

## **ITEM 402.09710125 - F1 WATERPROOFING HMA, 70 SERIES COMPACTION**

### **1. DESCRIPTION:**

- 1.01 This work shall consist of developing a Waterproofing Hot Mix Asphalt (HMA) using the SUPERPAVE Mix Design procedure detailed in Materials Method 5.16, "SUPERPAVE Hot Mix Asphalt Mixture Design and Mixture Verification Procedures," in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. The Contractor shall be responsible for compacting the pavement to a specified density requirement.

### **2. MATERIALS:**

The materials and composition for Waterproofing HMA shall meet the requirements specified in §401-2 **Materials**, except as noted herein.

- 2.01 Produce Waterproofing HMA in accordance with the procedures outlined in this specification and Material Method 5.16, Superpave Hot Mix Asphalt Mixture Design and Mixture Verification Procedures, except as modified below:
- A. Formulate and submit to the Engineer a Waterproofing HMA design, which satisfies design criteria outlined in this specification. The provisions of §401-2.05, Reclaimed Asphalt Pavement, shall not apply. The minimum Total Binder content (virgin PG Binder and Thermoplastic Polymer combined) shall not be less than 6.5%. The minimum virgin PG Binder content shall not be less than 5%. The minimum Thermoplastic Polymer shall be 1.5% by weight of the total mixture. Mixture design criteria requirements,  $N_{\text{initial}}$  and  $N_{\text{max}}$  shall not apply.

**TABLE 1 – Waterproofing HMA Design Gradations**

Standard Sieves (inches)	Percent Passing Criteria	
	Maximum	Minimum
1/2"		100
3/8	100	80
#4	76	50
#8	54	37
#16	40	26
#30	29	17
#50	21	10
#100	16	5
#200	8	2

**TABLE 2 – Waterproofing HMA Volumetric Design Criteria**

% Air Voids at $N_{\text{design}}$	% Voids in the Mineral Aggregate, minimum
≤ 1.5	15.5

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## 2.01 (cont'd)

**TABLE 3 – Waterproofing HMA Design Number of Gyration**

Compactive Effort	N <sub>design</sub>
Number of Gyration*	50

\* - Aggregate Consensus Properties must still meet the requirements based on project ESAL level as outlined in Materials Method 5.16. The project ESAL level will be specified in the Contract Documents.

**TABLE 4 – Waterproofing HMA Production Gradation Tolerances**

Sieve Size (inches)	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
Tolerance	---	±6	±6	±5	±4	±4	±3	±2	±1.5

**TABLE 5 – Waterproofing HMA Additional Mixture Design Criteria**

Permeability (ASTM D5084) 4.0% ± 1.0% Air Voids	10 <sup>-7</sup> m/s minimum
Flexural Beam Fatigue (AASHTO T321) @ 750 microstrains, 10 Hz. 4.0% ± 1.0% Air Voids	250,000 cycles minimum (average of two samples)

2.02 **Coarse Aggregate Type F1 Conditions:**

1. Limestone, dolomite, or a blend of the two having an acid insoluble residue content of not less than 20.0%.
2. Sandstone, granite, chert, traprock, ore tailings, slag, or other similar noncarbonated materials.
3. Use gravel or blend two or more of: gravel, limestone, dolomite, sandstone, granite, chert, traprock, ore tailings, or other similar materials to produce a final blend of which the noncarbonated plus 1/8" particles must comprise at least 30.0% of the total aggregate. In addition, at least 95.0% of the plus No. 4 particles must be noncarbonated.

2.03 **Coarse Aggregate Type F2 Conditions:**

1. Limestone, dolomite, or a blend of the two having an acid insoluble residue content of not less than 20.0%.
2. Sandstone, granite, chert, traprock, ore tailings, slag, or other similar noncarbonated materials.
3. Use gravel or blend two or more of: gravel, limestone, dolomite, sandstone, granite, chert, traprock, ore tailings, or other similar materials to produce a final blend of which the non-carbonate plus 1/8" particles must comprise at least 10.0% of the total aggregate. In addition, at least 20.0% of the plus No. 4 particles must be noncarbonated.

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### **2. MATERIALS:** (cont'd)

#### **2.04 Coarse Aggregate Type F3 Conditions:**

1. Limestone or a blend of limestone and dolomite having an acid insoluble residue content of not less than 20.0%.
2. Dolomite.
3. Sandstone, granite, chert, traprock, ore tailings, slag, or other similar noncarbonated materials.
4. Use gravel or blend two or more of: gravel, limestone, dolomite, sandstone, granite, chert, traprock, ore tailings, or other similar materials to produce a final blend of which the noncarbonated plus  $\frac{1}{8}$ " particles must comprise at least 10.0% of the total aggregate. In addition, at least 20.0% of the plus No. 4 particles must be noncarbonated.

#### **2.05 PG Binder:** Provide a Performance – Graded Binder (PG Binder) as follows:

- A. Begin with a neat PG 64-22. Add 1.5 percent of a concentrated, thermoplastic, virgin polymeric material by weight of the total mixture. Ensure that the modified binder conforms to AASHTO M320 with a high temperature of 82°F or higher and a low temperature of -28°F or lower. In addition, ensure that the binder conforms to Table 6, Additional PG Binder Criteria.

**TABLE 6 – Additional PG Binder Criteria**

Elastic Recovery at 50°F (ASTM D6084)	92% (min)
Toughness (ASTM D5801)	210 in-lb
Tenacity (ASTM D5801)	140 in-lb

- 2.06 Edge Sealant:** Provide a material for edge sealant as recommended by the producer of the thermoplastic polymer modifier utilized in the Waterproofing HMA. Ensure the material is a highly thixotropic edge sealant that dries to a soft consistency and will not dry out, crack, or split under vibration of slight movement of opposing surfaces.

- 2.07 Adhesive Tack Coat:** Provide a solvent-based, elastomeric primer adhesive tack coat as recommended by the producer of the thermoplastic polymer modifier utilized in the Waterproofing HMA.

### **3. CONSTRUCTION DETAILS:**

The provisions of **§401-3** and **§402-3, Construction Details**, shall apply except as modified below:

- 3.01 Quality Control:** Quality Control (QC) sampling and testing will be performed on any portion of the lot as determined by the Engineer. The sampling point(s) will be determined by the Engineer. Exclusion of the first and last 150 ton portion of the lot for testing shall not apply. A Quality Control Technician (QCT) shall be present during all production, regardless of the lot size.
- 3.02 Batch Plants:** After adding the concentrated thermoplastic virgin polymeric material, dry-mix for approximately ten seconds. Next, add the asphalt binder, and wet-mix for 80 seconds to ensure a homogenous blend.
- 3.03 Drum Plants:** Parallel-flow drum plants shall not be allowed to produce Waterproofing HMA. All other drum plants must follow the Thermoplastic Polymer manufacturer's recommendations.

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### **3. CONSTRUCTION DETAILS:** (cont'd)

3.04 **Production Temperature:** The mixture shall be produced between 410°F and 450°F.

3.05 **Conditioning of Existing Surface:**

- A. **Application of Edge Sealant:** Apply edge sealant, at 4 to 6 inch wide and approximately 1/32" thick, before and after Waterproofing HMA application in accordance with the guidelines from the producer of the thermoplastic polymer modifier utilized in the Waterproofing HMA. Apply the sealant to all perimeter surfaces adjacent to the Waterproofing HMA, such as curbs, parapet walls, headers, drains, scuppers, and joints, in order to reduce moisture infiltration around the Waterproofing HMA. Also, apply edge sealant to all longitudinal and transverse joints in the Waterproofing HMA that have cooled below 150°F. When practical, apply the edge sealant the day before or as early as possible on the day of paving to maximize drying time.
- B. **Application of Adhesive Tack Coat:** Apply an adhesive tack coat to the existing pavement at a rate to achieve an undiluted residue of 0.10 gal/yd<sup>2</sup> to 0.15 gal/yd<sup>2</sup>. For milled surfaces, apply the tack coat at a rate to achieve an undiluted residue of 0.15 gal/yd<sup>2</sup>. For smaller projects as defined by the Engineer, cold-apply the tack coat by hand with a brush, roller, or hand-wand sprayer. Allow the adhesive tack coat to cure for a period of at least 40 minutes, or until the tack coat is dry, depending on local conditions.

3.06 **Weather and Seasonal Limitations:** The pavement surface temperature shall be a minimum of 50°F and rising at the time of Waterproofing HMA placement.

3.07 **Delivery and Compaction Temperature:** The mixture shall be delivered at a temperature between 350°F and 450°F. The pavement shall be compacted at a temperature between 250°F and 450°F.

3.08 **Rollers:** Use of Pneumatic rubber-tired rollers will not be allowed. All rollers shall be double-drum steel rollers operated in static mode. Due to the elevated temperature of the mat, utilize approximately twice the water for the rollers than that of standard paving. Because the rollers will require more frequent filling, provide an additional roller to replace the roller being filled with water. Also provide a small roller or vibratory plate to compact smaller areas such as headers, scuppers, expansion joints, etc. that cannot accommodate a full-size roller.

3.09 **Compaction:** The provisions of the "70 Series Compaction Method" shall apply except as modified below:

- A. **Project Target Density (PTD) Determination:** Prior to paving operations the PTD will be determined and submitted to the Engineer. The PTD will be determined by taking 96% of the Mixtures Maximum Theoretical Density and applying a correction factor for the density gauge(s) that will be used on the project. Only density gauge(s) calibrated for this project will be allowed to be used during routine paving operations. If another gauge density gauge is to be used, a new PTD must be established by the Engineer.
- B. **Density Gauge Testing Frequency.** The density gauge will be required to take density readings at the intervals outlined in Table 7 – Density Gauge Testing Frequency. No restricted testing areas will be applied to transverse or longitudinal joints.

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**3. CONSTRUCTION DETAILS:** (cont'd)

**3.09 Compaction:** (cont'd)

**TABLE 7 – Density Gauge Testing Frequency**

<b>Lane Feet of Paving, L</b>	<b>Frequency of Readings</b>
$L \leq 300$ feet	Every 100 feet
$L > 300$ feet	Every 200 feet

- C. **Density Requirements:** The pavement and longitudinal joints shall be compacted sufficiently to achieve a minimum density of 98% of the PTD at each test location as determined by the density gauge. If the average reading at two (2) consecutive test locations is below 98% of the PTD, stop routine paving and determine a new PTD as described earlier. Routine paving shall only resume once a new PTD has been established.

- 3.10 **Opening to Traffic:** Open lanes to traffic when the Waterproofing HMA pavement reaches 140°F or a minimum of one (1) hour after compaction is completed.

**4. METHOD OF MEASUREMENT:**

- 4.01 The provisions of §401-4 and §402-4, Method of Measure, shall apply including the following:

“The final Quality Adjustment Factor for plant production shall be 1.00.”

**5. BASIS OF PAYMENT:**

- 5.01 The provisions of §402-5, Basis of Payment, shall apply including the following:

“The unit bid price will also include all material and labor costs associated with the placement of Waterproofing HMA such as Edge Sealant, Adhesive Tack Coat, etc.