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| Use on all projects when a Hveem or Marshall job-mix-formula will be developed for the specific project, and statistical acceptance will be used. Be mindful of the project duration: it takes 1 month to do a mix design. Use this for **more** than 7000 tons of asphalt concrete pavement. |

## Section 402. — ASPHALT CONCRETE PAVEMENT BYHVEEM OR MARSHALL MIX DESIGN METHOD

**Description**

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| Enter the pavement roughness type and asphalt binder grade in the highlighted areas below. Materials will provide to the designer the following:1) Roughness type: Use the following guidelines:1. Type I is for 3R mill and fill ONE lift. This requires before and after IRI measurement.
* Type I-A is for higher speeds greater than 35 mph
* .Type I-B is for slower winding roads less than 35 mph.
1. Type II is for 3R mill and fill TWO lifts. This requires before and after IRI measurement.
* Type I-A is for higher speeds greater than 35 mph
* .Type I-B is for slower winding roads less than 35 mph.
1. Type III is for 4R and 3R work with pulverization, base, or other typical section work prior to placing the asphalt.
* Type III-A is for higher speeds greater than 35 mph.
* Type III-B is for slower winding roads less than 35 mph.

2) Asphalt binder grade: Binder grade is project specific.3) Pressure Aging Vessel Temperature: The default temperature should be110°C (212°F). If the project is in a desert environment the temperature could change to 110°C (230°F) in the highlighted area below. |

**402.01** Delete the fifth paragraph and substitute the following:

Antistrip additive type is designated according to Subsection 702.05. A minimum of one percent Type 3 (lime) is required in the asphalt concrete mixture.

Add the following:

Aggregate grading designation is ¾-inch (19-millimeter) or ½-inch (12.5-millimeter) as shown in Table 703-4.

Pavement roughness is type I-A, I-B, II-A, II-B, III-A, or III-B, and IV as shown in Subsection 402.16.

Asphalt binder grade is PG xx-xx. The Pressure Aging Vessel test temperature shall be 212°F (100°C).

**Construction Requirements**

**402.03 Composition of Mix (Job-Mix Formula).** Add the following after the first paragraph:

If more than 1.0 percent hydrated lime is proposed in the JMF, provide AASHTO T 283 test results showing the additional lime is necessary to meet the minimum tensile strength ratio requirements in Table 402-1.

Delete Table 402-2 and substitute the following:

**Table 402-2**

**Voids in Mineral Aggregate (VMA)**

**Hveem or Marshall Mix Design**

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| **Sieve Size (1)** | **Voids in Mineral Aggregate,****Minimum, % (2)(3)** |
|  | **Hveem** | **Marshall** |
| No. 4 (4.75 mm) | 16.0-19.0 | 18.0-21.0 |
| ⅜ inch (9.5 mm) | 14.0-17.0 | 16.0-19.0 |
| ½ inch (12.5 mm) | 13.0-16.0 | 15.0-18.0 |
| ¾ inch (19 mm) | 12.0-15.0 | 14.0-17.0 |
| 1 inch (25 mm) | 11.0-14.0 | 13.0-16.0 |

(1) The largest sieve size listed in the applicable specification upon which material is permitted to be retained.

(2) VMA to be determined according to AASHTO R 35.

(3) When mineral filler or hydrated lime is used, include in the calculation for compliance with the VMA.

**(c) Submission**

**(1) Aggregate and mineral filler**

*(a)* Target values: Delete line *(2)* and substitute the following:

*(2)* Designate target values within the gradation band specified for the nominal maximum size aggregate grading shown in Table 703-4. Allowable deviations are shown in Table 703-5:

**(2) Asphalt binder.** Add the following:

*(e)* Laboratory mixing and compaction temperatures and maximum plant mixing temperature

**(3) Antistrip additives.** Add the following:

*(e)* Dosage rate.

**(4) RAP.** Add the following:

*(f)* Optional sheet for RAP on Form FHWA 1641.

**(d) Verification.** Delete the first paragraph and substitute the following:

The verification process starts when all required job mix formula documentation and materials are received.The CO will review the job mix formula and may perform job mix formula verification testing. If verification testing is performed, the information supplied in the Contractor’s job mix formula must agree with the verification test results within the tolerances shown below. Do not begin asphalt concrete mix production for the control strip until the JMF has been approved.

Delete lines (3) and (7) and substitute the following:

**(3) Bulk specific gravity of aggregate (Gsb).** The Contractor’s coarse and fine Gsb is verified if the CO’s results are within 0.038 for AASHTO T 85 and 0.066 for AASHTO T 84.

**(7) Tensile strength ratio (TSR).** The Contractor’s TSR result is verified if the CO’s result is above 0.80.

Add the following:

**(8) Voids in the mineral aggregate (VMA)**. The Contractor’s VMA result is verified if the CO’s result is within the specification limit in Table 402-2.

**402.05 Equipment.**

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| Do not include the pay item for a “Material Transfer Vehicle” in that it is considered incidental to construction. If haul distance is anticipated to be short (e.g. less than 30 minutes), Subsection 402.05(b) may be deleted. Verify with pavement & materials group. |

**(b) Materials Transfer Vehicle (MTV).** Delete this Subsection and substitute the following:

**(b) Materials Transfer Vehicle (MTV).** Furnish an MTV with the following:

1. Independently operated with its own driver/operator;
2. Independent from the paver;
3. A loading system with the ability to receive mixtures from hauling equipment;
4. A minimum storage capacity of 15 tons (13.6 metric tons) with a remixing system in the material storage bin;
5. Remixing capability within the storage bin;
6. A discharge conveyor to deliver the mixture to the paver hopper; and
7. A mass not exceeding the maximum legal loadings on structures.

Pick-up machines, hopper inserts, and material transfer devices are not considered MTVs.

In the event the MTV malfunctions during paving operations, the Contractor must suspend paving, however mix in transit and stored in the silo at the time of breakdown may be placed without the use of an MTV. Do not resume mix placement until the MTV is operational.

**402.14 Compacting.** Add the following:

Do not cause cracking, shoving, or undue displacement. Continue rolling until all roller marks are eliminated, all cracks are sealed, and the required density is obtained. For HMA, do not roll the mix after the surface cools below 175 °F (80°C).

**402.15 Joints, Trimming Edges, and Cleanup.** Add the following:

Make the longitudinal joint in the top layer at the centerline of the pavement on two-lane roadways or at the lane lines of roadways with more than two lanes. Establish the centerline of the pavement from recorded data defined in Subsection 152.05(b) or construction staking data if provided by the government. Offset the longitudinal joint in the layer immediately below at least 6-inches (150-millimeters) from the joint.

For curve widening see the plans for locations and details. For two-lane roadways make the longitudinal joint at the centerline of the pavement. Do not vary the shoulder width where curve widening exists.

At connections to existing pavements and previously placed lifts, make the transverse joints vertical to the depth of the new pavement. Form transverse joints by cutting back the previous run to expose the full-depth of the course.