Regional Engineers

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Special Provision for Hot-Mix Asphalt – Binder and Surface Course

July 26, 2019

This special provision was developed to create a statewide specification for HMA mixtures IL-9.5FG and SMA 9.5; eliminate the use of leveling binder; and standardize the HMA pay items. This special provision also incorporates the BDE special provisions “Hot-Mix Asphalt - Density Testing of Longitudinal Joints” and “Hot-Mix Asphalt - Oscillatory Roller”.

This special provision should be inserted into all HMA contracts.

The districts should include the BDE Check Sheet marked with the applicable special provisions for the November 8, 2019 and subsequent lettings. The Project Coordination and Implementation Section will include a copy in the contract.

This special provision will be available on the transfer directory July 26, 2019.

80416m

# HOT-MIX ASPHALT – BINDER AND SURFACE COURSE (BDE)

Effective: July 2, 2019

Revised: November 1, 2019

Description. This work shall consist of constructing a hot-mix asphalt (HMA) binder and/or surface course on a prepared base. Work shall be according to Sections 406 and 1030 of the Standard Specifications, except as modified herein.

Materials. Add the following after the second paragraph of Article 1003.03(c):

“ For mixture IL-9.5FG, at least 67 percent of the required fine aggregate fraction shall consist of either stone sand, slag sand, steel slag sand, or combinations thereof meeting FA 20 gradation.”

Revise Article 1004.03(c) to read:

“ (c) Gradation. The coarse aggregate gradations shall be as listed in the following table.

|  |  |  |
| --- | --- | --- |
| Use | Size/Application | Gradation No. |
| Class A-1, A-2, & A-3 | 3/8 in. (10 mm) Seal | CA 16 or CA 20 |
| Class A-1 | 1/2 in. (13 mm) Seal | CA 15 |
| Class A-2 & A-3 | Cover Coat | CA 14 |
| HMA High ESAL | IL-19.0 | CA 11 1/ |
| SMA 12.5 2/ | CA 13, CA 14, or CA 16 |
| SMA 9.5 2/ | CA 13 or CA 16 3/ |
| IL-9.5 | CA 16 |
| IL-9.5FG | CA 16 |
| HMA Low ESAL | IL-19.0L | CA 11 1/ |
| IL-9.5L | CA 16 |

1/ CA 16 or CA 13 may be blended with the CA 11.

2/ The coarse aggregates used shall be capable of being combined with stone sand, slag sand, or steel slag sand meeting the FA/FM 20 gradation and mineral filler to meet the approved mix design and the mix requirements noted herein.

3/ The specified coarse aggregate gradations may be blended.”

HMA Nomenclature. Revise the “High ESAL” portion of the table in Article 1030.01 to read:

|  |  |  |
| --- | --- | --- |
| “High ESAL | Binder Courses | IL-19.0, IL-9.5, IL-9.5FG, IL-4.75, SMA 12.5, SMA 9.5 |
| Surface Courses | IL-9.5, IL-9.5FG,  SMA 12.5, SMA 9.5” |

Mixture Design. Revise the table in Article 1030.04(a)(1) and add SMA 9.5 and IL-9.5FG mixture compositions as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| “HIGH ESAL, MIXTURE COMPOSITION (% PASSING) 1/ | | | | | | |
| Sieve Size | SMA 12.5 5/ | | SMA 9.5 5/ | | IL-9.5FG | |
| min. | max. | min. | max. | min. | max. |
| 1 in. (25 mm) |  |  |  |  |  |  |
| 3/4 in. (19 mm) |  | 100 |  | 100 |  |  |
| 1/2 in. (12.5 mm) | 90 | 99 | 95 | 100 |  | 100 |
| 3/8 in. (9.5 mm) | 50 | 85 | 70 | 95 | 90 | 100 |
| #4 4.75 mm) | 20 | 40 | 30 | 50 | 60 | 75 |
| #8 (2.36 mm) | 16 | 24 4/ | 20 | 30 | 45 | 60 |
| #16 (1.18 mm) |  |  |  | 21 | 25 | 40 |
| #30 (600 μm) |  |  |  | 18 | 15 | 30 |
| #50 (300 μm) |  |  |  | 15 | 8 | 15 |
| #100 (150 μm) |  |  |  |  | 6 | 10 |
| #200 (75 μm) | 8.0 | 11.0 3/ | 8.0 | 11.0 3/ | 4.0 | 6.5 |
| #635 (20 μm) |  | ≤ 3.0 |  | ≤ 3.0 |  |  |
| Ratio of Dust/Asphalt Binder |  |  |  |  |  | 1.0 |

1/ Based on percent of total aggregate weight.

2/ The mixture composition shall not exceed 44 percent passing the #8 (2.36 mm) sieve for surface courses with Ndesign = 90.

3/ Additional minus No. 200 (0.075 mm) material required by the mix design shall be mineral filler, unless otherwise approved by the Engineer.

4/ When establishing the adjusted job mix formula (AJMF) the percent passing the #8 (2.36 mm) sieve shall not be adjusted above 24 percent.

5/ When the bulk specific gravity (Gsb) of the component aggregates vary by more than 0.2, the blend gradations shall be based on volumetric percentage.”

Revise the table in Article 1030.04(b)(1) to read:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| “VOLUMETRIC REQUIREMENTS, High ESAL | | | | | |
| Ndesign | Voids in the Mineral Aggregate (VMA), % minimum | | | Voids Filled with Asphalt Binder (VFA),% |
| IL-19.0 | IL-9.5  IL-9.5FG | IL-4.75 1/ |
| 50 | 13.5 | 15.0 | 18.5 | 65 - 78 2/ |
| 70 |  | 65 – 75 3/ |
| 90 |

1/ Maximum draindown for IL-4.75 shall be 0.3 percent.

2/ VFA for IL-4.75 shall be 76-83 percent.

3/ VFA for IL-9.5FG shall be 65-78 percent.”

Revise the table in Article 1030.04(b)(3) to read:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| “VOLUMETRIC REQUIREMENTS, SMA 12.5 1/ and SMA 9.5 1/ | | | | | |
| ESALs  (million) | Ndesign | Design  Air Voids  Target, % | Voids in the Mineral Aggregate (VMA), % min. | Voids Filled with Asphalt (VFA), % |
| ≤ 10 | 50 | 4.0 | 16.0 | 75 – 80 |
| > 10 | 80 | 4.0 | 17.0 | 75 – 80 |

1/ Maximum draindown shall be 0.3 percent.”

Quality Control/Quality Assurance (QC/QA). Revise the third paragraph of Article 1030.05(d)(3) to read:

“ If the Contractor and Engineer agree the nuclear density test method is not appropriate for the mixture, cores shall be taken at random locations determined according to the QC/QA document "Determination of Random Density Test Site Locations". Core densities shall be determined using the Illinois Modified AASHTO T 166 or T 275 procedure.”

Add the following paragraphs to the end of Article 1030.05(d)(3):

“ Longitudinal joint density testing shall be performed at each random density test location. Longitudinal joint testing shall be located at a distance equal to the lift thickness or a minimum of 4 in. (100 mm), from each pavement edge (i.e. for a 5 in. (125 mm) lift the near edge of the density gauge or core barrel shall be within 5 in. (125 mm) from the edge of pavement). Longitudinal joint density testing shall be performed using either a correlated nuclear gauge or cores.

a. Confined Edge. Each confined edge density shall be represented by a one-minute nuclear density reading or a core density and shall be included in the average of density readings or core densities taken across the mat which represents the Individual Test.

b. Unconfined Edge. Each unconfined edge joint density shall be represented by an average of three one-minute density readings or a single core density at the given density test location and shall meet the density requirements specified herein. The three one-minute readings shall be spaced 10 ft (3 m) apart longitudinally along the unconfined pavement edge and centered at the random density test location.

When a longitudinal joint sealant (LJS) is applied, longitudinal joint density testing will not be required on the joint(s) sealed.”

Revise the second table in Article 1030.05(d)(4) and its notes to read:

|  |  |  |  |
| --- | --- | --- | --- |
| “DENSITY CONTROL LIMITS | | | |
| Mixture Composition | Parameter | Individual Test (includes confined edges) | Unconfined Edge Joint Density, minimum |
| IL-4.75 | Ndesign = 50 | 93.0 – 97.4 % 1/ | 91.0% |
| IL-9.5FG | Ndesign = 50 - 90 | 93.0 – 97.4 % | 91.0% |
| IL-9.5 | Ndesign = 90 | 92.0 – 96.0 % | 90.0% |
| IL-9.5, IL-9.5L, | Ndesign < 90 | 92.5 – 97.4 % | 90.0% |
| IL-19.0 | Ndesign = 90 | 93.0 – 96.0 % | 90.0% |
| IL-19.0, IL-19.0L | Ndesign < 90 | 93.0 2/ – 97.4 % | 90.0% |
| SMA | Ndesign = 50 or 80 | 93.5 – 97.4 % | 91.0% |

1/ Density shall be determined by cores or by correlated, approved thin lift nuclear gauge.

2/ 92.0 % when placed as first lift on an unimproved subgrade.”

Equipment. Add the following to Article 1101.01 of the Standard Specifications:

“ (h) Oscillatory Roller. The oscillatory roller shall be self-propelled and provide a smooth operation when starting, stopping, or reversing directions. The oscillatory roller shall be able to operate in a mode that will provide tangential impact force with or without vertical impact force by using at least one drum. The oscillatory roller shall be equipped with water tanks and sprinkling devices, or other approved methods, which shall be used to wet the drums to prevent material pickup. The drum(s) amplitude and frequency of the tangential and vertical impact force shall be approximately the same in each direction and meet the following requirements:

(1) The minimum diameter of the drum(s) shall be 42 in. (1070 mm);

(2) The minimum length of the drum(s) shall be 57 in. (1480 mm);

(3) The minimum unit static force on the drum(s) shall be 125 lb/in. (22 N/m); and

(4) The minimum force on the oscillatory drum shall be 18,000 lb (80 kN).”

CONSTRUCTION REQUIREMENTS

Add the following to Article 406.03 of the Standard Specifications:

“(j) Oscillatory Roller 1101.01”

Revise the third paragraph of Article 406.05(a) to read:

“ All depressions of 1 in. (25 mm) or more in the surface of the existing pavement shall be filled with binder. At locations where heavy disintegration and deep spalling exists, the area shall be cleaned of all loose and unsound material, tacked, and filled with binder (hand method).”

Revise Article 406.05(c) to read.

“ (c) Binder (Hand Method). Binder placed other than with a finishing machine will be designated as binder (hand method) and shall be compacted with a roller to the satisfaction of the Engineer. Hand tamping will be permitted when approved by the Engineer.”

Revise the special conditions for mixture IL-4.75 in Article 406.06(b)(2)e. to read:

“ e. The mixture shall be overlaid within 5 days of being placed.”

Revise Article 406.06(d) to read:

“ (d) Lift Thickness. The minimum compacted lift thickness for HMA binder and surface courses shall be as follows.

|  |  |
| --- | --- |
| MINIMUM COMPACTED LIFT THICKNESS | |
| Mixture Composition | Thickness, in. (mm) |
| IL-4.75 | 3/4 (19) - over HMA surfaces 1/  1 (25) - over PCC surfaces 1/ |
| IL-9.5FG | 1 1/4 (32) |
| IL-9.5, IL-9.5L | 1 1/2 (38) |
| SMA 9.5 | 1 1/2 (38) |
| SMA 12.5 | 2 (51) |
| IL-19.0, IL-19.0L | 2 1/4 (57) |

1/ The maximum compacted lift thickness for mixture IL-4.75 shall be 1 1/4 in. (32 mm).”

Revise Table 1 and Note 3/ of Table 1 in Article 406.07(a) of the Standard Specifications to read:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| “TABLE 1 - MINIMUM ROLLER REQUIREMENTS FOR HMA | | | | |
|  | Breakdown Roller (one of the following) | Intermediate Roller | Final Roller (one or more of  the following) | Density Requirement |
| Binder and Surface 1/ | VD, P 3/, TB, 3W, OT, OB | P 3/, OT, OB | VS, TB, TF, OT | As specified in Articles:  1030.05(d)(3), (d)(4), and (d)(7). |
| IL-4.75 and SMA 4/ 5/ | TB, 3W, OT | - - | TF, 3W, OT |  |
| Bridge Decks 2/ | TB | - - | TF | As specified in Articles 582.05 and 582.06. |

3/ A vibratory roller (VD) or oscillatory roller (OT or OB) may be used in lieu of the pneumatic-tired roller on mixtures containing polymer modified asphalt binder.”

Add the following to EQUIPMENT DEFINITION in Article 406.07(a) contained in the Errata of the Supplemental Specifications:

“ OT - Oscillatory roller, tangential impact mode. Maximum speed is 3.0 mph (4.8 km/h) or 264 ft/min (80 m/min).

OB - Oscillatory roller, tangential and vertical impact mode, operated at a speed to produce not less than 10 vertical impacts/ft (30 impacts/m).”

Basis of Payment. Replace the second through the fifth paragraphs of Article 406.14 with the following:

“ HMA binder and surface courses will be paid for at the contract unit price per ton (metric ton) for MIXTURE FOR CRACKS, JOINTS, AND FLANGEWAYS; HOT-MIX ASPHALT BINDER COURSE (HAND METHOD), of the Ndesign specified; HOT-MIX ASPHALT BINDER COURSE, of the mixture composition and Ndesign specified; HOT-MIX ASPHALT SURFACE COURSE, of the mixture composition, friction aggregate, and Ndesign specified; POLYMERIZED HOT-MIX ASPHALT BINDER COURSE (HAND METHOD), of the Ndesign specified; POLYMERIZED HOT-MIX ASPHALT BINDER COURSE, of the mixture composition and Ndesign specified; POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, of the mixture composition, friction aggregate, and Ndesign specified; POLYMERIZED HOT-MIX ASPHALT BINDER COURSE, STONE MATRIX ASPHALT, of the mixture composition and Ndesign specified; POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, STONE MATRIX ASPHALT, of the mixture composition, friction aggregate, and Ndesign specified.”

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