SECTION 418 - HIGH MODULUS ASPHALT (EME2)‑

##This section cross-references Section 407 and must be included in the contract documents.

418.01 GENERAL

This section shall be read in conjunction with Section 407 ‑ Hot Mix Asphalt and covers the requirements for Size 14 mm high modulus asphalt (EME2) that are in addition to or override the requirements of Section 407.

418.02 AGGREGATES

Unless otherwise specified, the properties of the aggregates used in EME2 shall comply with the requirements for Type S asphalt as specified in clause 407.03. Further to clauses 407.03 and 407.09, no Reclaimed Asphalt Pavement (RAP) shall be incorporated into EME2.

418.03 BINDER

Unless otherwise approved, the binder used in EME2 shall be 15/25 hard penetration grade binder, as specified in Table 418.042.

418.04 MIX DESIGN

All asphalt mixes proposed for use on VicRoads works shall be registered in accordance with VicRoads Code of Practice RC500.01 and this specification.

All mix designs registered with VicRoads are issued a status according to compliance as:

**General** Complies with the requirements of Code of Practice RC500.01.

**Conditional** Mixes which do not comply in all respects with the requirements of Code of Practice RC500.01 but which are considered appropriate for use subject to conditions attached to the registration.

**Expired** Superseded by another registered mix but details are retained for record purposes.

**HP The Contractor shall only use asphalt mixes that are registered by VicRoads as ‘General’ mixes at the time of placement, unless otherwise approved by the Superintendent.**

The contractor shall be responsible for the development of a mix design to comply with the requirements of clauses 418.04 and 418.05.

The asphalt mix shall incorporate coarse aggregate, fine aggregate, filler and binder complying with the following requirements:

(a) Coarse Aggregate

Coarse aggregates shall comply with the requirements of clause 407.03 for Type S, except the Flakiness Index of each separate sized coarse aggregate fraction, with a nominal size of 10 mm or larger, shall be a maximum of 25%.

(b) Fine Aggregate

Fine aggregates shall comply with the requirements of clause 407.03 except that natural sand or glass fines shall not be used.

(c) Filler

The combined filler shall comply with the requirements of clause 407.04, except that the voids in dry compacted filler (dry compacted voids), and the Delta ring and ball shall meet the requirements specified in Table 418.041.

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**Table 418.041 Combined Filler Requirements**

|  |  |  |  |
| --- | --- | --- | --- |
| Material Property | Test Method | Value | Testing Frequency |
| Voids in dry compacted filler | AS1141.17 | Min 28%Max 45% | Report with design submission |
| Delta ring and ball (1) | EN 13179-1:2000 (2) andAS 2341.18 | Min 8oCMax 16oC | 1 per monthproduction testing |
| Notes:**(1)** This test assesses the stiffening effect of the filler on the binder-filler mastic using the softening point test; however the asphalt supplier need not have NATA accreditation for this EN test.**(2)** More details on sample preparation are provided in AP-T219/13. |

(d) Binder

The binder shall comply with Table 418.042.

**Table 418.042 Binder Requirements**

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| --- | --- | --- |
| **Material Property** | **Test Method** | **Value** |
| Penetration at 25°C (100g 5s) | AS 2341.12 | Min 15pu **(1)**Max 25pu |
| Softening Point | AS 2341.18 | Min 56oCMax 72oC |
| Mass Change | AS/NZS 2341.10 | + 0.5% |
| Retained Penetration **(2)** | AS/NZS 2341.10 and AS 2341.12 | Min 55% |
| Increase in softening point after RTFO treatment **(3)** | AS/NZS 2341.10 and AS 2341.18 | Max 8oC |
| Viscosity at 60°C **(4)** | AS/NZS 2341.2 | Min 900 Pa.s |
| Viscosity at 135°C | AS 2341.3 or AS 2341.4 | Min 0.6 Pa.s |
| Matter insoluble in toluene | AS 2341.8 | Max 1% by mass |
| Penetration Index **(5)** | Not available | Report with design submission |
| Viscosity at 60°C after RTFO test | AS/NZS 2341.10 and AS/NZS 2341.2 | Report with design submission Pa.s |
| Viscosity at 60°C, percentage of original after RTFO test | AS/NZS 2341.10 and AS/NZS 2341.2 | Report with design submission % |
| Notes.**(1)** One (1) pu equals 0.1 mm.**(2)** Retained penetration shall be calculated using the following equation: (Penetration at 25°C (100g, 5s) after RTFOx100) / (Penetration at 25°C (100g, 5s) before RTFO)**(3)** Increase in softening point after RTFO treatment shall be calculated using the equation: Softening point after RTFO – softening point before RTFO**(4)** Test shall be performed using an Asphalt Institute viscosity tube.**(5)** Refer to clause 418.04(e) for details. |

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(e) Penetration Index

Penetration Index (PI) shall be calculated as follows (viz. Annexure A of EN 13924‑2006):

|  |  |
| --- | --- |
| *P I* =  | (20 x *SP*) + (500 x *logPen*) - 1952 |
| *SP* – (50 x *logPen*) + 120 |

where: SP = Softening point determined in accordance with AS 2341.18

 Pen = Penetration determined in accordance with AS 2341.12

418.05 MIX DESIGN CRITERIA

(a) The mix design shall comply with the following requirements:

**Table 418.051 Mix Design Criteria**

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| --- | --- | --- |
| **Mix Property** | **Test Method** | **Value** |
| Air voids in specimens compacted by gyratory compactor at 100 cycles | AS/NZS 2891.2.2 **(2)** | Max 6% **(1)** |
| Water sensitivity | AG:PT/T232 **(3)** | Min 80% |
| Wheel tracking at 60°C and 30,000 cycles (60,000 passes) **(4)** **(5)** | AG:PT/231 | Max 6.0 mm |
| Minimum flexural stiffness at 50 ± 3 µε, 15°C and 10 Hz **(4)** **(6)** **(7)** | AG:PT/T274 | Min 14,000 MPa |
| Fatigue resistanceat 20°C, 10 Hz and 1 million cycles **(4)** **(6)** | AG:PT/T274 | Min 150με |
| Indirect Tensile Modulus | AS 2891.13.1 | For information only |
| Richness modulus **(8)** | N/A | Min 3.4 |
| Notes:**(1)** Bulk density of gyratory compacted specimens shall be determined by mensuration in accordance with AS 2891.9.3, for an air void content between 3‑6%. This property shall be determined from the average of three (minimum) test specimens.**(2)** Test parameters for AS/NZS 2891.2.2 shall be as follows: Vertical loading stress of 600 ±18 kPa, gyratory angle (internal) of 0.82 ±0.02 and a rate of gyration of 30 ±0.5 revolutions per minute. Specimens should have a diameter of 150 mm and a thickness between 100 mm and 150 mm. Laboratory compaction temperature for preparing test specimens shall be determined in accordance with AS 2891.2.2, Appendix A.**(3)** The freeze/thaw moisture conditioning of specimens detailed in Section 5.2 of AG:PT/T232 shall be undertaken.**(4)** Specimens shall be compacted to an air void content between 1.5 – 4.5% where the bulk density is determined in accordance with AS 2891.9.2.(Presaturation method).**(5)** Determined from the average of two (minimum) test specimens.**(6)** Sinusoidal loading shall be used.**(7)** Flexural stiffness shall be determined as the average stiffness between the 45th and the 100th load repetition.**(8)** Refer to clause 418.05(d) for details. |

(b) For flexural stiffness and fatigue resistance testing undertaken in accordance with AG:PT/T274 the appropriate strain levels must be selected. Noting in particular some software (using manually selected sinusoidal loading) define strain levels differently to AG:PT/T274. These software programs may only apply half the strain level indicated on the input screen, i.e. A 280 microstrain loading on the software input screen may equate to 140 microstrain loading according to AG:PT/T274.

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(c) Grading

All aggregates must pass the 19 mm sieve (by mass).

(d) Richness Modulus

The richness modulus (K) of the mix design shall be calculated as follows:

where: B = Binder content (% by mass of the total asphalt mix)

 α = 2.65 / ρa

 ρa = Particle density of the combined mineral aggregate determined in accordance with AS/NZS 2891.8 (t/m3)

 Σ = (0.25G + 2.3S + 12s + 150f) / 100

where: G = Percentage of aggregate particles greater than 6.30 mm

 S = Percentage of aggregate particles between 6.30 mm and 0.250 mm

 s = Percentage of aggregate particles between 0.250 mm and 0.075 mm

 f = Percentage of aggregate particles less than 0.075 mm

G, S and s may be interpolated using a linear relationship from the grading curve using Australian standard sieves.

418.06 MIXING AND MIXING TEMPERATURES

The temperature of the asphalt shall not exceed 190°C.

418.07 FREQUENCY OF INSPECTION AND TESTING AT THE MIXING PLANT

The production tolerances on the grading aim of the mix before compaction shall be as specified for Size 14 mm in Table 407.071. Notwithstanding the requirements of clause 407.11, a reduced frequency of testing is not permitted.

For conformance testing of the binder, samples shall be prepared in accordance with AS 2008. The following sampling and testing shall be undertaken as a minimum.

Sampling and testing at the point of release from manufacture.

The maximum batch size shall comprise the discrete quantity of binder in the manufacturer’s storage tank. The binder in the storage tank shall represent a new batch when either:

(a) binder is added to the storage tank, or

(b) binder has been stored for a period of 14 days without the addition of new binder to the storage tank.

The minimum frequency of sampling and testing from the Manufacturer’s storage tanks shall be as follows:

(a) each batch - penetration and softening point, and

(b) first batch for the Project, then 3 monthly and at change in feed stock thereafter – all other properties listed in Table 418.042.

(c) binder to the binder storage tank - samples shall be tested for penetration and softening point and shall comply with the requirements of Table 418.042.

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Sampling and testing at the point of delivery (binder storage tank at the asphalt plant) shall be undertaken at a frequency not less than once every 150 tonnes. Additional samples shall be taken and tested when the binder has been stored for a period of more than 14 days without the addition of new binder to the binder storage tank. Samples shall be tested for penetration and softening point and shall comply with the requirements of Table 418.042.

Further to Table 407.111 the minimum frequency for Binder Content and Full Sieve Analysis of Asphalt (full extraction test) shall be one test per 150 tonnes or part thereof of the asphalt plant production on a representative sample taken from a delivery truck. The Binder Content and Full Sieve Analysis of the Asphalt results shall be provided to the Superintendent.

418.08 CONDITIONS FOR PLACING

The surface on which the EME2 is to be placed shall be essentially dry and free from surface water.

EME2 shall not be placed when the majority of the area to be paved has a surface temperature of less than 5°C.

418.09 COMMENCEMENT OF PLACING

**HP The placement of EME2 shall not commence until approval is obtained from the Superintendent.**

418.10 REQUIREMENTS FOR TESTING AND ACCEPTANCE OF COMPACTION

After placement, the EME2 shall be immediately compacted to meet the requirements for testing and acceptance of compaction as detailed in clause 407.21, except:

(a) work shall be tested for compaction density on a lot basis regardless of the quantity of material placed

(b) work represented by a lot of six test sites shall be assessed in accordance with Table 418.101

(c) work represented by either four or five test sites shall be assessed as shown in Table 418.102

**Table 418.101 Limits for Characteristic Density Ratio (Six tests)**

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| **For layers greater than 50 mm thickness** |
| **Characteristic Value of the Density Ratio****(Rc)** | **Assessment** |
| 98.0% or more | Accept lot |
| 96.0% to 97.9 | Lot may be accepted at a reduced rate calculated by P=10Rc – 890 |
| Less than 96.0% | Reject lot |

**Table 418.102 Mean Density Ratio (Four or Five tests)**

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| **For layers greater than 50 mm thickness** |
| **Mean Value of the Density Ratio****(Rm)** | **Assessment** |
| 99.5% or more | Accept lot |
| 96.5% to 99.4% | Lot may be accepted at a reduced rate calculated by P=10Rm – 895 |
| Less than 96.5% | Reject lot |

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