## ITEM P-609 CHIP SEAL COAT

DESCRIPTION

**609-1.1** This item shall consist of a chip seal coat as a wearing course composed of a single or multiple application of liquid asphalt material and aggregate cover placed on the prepared primed base or properly cured wearing surface, according to these Specifications, and shall conform to the dimensions and typical cross section shown on the Plans.

**609-1.2 QUANTITIES OF MATERIALS.** The approximate amounts of materials per square yard for the chip seal shall be as provided in Table 609-1 for the treatment specified on the Plans. The exact amounts shall be provided to the Engineer for review and approval.

TABLE 609-1. QUANTITIES OF MATERIALS

|  |  |  |  |
| --- | --- | --- | --- |
| **Application No** | **Aggregate lbs/yd2** | **Asphalt gal/yd2** | **Type of Asphalt \1\** |
| 1 | 40-50 | 0.35-0.45 | Asphalt Cement |
| 0.40-0.50 | Emulsified Asphalt |
| 2 | 20-25 | 0.15-0.25 | Asphalt Cement |
| 0.20-0.35 | Emulsified Asphalt |
| 3 | 15-20 | 0.15-0.20 | Emulsified Asphalt |

\1\ See Table 609-4 for grades of asphalt and spraying temperatures.

MATERIALS

**609-2.1 AGGREGATE MATERIALS.** The aggregate material shall be either crushed stone or crushed gravel. The cover material shall be screenings; sand may be used when specified.

If the material is to be crushed stone, it shall be manufactured from sound, hard, durable rock of accepted quality and crushed to specification size. All strata, streaks, and pockets of clay, dirt, sandstone, soft rock, or other unsuitable material accompanying the sound rock shall be discarded and not allowed to enter the crusher.

If the material is to be crushed gravel, it shall consist of hard, durable, fragments of stone or gravel of accepted quality and crushed to specification size. All strata, streaks, and pockets of sand, excessively fine gravel, clay, or other unsuitable material including all stones, rocks, and boulders of inferior quality shall be discarded and not allowed to enter the crusher. When tested according to ATM 305, the crushing of the gravel shall result in a product in which the material retained on the separate No. 4, 3/8-inch, and 1/2-inch sieves shall have at least 90% of particles with at least one fractured face.

TABLE 609-2. AGGREGATE MATERIAL REQUIREMENTS

| **Material Test** | **Requirement** | **Standard** |
| --- | --- | --- |
| L.A. Wear | Loss: 40% maximum | AASHTO T 96 |
| Soundness of Aggregates by Use of Sodium Sulfate | Loss after 5 cycles:  12% maximum using Sodium sulfate | AASHTO T 104 |
| Micro-Deval | 15% maximum | AASHTO T 327 |
| Percentage of Fractured Particles | Minimum 90% by weight of particles with at least one fractured faces1 | ATM 305 |
| Flat, Elongated, or Flat and Elongated Particles | 8% maximum, by weight, of flat, elongated, or flat and elongated particles at 3:1 | ATM 306 |

1 The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be achieved by crushing.

The crushed aggregate for the applications shall meet the requirements for gradation given in Table 609-3 when tested according to ATM 304.

TABLE 609-3. REQUIREMENTS FOR GRADATION OF AGGREGATE1

| Sieve Designation (square openings) | Percentage by Weight Passing Sieves | | |
| --- | --- | --- | --- |
| Aggregate No. 1 | Aggregate No. 2 | Aggregate No. 3 |
| 1 inch  3/4 inch  1/2 inch  3/8 inch  No. 4  No. 8  No. 16 | 100  90-100  20-55  0-15  0-5 | 100  85-100  10-30  0-10  0-5 | 100  60-85  0-25  0-5 |
| No. 200 | 0-1 | 0-1 | 0-2 |

1 Locally available aggregate used for chip seals with similar gradations may be used provided the maximum aggregate size is the same; and the aggregate meets all other quality requirements in these specifications.

The gradations in the table represent the limits which shall determine suitability of aggregate for use for the specified applications from the sources of supply. The final gradations decided on, within the limits designated in the table, shall be uniformly graded from coarse to fine.

The aggregate to be used shall show no evidence of stripping or swell when tested according to according to ATM 414. The use of antistrip agents for the control of stripping shall be used if necessary.

**609-2.2 ASPHALT MATERIAL.** The types, grades, controlling specifications, and application temperatures for the asphalt materials are shown in Table 609-4. Provide the specific liquid asphalt material designated in the Plans.

TABLE 609-4. ASPHALT MATERIALS

|  |  |  |
| --- | --- | --- |
| **Type and Grade** | **Specification** | **Spraying Temperature \1\Deg. F** |
| Asphalt Cement | | |
| PG 52-28 | AASHTO M 320 | 275+ |
|  |  |  |
| Emulsified Asphalt | | |
| RS-1 | AASHTO M 140 | 70-140 |
| RS-2 | AASHTO M 140 | 125-175 |
| MS-1, HFMS-1 | AASHTO M 140 | 70-160 |
| CRS-1 | AASHTO M 208 | 125-175 |
| CRS-2 | AASHTO M 208 | 125-175 |
| CRS-2P | AASHTO M 316 | 140-170 |

\1\ The maximum temperature for asphalt cements shall be below that at which fogging occurs.

The Contractor shall provide samples of the asphalt material and a copy of the manufacturer’s Certificate of Analysis (COA) for each carload or equivalent of the asphalt material to the Engineer for review and acceptance before the asphalt material is applied. If the asphalt emulsion is diluted at other than the manufacturer’s facility, the Contractor shall provide a supplemental COA from an independent laboratory verifying the asphalt emulsion properties. The furnishing of COA for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer’s COA may be subject to verification by testing the material delivered for use on the project.

**609-2.3 SAMPLING AND TESTING** Sampling and testing is the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor, subject to approval by the Engineer. Sampling shall be according to ATM 301 for aggregates and ATM 401 for asphalt material, unless otherwise directed. Perform aggregate gradation tests on each sample according to ATM 304. Perform all other aggregate tests on the initial source samples and repeat tests when there is a change of source. Perform sieve analyses daily from material samples. The tests shall include an analysis of each gradation of material. Submit copies of test results to the engineer, within 24 hours after completion of each test.

CONSTRUCTION METHODS

**609-3.1 WEATHER LIMITATIONS.** Asphalt material shall be applied only when the existing surface is dry and the atmospheric temperature is above 60°F. No material shall be applied when rain is imminent or when dust or sand is blowing.

**609-3.2 EQUIPMENT AND TOOLS.** The Contractor shall furnish all equipment, tools, and machines necessary for the performance of the work.

1. **Asphalt Distributor.** The distributor shall be designed, equipped, maintained, calibrated according to ASTM D2995, and operated so that asphalt material at even heat may be applied uniformly on variable widths of surface at the specified rate. The allowable variation from the specified rate shall not exceed 5%. Distributor equipment shall include a tachometer, pressure gages, volume-measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. The distributor shall be self-powered and shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically.
2. **Aggregate Spreader.** The aggregate spreader shall be a self-propelled mechanical spreader or truck-attached mechanical spreader capable of uniformly distributing aggregate at the specified rates.
3. **Power Rollers.** Power rollers shall be steel-wheeled or pneumatic-tired type, conforming to the following requirements:
   1. Steel-wheeled rollers shall have at least one steel drum and weigh a minimum of 5 tons. Steel wheels of the rollers shall be equipped with adjustable scrapers.
   2. Pneumatic-tired rollers shall be self-propelled and have wheels mounted on two axles in such manner that the rear tires will not follow in the tracks of the forward group. Tires shall be uniformly inflated to not less than 60 psi nor more than 80 psi pressure. The pneumatic-tired rollers shall be equipped with boxes or platforms for ballast loading and shall be loaded so that the tire print width of each wheel is not less than the clear distance between tire prints.
4. **Power Broom.** A power broom and/or blower shall be provided for removing loose material from the surface to be treated.

**609-3.3 PREPARING UNDERLYING COURSE.** The surface of the underlying course shall be prepared, shaped, and conditioned to a uniform grade and section, as shown on the Plans and as specified. Loose dirt and other objectionable material shall be removed from the surface.

On those type of bases where a prime coat is required and specified, the prime shall be applied and satisfactorily cured before starting the asphalt surface treatment.

When specified, the Contractor shall be required to patch, with premixed material, any holes or other malformations deviating from the true cross section and grade. The premixed material shall be made of the asphalt material specified and prepared by the method directed by the Engineer. All small patches shall be thoroughly hand tamped while the large patches shall be rolled with a power or pneumatic roller.

**609-3.4 CONTROL STRIP.** Prior to providing a complete chip seal coat and in the presence of the Engineer, treat three lengths of at least 100-feet for the full width of the distributor bar. Use the appropriate typical application rates shown in Table 609-1 for one surface treatment trial. Make other chip seal coat trials using various amounts of materials, as required by the Engineer.

**609-3.5 APPLICATION OF ASPHALT MATERIAL.** Asphalt material shall be applied on the properly prepared surface at the rate and temperature specified using a pressure distributor to obtain uniform distribution at all points. To ensure proper drainage, the strips shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope. During all applications, the surfaces of adjacent structures shall be protected in such manner as to prevent their being spattered or marred. Asphalt materials shall not be discharged into borrow pits or gutters or upon the airport area.

**609-3.6 APPLICATION OF AGGREGATE MATERIAL.** Immediately after the application of the asphalt material, or as directed by the Engineer, uniformly spread the aggregates over the asphalt material at the rate specified for each designated application. Trucks spreading aggregate shall be operated backward so that the asphalt material will be covered before the truck wheels pass over it. The aggregate shall be spread in the same width of application as the asphalt material and shall not be applied in such thickness as to cause blanketing. Back-spotting or sprinkling of additional aggregate material, and pouring additional asphalt material over areas that show up having insufficient cover or asphalt, shall be done by hand whenever necessary. Additional spreading of aggregate material shall be done with a motor-patrol grader equipped with broom moldboard, a broom drag, kick broom, or a power broom, as directed by the Engineer.

Immediately after spreading each application, the aggregate shall be rolled. The rolling shall be continued until no more aggregate can be worked into the surface. In the construction of the second and third application, blading with the wire-broom moldboard attachment, kick broom, or broom dragging shall begin as soon as possible after the rolling has started and after the surface has set sufficiently to prevent excessive marking. Further blading and rolling on the strip being placed and on adjacent strips previously placed, shall be done as often as necessary to keep the aggregate material uniformly distributed. These operations shall be continued until the surface is evenly covered and cured to the satisfaction of the Engineer.

Succeeding applications shall not be applied until the preceding application has set and in no case until at least 24 hours have elapsed. If dust, dirt, or other foreign matter accumulates on the surface between the applications, the Contractor shall sweep and clean the surface as specified herein. The asphalt material and the aggregate shall be spread upon the clean and properly cured surface and handled as required. Avoid brooming or tracking dirt or any foreign matter on any portion of the pavement surface under construction.

All surplus aggregate from the final application shall be swept off the surface and removed prior to final acceptance of the work.

**609-3.7 CORRECTION OF DEFECTS.** Any defects, such as raveling, low centers, lack of uniformity, or other imperfections, shall be corrected to the satisfaction of the Engineer.

All defective materials resulting from over-heating, improper handling, or improper application shall be removed by the contractor and replaced with approved materials according to these specifications.

**609-3.8 FREIGHT AND WAYBILLS.** Before the final estimate is allowed the Contractor shall file with the Engineer receipted bills where railroad shipments are made, and certified waybills when materials are received in any other manner, of the asphalt and covering materials actually used in the construction covered by the contract. The Contractor shall not remove asphalt material from the tank car or storage tank until the initial outage and temperature measurements have been taken by the Engineer, nor shall the car or tank be released until the final outage has been taken by the Engineer. Copies of all freight bills and waybills shall be furnished to the Engineer during the progress of the work.

METHOD OF MEASUREMENT

**609-4.1** The asphalt material will be measured by the ton. Water added to emulsified asphalt will not be measured for payment.

**609-4.2** The quantity of aggregate material for the first, second, and third application to be paid for will be the number of tons of aggregate used for the accepted work.

**609-4.3** Chip Seal Coat, [number of aggregate] Applications. Section 90, by square yard of chip seal coat. Chip seal coat will be measured by the square yard, all preparation, materials, and application, completed and accepted. Liquid asphalt material, aggregate, blotter material, water used for aggregate and preparation, sweeping and dust control are subsidiary to P-609 items. Any areas of asphalt surface treatment found unacceptable by the Engineer shall be removed and reconstructed at the Contractor’s expense. The pay unit/payment is for all layers/full depth of the surface treatment.

BASIS OF PAYMENT

**609-5.1** Payment will be made at the contract unit price per ton for asphalt material for surface treatment and per ton for the first, second, and third aggregate application, or by the square yard for the completed chip seal coat application, as shown in the Bid Schedule.

Payment will be made under:

Item P609.010.0000 Asphalt Material – per ton

Item P609.020.0000 First Application Aggregate – per ton

Item P609.030.0000 Second Application Aggregate – per ton

Item P609.040.0000 Third Application Aggregate – per ton

Item P609.050.0000 Chip Seal Coat, \_\_\_\_Applications – square yard.

REFERENCES

AASHTO M 140 Emulsified Asphalt

AASHTO M 208 Cationic Emulsified Asphalt

AASHTO M 320 Performance Graded Asphalt Binder

AASHTO T 96 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

AASHTO T 104 Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

AASHTO T 327 Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

ATM 301 Sampling of Aggregates

ATM 304 Sieve Analysis of Aggregates & Soils

ATM 305 Percentage of Fracture in Coarse Aggregate

ATM 306 Percentage of Flat and Elongated Particles in Coarse Aggregate

ATM 401 Sampling Asphalt Materials

ATM 414 Anti-Strip Requirements of Hot Mix Asphalt