

**BITUMINOUS CHIP SEAL.**  
**(REV 1-29-14)**

**BITUMINOUS CHIP SEAL**

**335-1 Description:** This work shall consist of furnishing all labor, equipment, material, supplies, notification signage, and other incidentals necessary to provide an application of polymer emulsified asphalt and cover coat aggregate to an existing roadway surface.

**335-2 Materials.**

**335-2.1 Asphalt Emulsion:** Provide a CRS-2 or CRS-2h, bituminous material for chip seal, as specified in FI/DOT 916-3.1.

**335-2.2 Cover Aggregate:** The chip seal cover aggregate shall be washed, hard, durable, clean rock and free from coatings or deleterious material. All of the aggregate shall be crushed gray granite with 100% fractured faces. The aggregate shall have maximum loss of 20% when tested with the LA Abrasion procedure as defined by AASHTO T96. The maximum amount of flat and elongated aggregate with a ratio of 3:1 shall not exceed 12% as determined by ASTM D4791. Only one source of aggregate shall be used for the mix design and shall conform to the following gradations:

Table 1 Cover Aggregate Gradation (percent passing)			
Sieve Size	1/2 inch Chip	3/8 inch Chip	1/4 inch Chip
3/4"	100	100	100
1/2"	95-100	100	100
3/8"	0-60	95-100	100
1/4"	0-10	0-35	95-100
No. 4	N/A	N/A	N/A
No. 8	0-3	0-3	0
No 200	0-1.0	0-1.0	0-1.0

**335-3 Equipment.**

**331-3.1 Asphalt Distributor:** The distributor shall be self-powered and capable of providing a uniform application rate of emulsion varying from .05-1.00 gallon per square yard over a variable width up to the maximum width as required by the Engineer in a single pass. Distributor shall be self-powered and include a computerized application controls, a tachometer, pressure gauges, accurate volume devices, calibrated tank, and a thermometer for measuring temperatures of the emulsion in the tank.

The distributor shall be equipped with ground speed control and a variable power unit for the pump and full circulation spray bars, which are adjustable laterally and vertically. Prior to construction, the nozzle angle shall be adjusted uniformly to 15 - 30 degrees at an angle to the axis of the spray bar, and the spray bar height shall be set to provide one hundred percent of triple coverage in a single pass. Where multiple lane passes will be required to complete the road width, overlapping passes must be four inches with fifty percent coverage so that the next

pass will complete the full application rate specified. The longitudinal joints shall coincide with existing painted lane lines.

**335-3.2 Aggregate Spreader:** The aggregate spreader shall be self-propelled and supported by at least four tires on two axles capable of providing a uniform application rate of aggregate from five to fifty pounds per square yard over a variable width up the maximum width as required by the Engineer. The uniformity of this machine shall not vary by more than one pound per square yard. The aggregate spreader shall be equipped with the means of applying the cover aggregate to the surface with computerized application rate control so that the required amount of material will be deposited uniformly over the full width of the asphalt emulsion.

**335-3.3 Rollers:** Three self-propelled pneumatic tired rollers shall be used on the project. Pneumatic rollers are capable of ballast loading, either with water or sand, which allows the weight of the machine to be varied "from 10 to 16 tons" or "not more than 20 tons" to achieve the specified contact pressure which typically runs around 80 pounds per square inch. Tire pressure shall be specified by the manufacturer for the pneumatic tire rollers and shall not vary more than plus or minus 5.0 psi. Depending on the speed of the Chip Seal operation and the width of coverage, additional rollers may be required. At no time shall the rollers travel more than 5 miles per hour.

**335-3.4 Sweepers:** Provide motorized brooms with a positive means of controlling vertical pressure and capable of cleaning the road surface prior to spraying bituminous material and removing loose aggregate after bituminous seal coating.

#### **335-4 Installation.**

**335-4.1 Preparation and Placement:** The Chip Seal shall not be applied when the pavement is moist, or when the weather is or may be detrimental. Detrimental weather is defined as rain showers, cool temperatures, moist pavements, threat of rain showers, or other environmental factors which could affect the performance of the Chip Seal construction. No Chip Seal shall be applied if either the pavement or air temperature is below 60°F and falling.

The Contractor shall be responsible for all measures required providing a thoroughly clean and dry pavement surface including vegetation removal and sweeping prior to the Chip Seal application. The Contractor shall remove and dispose of all raised pavement markings prior to beginning application.

Manholes, valve boxes and thermo markings (as directed by the Engineer) shall be covered with an approved material during the operation and shall be removed immediately after the street has been Chip Sealed. The Contractor is responsible for locating all exposed manholes, valve boxes and thermo markings prior to Chip Sealing.

Application of Asphalt Emulsion shall be performed by means of a pressure distributor in a manner to achieve a uniform and continuous spread over the asphalt surface. The temperature of the emulsion shall be applied within the range of 140-180°F. At no time shall the emulsion be heated above 185° in the distributor. Prior to construction, calibrate the distributor in accordance with ASTM D2995-99 in the presence of the Engineer. The distributor shall be moving forward at the proper application speed at the time the spray bar is opened. If at any time a nozzle becomes clogged or not spraying a proper pattern, the operation shall be immediately halted until repairs are made. Repairs shall be made immediately after deficiencies are noted and prior to the aggregate placement at all times during construction. The width of the emulsion application shall be no greater than the width of the aggregate spreader except where additional passes are required then the emulsion shall be four inches beyond the aggregate spread at a fifty percent application rate. At no time shall the emulsion be allowed to break, chill, setup, harden,

or otherwise impair the aggregate retention before the aggregate has been properly applied and rolled.

**335-4.2 Application of Cover Coat Aggregate:** The aggregate shall be applied within one minute following the emulsion application by the approved aggregate spreader. Prior to construction, calibrate the aggregate spreader in accordance with ASTM D5624-02, in the presence of the Engineer. The allowable deviation in the amount of aggregate spread on each of the rubber mats shall not exceed plus or minus 1 pound per square yard in the transverse direction, or plus or minus 1 pound per square yard in the longitudinal direction, from the design application rate. Spreading shall be accomplished in such a manner that the tires of the trucks and aggregate spreader never contact the newly applied asphalt emulsion. The width of the aggregate spreader shall be equal to the width of the emulsion spread, except where additional passes are required. Areas, which are deficient in aggregate, shall be covered immediately with additional material. Previously used (sweeping) aggregates will not be allowed.

**335-4.3 Mix Design:** The contractor shall provide a mix design to the engineer at the Pre-Construction meeting to be approved prior to beginning work. The McLeod design method shall be utilized in determining application rates. The following application rates are suggested initial values for the mix design:

Material	Asphalt Emulsion	Cover Coat Aggregate
1/2 Chip Seal	0.36 – 0.46 gal/sy	22 lbs/sy
3/8 Chip Seal	0.34 – 0.40 gal/sy	20 lbs/sy
1/4 Chip Seal	0.28 – 0.34 gal/sy	18 lbs/sy

**335-4.4 Mix Design Test Strip:** Begin the rate of application for the bituminous material as determined by the approved bituminous seal coat design. Construct a short test strip 100 feet long to ensure the bituminous material application rate is adequate. After applying the bituminous material to this test strip, place the cover aggregate at the design application rate. Inspect the aggregate after rolling for proper embedment. Make adjustments to the rate of application, if necessary. Construct one full lane width at a time. Make additional adjustments to the rate of application during the Project, if needed.

**335-4.5 Rolling:** Initial chip seal rolling shall begin one minute after the application of cover coat aggregate. Rollers shall work in tandem and complete a minimum of three passes with a sufficient overlap. Should the rolling operation be delayed, the aggregate and emulsion spreading shall be halted until the operation regains proper sequencing and timing. The maximum speed of the rolling operations shall be 5 miles per hour.

**335-4.6 Sweeping:** Excess aggregate shall be swept from the roadway and adjacent areas. Sweep off the surplus aggregate on the same day of the chip seal construction. Exercise care to not disturb aggregate that has set. Re-sweep areas the day after the initial sweeping. The Contractor will dispose of the surplus cover aggregate in a manner satisfactory to the Engineer.

**335-5 Quality Control.**

**335-5.1 General:** The Contractor is responsible for quality control (QC) sampling and testing.

**335-5.2 Chip Seal Aggregate:**

**331.5.2.1: Stockpile Production:** Provide material gradation and quality test results taken during production. The testing rate for gradation is a minimum of one per day, or one per 1500 tons, whichever is greater. The testing rate for quality values in Table 1 is once per source.

**335-5.2.2 Construction:** Sample the cover aggregate once each production day. The aggregate sample will be taken from the chip spreader.

**335-5.3 Chip Seal Asphalt Emulsion:** Only asphalt emulsion from Certified Sources is allowed for use. Verify the application rate of the asphalt emulsion by dividing the volume of material used by the area of chip sealing for that day. Provide material certification and quality control test results for each batch of asphalt emulsion used on the Project. Include the supplier name, plant location, emulsion grade, and batch number on all reports.

**335-6 Quality Assurance.**

**335-6.1 General:** The Agency is responsible for quality assurance (QA) sampling and testing. Samples cannot be from split samples and must be taken randomly by the Engineer.

**335-6.1 Cover Aggregate:**

**335-6.1.1 Stock Pile Production:** Test for gradation-the testing rate is a minimum of one per day, or one per 1500 tons, whichever is greater. If the material is hauled from the production site to a temporary stockpile, test at the temporary stockpile.

**335-6.1.2 Construction:** Sample the cover aggregate once each production day. The aggregate sample will be taken from the chip spreader. Samples will be stored and tested for gradation, at the Engineer’s discretion. If the results vary from the requirements of Table 1, the contractor will remove and replace the defective material placed as directed by the engineer to meet specifications.

**335-6.2 Asphalt Emulsion:** Sample the first daily shipment. Also, provide one sample for every 50,000 gallons (approximately 200 ton).

**335-7 Basis of Payment.**

Payment for the chip seal at the Contract bid unit prices of measure is compensation in full for all costs of furnishing and applying the material as specified, including cleaning the existing pavement, stationing, purchase of aggregate, delivery of aggregate, all labor, equipment, and materials necessary for the placement of the chip seal, sweeping of any loose aggregate after construction and other requirements as specified. The cost of removing existing raised pavement markings and installation of temporary paint markings for traffic control shall be considered incidental to the work unless specified elsewhere in the plans or proposal.

Payment for the accepted quantity of asphalt emulsion for chip seal (including any required additives) at the Contract bid price of measure is compensation in full for all costs of furnishing and applying the material as specified.

Payment will be made in accordance with the schedule set forth below at the Contract bid price for the specified unit of measure. Such payment, in each instance, is compensation in full for all costs incidental thereto.

Payment will be made under:

- Item No. 335- Asphalt Emulsion for Chip Seal, per gallon
- Item No. 335- Aggregate Coverage for Chip Seal, square yards