320 binder in Type SI.

Table 8 - Compaction Cycles and Air Voids for the Mixes Designed by the Austroads Method

| Asphalt Type | Gyratory Cycles to Achieve Design Aim for Air Voids (No.) | Design Air Voids ⁽¹⁾ (%) | Minimum Air Voids at 250 Gyratory Cycles ⁽²⁾ (%) |
|--------------|---|-------------------------------------|---|
| L | 50 | 4.0 | Not Applicable |
| N | 80 | 4.0 | To be reported |
| H and HG | 120 | 4.0 | To be reported |
| V | 120 | 5.0 | To be reported |
| HP | 120 | 3.0 | To be reported |
| VP | 120 | 4.0 | To be reported |
| SI, SS & SG | 120 | 4.0 | To be reported |
| SP | 120 | 3.0 | To be reported |
| SF | 80 | 2.0 | Not Applicable |

Notes on Table 8

1. The design air voids values may be adjusted to account for rounding of the binder content to the nearest 0.1%
2. Also applies to mixes types designed by the Marshall Method

Table 9 – Air Voids and Voids in Mineral Aggregate for Mix Types Designed by the Marshall Method

| Mix Size (mm) | Air Voids Range (%) | | | | | | Minimum Voids in Mineral Aggregate (%) ⁽¹⁾ | | | | | | |
|---------------|---------------------|-----------|-----------|-----------|-----------|-----------|---|----|----|----|----|----|---------|
| | L | N & H | V | VP | SI | SG & SS | L | N | H | V | VP | SI | SG & SS |
| 7 | 3.8 – 4.2 | 4.9 – 5.3 | - | - | - | - | 15 | 15 | 16 | - | - | - | - |
| 10 | 3.8 – 4.2 | 4.9 – 5.3 | 5.9 – 6.3 | - | - | - | 15 | 15 | 16 | 16 | - | - | - |
| 14 | - | 4.9 – 5.3 | 5.9 – 6.3 | 4.9 – 5.3 | 4.9 – 5.3 | - | - | 15 | 15 | 15 | 15 | 15 | - |
| 20 | - | - | - | - | 4.9 – 5.3 | 4.9 – 5.3 | - | - | - | - | - | 14 | 14 |

Notes on Table 9

1. Also applies to mix types designed by the Austroads Mix Design Method

(c) Performance Test Properties**(i) Indirect Tensile Modulus Test Properties**

The mean indirect tensile modulus of test specimens for each asphalt type listed in Table 10 shall be within the corresponding specified range.

| Asphalt Type | Nominal Size (mm) | Mean Indirect Tensile Modulus at 25°C (MPa) | |
|-------------------------|-------------------|---|------------------|
| | | Min | Max |
| N ¹ & H | 10 | 2500 | 5500 |
| N ² | 10 & 14 | 2000 | 5000 |
| N ¹ , H & SI | 14 | 3000 | 6000 |
| V & HG | 10 & 14 | 2500 | 5500 |
| VP | 14 | 1000 | - ⁽³⁾ |
| HP | 10 & 14 | 1000 | 2500 |
| SP | 20 | 1000 | 2500 |
| SI, SS & SG | 20 | 3500 | 7000 |
| SF | 20 | 3000 | 7000 |

Notes on Table 10

Modulus test limits apply to gyratory compacted specimens compacted to 5% air voids within a tolerance of $\pm 0.5\%$ air voids.

- Mixes with RAP content and C170 bitumen or Mixes with C320 bitumen
- Mixes with C170 bitumen
- Value to be added in future revision

(ii) Moisture Sensitivity

The Wet Tensile Strength and the Tensile Strength Ratio shall comply with the requirements of Table 11.

| Asphalt Size & Type | Minimum Wet Tensile Strength (kPa) | Minimum Wet to Dry Tensile Strength Ratio |
|--|------------------------------------|---|
| 10N, 10H, 10V, 10HG, 14N, 14H, 14V, 14HG | 850 | 80% |
| 14SI, 20SI, 20SS, 20SG | 650 | 80% |
| 10HP, 14HP, 14VP, 20SP | To be reported | 80% |

Notes on Table 11

Test specimens shall be prepared using gyratory compaction to 8% air voids $\pm 1\%$ air voids.

(iii) Resistance to Deformation

The maximum Tracking Depth tested under the Austroads Wheel Tracking test method shall not exceed the values for asphalt mixes specified in Table 12.

| Asphalt Size and Type | Maximum Tracking Depth at 60°C (mm) |
|------------------------------------|-------------------------------------|
| 14V, 14HP, 14VP, 20SP | 4 |
| 10HP, 10HG, 14HG, 20SI, 20SS, 20SG | 5 |
| 10V, 14N ¹ , 14H, 14SI | 7 |
| 10H & 10N ¹ | 8 |

Notes on Table 12

Wheel track test specimens shall be compacted to 5% air voids $\pm 1\%$ air voids.

- Conditional Use RAP requirement

(iv) **Resistance to Fatigue under Flexural Bending**

Fatigue testing requirements will be included in a future revision based on the outcomes of further investigations.

6.2 Test Properties required for other Bituminous Mixes

Stone Mastic Asphalt (SMA)

Refer to VicRoads Standard Specification Section 404.

Regulation Gap Graded Asphalt (RGGA)

Refer to VicRoads Standard Specification Section 405.

Open Graded Asphalt (OGA)

Refer to VicRoads Standard Specification Section 417.

High Modulus Asphalt (EME2)

Refer to VicRoads Standard Specification Section 418.

Bitumen Crumb Rubber Asphalt (BCRA)

Refer to VicRoads Standard Specification Section 421.

Bituminous Slurry Surfacing

Refer to VicRoads Standard Specification Section 427.

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**VicRoads Code of Practice - Revision Summary
RC 500.01 - Registration of Bituminous Mix Designs**

| Date | Clause | Description of Revision | Authorised by |
|---------------|---------|---|--|
| December 2018 | various | <p>Various format and structural changes.</p> <p>Registration of other bituminous mixes included (UTA and Lean mix removed)</p> <p>Added 14VP and Size 7 mm SMA</p> <p>Table 1: Expanded definitions to bituminous mixes. VP and Size 7 mm SMA added. EME2 reclassified as DGA.</p> <p>Table 2: Removed 10 gyratory cycles, stability and flow. Revised testing requirements for various mixes.</p> <p>Table 3: Multigrade M500 replaces M1000. Added 15/25 penetration grade for EME2.</p> <p>Table 4: Particle loss required for SI. Particle loss removed for SF.</p> <p>Table 5: Removed aggregate proportion. Removed upper limit of bitumen content.</p> <p>Volumetric testing of the base mix will use production binder. VMA tolerance removed.</p> <p>Table 8: Removed 10 gyratory cycles. Added V & VP.</p> <p>Table 9: Removal of stability and flow. VMA reduced by 1% to account for the removal of the tolerance in 6.1 (b).</p> <p>Table 11: Moisture sensitivity testing extended to additional mixes</p> <p>Table 12: Revised wheel tracking limits for mixes.</p> <p>Removal of fatigue testing requirements pending further investigation.</p> <p>Table of acceptable warm mix technologies removed.</p> | Principal Advisor – Pavements Geotech.& Materials |
| April 2016 | various | Incorporation of EME2 references | Principal Advisor – Pavements Geotech.& Materials |
| March 2014 | various | <p>Table 2: removal of "for information" criteria for IDT Modulus, Wheel tracking & Moisture Sensitivity for Marshall designed mixes.</p> <p>Table 9: modification to the modulus requirements.</p> <p>Table 10: minimum Wet/Dry strength ratio 80% for all P.</p> <p>Table 11: no change to limits, addition of rutting criteria to 10mm Type N mixes.</p> | Principal Advisor – Pavements Geotech.& Materials |

| Date | Clause | Description of Revision | Authorised by |
|--------------|-----------------|--|---|
| June 2013 | various | Updated to reflect agreed changes to the registration process with AAPA. | Principal Advisor – Pavements Geotech.& Materials |
| October 2012 | Table 2 | Inclusion of Moisture Sensitivity Requirements to align with Table 10 | Principal Advisor – Pavements & Materials |
| July 2012 | 4, 5(b) and 6.3 | Inclusion of WMA clauses | Principal Advisor – Pavements & Materials |
| June 2012 | Full document | Re-styled with minor corrections made | Principal Advisor – Pavements & Materials |