

400-R-780 MSCR BINDER SPECIFICATIONS

(Revised 05-17-24)

The Standard Specifications are revised as follows:

SECTION 401, BEGIN LINE 36, DELETE AND INSERT AS FOLLOWS:

401.04 Design Mix Formula

A DMF shall be prepared in accordance with 401.05 and submitted in a format acceptable to the Engineer one week prior to use. The DMF shall be based on the ESAL category identified in the pay item and shall state the mixture designation and maximum particle size in the mixture. No mixture shall be used until the DMF has been assigned a mixture number by the DTE. *The mixture number will be assigned for each calendar year. Assigning of a mixture number shall not in any way be construed as acceptance in conjunction with 401.19.*

The DMF shall state the binder content, the ΔPb as determined in accordance with ITM 591, and the MAF. The DMF shall state the source, type, and dosage rate of any stabilizing additives.

The ESAL category identified in the pay item correlates to the following ESAL ranges.

| ESAL Category | ESAL |
|--|---------------------------|
| 2 [*] | < 3,000,000 |
| 3 | 3,000,000 to < 10,000,000 |
| 4 [*] | ≥ 10,000,000 |
| * A category 2 mixture shall replace a category 1 mixture and a category 4 mixture shall replace a category 5 mixture. | |

A category 4 mixture meeting all the requirements of a category 3 mixture may be used in lieu of a category 3 mixture.

The plant discharge temperature for any mixture shall not be more than 315°F whenever PG 64-2258S-28 or PG 70-2258H-28 binders are used or not more than 325°F whenever PG 76-2258E-28 binder is used. QC/QA HMA may be produced using a water-injection foaming device. The DMF shall list the minimum and maximum plant discharge temperatures as applicable to the mixture.

401.05 Volumetric Mix Design

The DMF shall be determined for each mixture from a volumetric mix design by a design laboratory selected from the Department's list of Qualified QPL of HMA Mix Design Laboratories. *A laboratory will be considered for inclusion on the QPL by following the procedure in ITM 574.* A volumetric mixture shall be designed in accordance with AASHTO R 35 and the respective AASHTO reference as listed below.

All loose mixtures shall be conditioned for 4 h in accordance with AASHTO R 30 prior to testing, *except as follows:*

(a) *Mixtures shall be conditioned for 4 hours.*

(b) *Dense graded mixtures shall be conditioned at 300 ±5°F and open graded mixtures shall be conditioned at 260 ±5°F.*

Steel furnace slag coarse aggregate, when used in an intermediate or base mixture application, shall have a deleterious content less than 4.0% as determined in accordance with ITM 219.

SECTION 401, BEGIN LINE 82, INSERT AS FOLLOWS:

Dust/Calculated Effective Binder Ratio for *dense graded mixtures* shall be 0.6 to 1.4. The Dust/Calculated Effective Binder Ratio for 4.75 mm mixtures shall be 1.0 to 2.0.

SECTION 401, BEGIN LINE 97, DELETE AND INSERT AS FOLLOWS:

The percent draindown of open graded mixtures shall not exceed 0.30% in accordance with AASHTO T 305. Open graded mixtures may incorporate recycled materials and fibers. The recycled materials shall be in accordance with 401.06. The fiber type and minimum dosage rate shall be in accordance with AASHTO M 325. The binder for open graded mixtures may have ~~the upper temperature classification reduced by 6°C from the specified binder grade~~ a traffic loading designation of H if fibers are incorporated into the mixture or if 3.0% reclaimed asphalt shingles RAS by weight of the total mixture is used.

SECTION 401, BEGIN LINE 114, DELETE AND INSERT AS FOLLOWS:

A PG binder grade or source change will not require a new mix design. If the ~~upper temperature classification~~ traffic loading designation of the PG binder is lower than the original PG grade, a new TSR value is required.

SECTION 401, AFTER LINE 173, INSERT AS FOLLOWS:

If a pay item is designated as PG 58S-28 and a surface mixture, the binder grade used shall be PG 58H-28 when the Binder Replacement is less than or equal to 15.0%.

SECTION 401, BEGIN LINE 232, DELETE AND INSERT AS FOLLOWS:

The Engineer will randomly select the location within each subplot for sampling in accordance with ITM 802. The first 300 t of the first subplot of the first lot for each ~~mixture~~ original contract pay item in a calendar year will not be sampled. An acceptance sample will consist of plate samples obtained in accordance with ITM 802 and ITM 580. The Engineer will take immediate possession of the samples.

SECTION 401, BEGIN LINE 404, DELETE AND INSERT AS FOLLOWS:

applicable portion of the mixture for each. The temperature of each mixture at the time of spreading shall be less than 315°F whenever PG ~~64-2258S-28~~ or PG ~~70-2258H-28~~ binders are used or not more than 325°F whenever PG ~~76-2258E-28~~ binder is used. No mixture shall be placed on a previously paved course that has not cooled to below 175°F. For mixtures compacted in accordance with 402.15, the temperature of each mixture at the time of spreading shall not be less than 245°F.

SECTION 401, BEGIN LINE 1004, DELETE AND INSERT AS FOLLOWS:

QC/QA-HMA, _____, 58, _____, _____ mm... TON
(ESAL⁽¹⁾) (PG⁽²⁾) (Course⁽³⁾) (Mix⁽⁴⁾)

- (1) ESAL Category as defined in 401.04
 (2) Number represents the high temperature binder grade. *Letter represents traffic loading designation.* Low temperature grades are - ~~2228~~
 (3) Surface, Intermediate, or Base
 (4) Mixture Designation

SECTION 402, BEGIN LINE 36, DELETE AND INSERT AS FOLLOWS:

The DMF will be based on the ESAL and mixture designation as follows:

| Mixture Type | Type B* | Type C | Type D |
|---|------------------------|---------------------------|------------------------|
| Design ESAL | < 3,000,000 | 3,000,000 to < 10,000,000 | ≥ 10,000,000 |
| Surface | 4.75 mm | 4.75 mm | 4.75 mm |
| | 9.5 mm | 9.5 mm | 9.5 mm |
| | 12.5 mm | 12.5 mm | 12.5 mm |
| Surface – PG Binder | 64-2258S-28 | 70-2258H-28 | 70-2258E-28 |
| Intermediate | 9.5 mm | 9.5 mm | 9.5 mm |
| | 12.5 mm | 12.5 mm | 12.5 mm |
| | 19.0 mm | 19.0 mm | 19.0 mm |
| | 25.0 mm | 25.0 mm | 25.0 mm |
| Intermediate – PG Binder | 64-2258S-28 | 64-2258H-28 | 70-2258E-28 |
| Base | 19.0 mm | 19.0 mm | 19.0 mm |
| | 25.0 mm | 25.0 mm | 25.0 mm |
| Base – PG Binder | 64-2258S-28 | 64-2258S-28 | 64-2258S-28 |
| *A Type B mixture shall replace a Type A mixture. | | | |

A Type C mixture may be used in lieu of a Type B mixture. A Type D mixture may be used in lieu of a Type C or a Type B mixture.

Surface 4.75 mm mixtures shall not be used when the required lay rate shown on the plans is greater than 100 lb/sq yd. Surface 12.5 mm mixtures shall not be used when the required lay rate shown on the plans is less than 195 lb/sq yd.

The plant discharge temperature for any mixture shall not be more than 315°F whenever PG ~~64-2258S-28~~ or PG ~~70-2258H-28~~ binders are used *or not more than 325°F whenever 58E-28 binder is used.* HMA may be produced using a water-injection foaming device. The DMF shall list the minimum and maximum plant discharge temperatures as applicable to the mixture.

SECTION 402, BEGIN LINE 180, DELETE AND INSERT AS FOLLOWS:

The temperature of each mixture at the time of spreading shall be less than 315°F whenever ~~64-2258S-28~~ or PG ~~70-2258H-28~~ binders are used *or not more than 325°F whenever 58E-28 binder is used.* The temperature of each mixture at the time of spreading shall not be less than 245°F. No mixture shall be placed on a previously paved course that has not cooled to less than 175°F.

SECTION 406, BEGIN LINE 9, DELETE AND INSERT AS FOLLOWS:

406.02 Materials

The type and grade of asphalt material shall be in accordance with the following:

- Asphalt Emulsion, SS-1h, AE-NT902.01(b)
- PG Asphalt Binder, PG ~~64-2258S-28~~.....902.01(a)

SECTION 408, BEGIN LINE 12, DELETE AND INSERT AS FOLLOWS:

408.02 Materials

Materials shall be in accordance with the following:

- Asphalt Binder, PG ~~64-2258S-28~~* 902.01(a)
- Asphalt Emulsion for Crack Filling, AE-90S 902.01(b)
- Fine Aggregates, No. 23 or No. 24 904.02
- Joint Sealing Materials 906.02(a)2

* A PG ~~64-2258S-28~~ asphalt binder shall be used to fill cracks on a surface that is milled in accordance with 306, and polypropylene fibers shall be used only in conjunction with warranted micro-surfacing.

SECTION 902, BEGIN LINE 3, DELETE AND INSERT AS FOLLOWS:

902.01 Asphalt

Asphalt is defined as a cementitious material obtained from petroleum processes. Asphalts shall be sampled and tested in accordance with the applicable requirements of 902.02.

(a) Performance Graded Asphalt Binders

~~Performance graded asphalt~~PG binders shall be from a supplier on the QPL of Performance-Graded Asphalt Binder Suppliers. A PG binder will be considered for inclusion on the QPL by following ITM 581.

~~Performance graded, PG asphalt binders shall be in accordance with the following:~~

| GRADE | 58-28 | 64-22 | 64-28 | 70-22 | 70-28 | 76-22 |
|---|-----------------|-------|-------|-------|-------|-------|
| ORIGINAL BINDER | | | | | | |
| Flash Point, minimum, °C | 230 | | | | | |
| Viscosity, maximum, 3 Pa·s, Test Temp, °C | 135 | | | | | |
| DSR, G*/sin δ (delta), minimum, 1.00 kPa, Test Temp. @ 10 rad/s, °C | 58 | 64 | 64 | 70 | 70 | 76 |
| ROLLING THIN FILM OVEN RESIDUE | | | | | | |
| Mass Loss, maximum, % | 1.00 | | | | | |
| DSR, G*/sin δ (delta), minimum, 2.20 kPa, Test Temp. @ 10 rad/s, °C | 58 | 64 | 64 | 70 | 70 | 76 |
| PRESSURE AGING VESSEL (PAV) RESIDUE | | | | | | |
| PAV Aging Temperature, °C | 100 (Note 1) | | | | | |
| DSR, G* sin δ (delta), maximum, 5,000 kPa, Test Temp. @ 10 rad/s, °C (Note 3) | 19 | 25 | 22 | 28 | 25 | 31 |
| Physical Hardening | Report (Note 2) | | | | | |
| Creep Stiffness, S, maximum, 300 MPa, m-value, minimum, 0.300, Test Temp. @ 60 s, °C | -18 | -12 | -18 | -12 | -18 | -12 |
| Notes: 1. Oven temperature tolerance shall be ±0.5°C. | | | | | | |
| 2. Physical Hardening is performed on a set of asphalt beams according to AASHTO T 313, Section 12.1, | | | | | | |

except the conditioning time is extended to 24 h \pm 10 minutes at 10°C above the minimum performance temperature. The 24 h stiffness and m value are reported for information purposes only.

3. Binders that have a $G^* \sin \delta$ (delta) of 5,001 to 6,000 Kpa will be considered acceptable if the phase angle is 42 degrees or greater.

~~A PG 58-28 or PG 64-22 binder may be modified by in-line blending with styrene butadiene rubber, SBR, polymer latex at the HMA plant in accordance with ITM 581. A PG 58-28 may be modified to a PG 64-28 and a PG 64-22 may be modified to a PG 70-22. A Type A certification in accordance with 916 shall be provided for SBR polymer latex. The results of the following shall be shown on the certification.~~

| Property | Requirements |
|---|--------------|
| Total Polymer Solids, % by weight | 60-72 |
| Butadiene, % by weight, min. | 68 |
| Residual Styrene, % by weight, max. | 0.1 |
| Ash, % of total polymer solids by weight, max. | 3.5 |
| pH | 9-11 |
| Viscosity, Brookfield model RVF, Spindle No. 2 @ 20 rpm @ 25°C, max. | 2,000 |

~~The minimum SBR polymer latex content shall be 2.5 %. The SBR polymer latex content may be reduced below the minimum content provided, if the following requirements are met:~~

1. ~~An AASHTO accredited laboratory shall blend the PG binder and SBR polymer latex at the proposed SBR polymer latex content and test and grade the modified PG binder in accordance with AASHTO M 320.~~
2. ~~The laboratory test results verifying the blend and compliance with 902.01(a) shall be submitted to the Engineer for approval.~~
3. ~~The source of the PG Binder or SBR polymer latex shall not be changed.~~

PG binders shall be in accordance with AASHTO M 332 and in accordance with the elastic response requirements in AASHTO R 92.

1. Sampling

An acceptance sample and backup sample shall be taken from the asphalt delivery system at the HMA plant. A copy of a load ticket identifying the binder source shall be submitted with the samples. The Engineer will take immediate possession of the samples.

2. PG Binder Testing

The Department will perform complete testing in accordance with AASHTO M 320332. Complete PG binder testing will consist of RTFO DSR and PAV BBR testing. *Elastic response in accordance with AASHTO R 92 will also be reported.* Rotational viscosity and flashpoint tests are not required. If the material is not in accordance with the

specifications, the material will represent one week of HMA production and be adjudicated as a failed material in accordance with 105.03.

3. Appeals

~~If the Contractor does not agree with the acceptance test results, a request may be made in writing for additional testing. The appeal shall be submitted within 15 calendar days of receipt of the Department's written results. The basis of the appeal shall include complete AASHTO M 320 test results.~~
