

### Section 505. CHIP SEALS

**505.01. Description.** This work consists of preparing the pavement surface and providing and placing a single chip seal, double chip seal, or shoulder chip seal.

**505.02. Materials.** Provide materials in accordance with the following:

Coarse Aggregate, 34CS .....	<u>902</u>
Asphalt Emulsion, CSEA.....	<u>904</u>

The Department will waive the AWI requirement on shoulders.

### 505.03. Construction.

A. **Equipment.** Provide equipment, in accordance with section 107 and the following, capable of producing and placing a product meeting the requirements of this section.

1. **Pressure Distributor.** Provide a pressure distributor with a computerized application rate and speed control, capable of maintaining the asphalt emulsion at the temperature required by the contract. Ensure the control has a radar ground-sensing device that controls the application rate regardless of ground speed and spray bar width. Ensure the spray bar nozzles produce a uniform, triple-lap application fan spray, with instantaneous shutoff and no dripping. Ensure each pressure distributor can maintain the required application rate within  $\pm 0.015$  gallons per square yard for each load.
2. **Chip Spreader.** Provide a self-propelled chip spreader equipped with a computerized spread control, pneumatic tires, and a screen to remove oversized material.
3. **Compacting Equipment.** Provide at least three self-propelled pneumatic-tired rollers, each weighing at least 8 tons.
4. **Brooms.** Provide motorized brooming equipment, capable of cleaning the road surface before treatment and removing loose particles after treatment. Provide pick-up sweepers to clean road surfaces adjacent to lawns or roadways with curb and gutter.
5. **Pilot Car.** Provide a pilot car equipped with a sign that reads "Pilot Car — Follow Me" in accordance with MDOT Sign Standard G20-4. Mount the sign in a conspicuous position on the rear of the vehicle.
6. **Lights on Equipment.** Equip self-propelled equipment with at least one Department-approved, flashing, rotating, or oscillating amber light, visible in every direction. Equip chip spreaders with one light on each side of the spreader.

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**B. Pre-Production Meeting.** Before beginning work, conduct an on-site pre-production meeting with the Engineer to discuss the following:

1. Review of the work schedule;
2. Examination of the traffic control plan;
3. Review of equipment calibration and adjustments;
4. Inspection of conditions of materials and equipment, including transport units;
5. Submission of the mix design including JMF and a "Design for Intended Yield," containing the aggregate gradation, LA Abrasion Resistance, loose unit weight, and application rate of asphalt emulsion and aggregate;
6. Submission of test results for flat and elongated ratio. Collect samples from one of the following locations:
  - a. The shipping face of the stockpile at the production source, or
  - b. The job site stockpile;
7. Discussion of the Quality Control (QC) plan; and
8. Designation of the Contractor's authorized representative.

**C. Weather and Seasonal Limitations.**

1. **Weather Limitations.** Place the chip seal when pavement and ambient temperatures are at least 55 °F. Do not place chip seal if air temperatures are forecast below 40 °F within 24 hours of completing placement. Do not apply chip seals in foggy or rainy weather, or if the existing pavement temperature is equal to or greater than 130 °F.
2. **Single Chip Seals and Shoulder Chip Seals Seasonal Limitations.** Place single chip seals and shoulder chip seals in accordance with the following:
  - a. From June 1 to August 15, in the Upper Peninsula;
  - b. From May 15 to September 1, in the Lower Peninsula north of M-46; and
  - c. From May 15 to September 15, in the Lower Peninsula south of M-46.
3. **Double Chip Seal Seasonal Limitations.** Place double chip seals in accordance with the following:
  - a. From June 1 to August 1, in the Upper Peninsula;
  - b. From May 15 to August 1, in the Lower Peninsula north of M-46; and
  - c. From May 15 to August 1, in the Lower Peninsula south of M-46.

**D. Placement Operation.**

1. **Signing.** Post signs along the roadway reading, "Loose Gravel," FHWA (W8-7), and mount a 35 mph speed plaque below the sign. Place the signs at no greater than ½-mile intervals throughout the length of the project.
2. **Dust Control.** During normal traffic operations, wet broom, or lightly fog seal the roadway to control dust, as required by the Engineer. If dusty conditions continue, pre-coat the aggregate. Pre-coat the aggregate with 0.75 percent, by mass, residual asphalt.  
  
The Contractor may perform pre-coating in a weight-batch type, continuous mixing type, or drum-type hot mix plant, using PG 64-22 asphalt binder or CSS-1h emulsion.
3. **Loose Stone.** During normal traffic operations, damage to motorist' vehicles due to loose stone picked up off the surface is unsatisfactory. Broom or fog seal the roadway until the condition is eliminated.
4. **Bleeding or Tracking.** During normal traffic operations, bleeding or moderate tracking is unsatisfactory. Sand and sweep the roadway to eliminate bleeding or moderate tracking. If sanding and sweeping do not eliminate bleeding or moderate tracking, apply, roll, and broom a heated aggregate with the physical properties specified in Table 902-8.
5. **Preparing Pavement Surface.** Prepare the pavement surface to receive the chip seal. Clean pavements requiring treatment with a motorized power broom to remove loose material. Use a hand broom to clean cracks and other areas inaccessible by power broom. Use pick-up sweepers adjacent to lawns or roadways with curb and gutter.
6. **Protecting Utility Castings and Raised Pavement Markers.** Before beginning the chip seal operation, protect utility castings and raised pavement markers using tarpaper or other Department-approved materials. Remove the protective coverings before sweeping and opening to traffic.
7. **Equipment Operation.** Operate vehicles and equipment involved in the chip sealing as close together as possible. Spread the aggregate to cover the asphalt emulsion within 30 seconds of application. Do not allow the chip spreader to trail the emulsion distributor by more than 150 feet.

8. **Longitudinal Construction Joints.**

- a. **Longitudinal Construction Joints in Single Chip Seal.** Where corrugations are not present, construct longitudinal construction joints in single chip seal to coincide with painted lane lines or at the outside edge of the shoulder except where corrugations are present. Where corrugations are present, construct joints at the outside edge of the far side of the corrugation on the first pass.
  - b. **Longitudinal Construction Joints in Double Chip Seal.** Where corrugations are not present, construct longitudinal construction joints in the first course of a double chip seal to overlap the painted lane lines by 6 inches, and in the second course to coincide with the original painted lane line locations. Where corrugations are present construct joints at the outside edge of the far side of the corrugation on the first pass. Construct joints at the outside edge of the opposite side of the corrugation for the second application.
  - c. **Longitudinal Construction Joints in Shoulder Chip Seal.** Construct the longitudinal construction joint in shoulder chip seal at the edge of the driving lane or at a location requiring a minimal overlap without extending onto the driving lane.
9. **Rolling.** Roll the aggregate after spreading. Allow no more than 2 minutes between the spreading of aggregate and completion of initial rolling. Use the rollers in a longitudinal direction at a speed no greater than 5 mph. Ensure each roller travels over the aggregate three times with the final pass in the direction of the chip spreader.
10. **Sweeping after Placement.** After chip seal placement, use the sweeping equipment specified in subsection 505.03.A.4 to perform an initial sweep of the construction traffic control zone before opening to traffic. Allow a minimum waiting period of 30 minutes between application of the chip seal and initial sweeping. Additional sweeping to remove loose stones after opening to traffic will be required as determined by the Engineer. The Contractor may use an arrow board, in bar mode, pulled behind a vehicle trailing the sweeping equipment. Conduct sweeping so loose aggregate does not migrate back onto the pavement. Use a pick-up sweeper to remove loose aggregate adjacent to lawns, curbs, or intersections.
11. **Cure Time and Repairs.** For double chip seals, wait at least 24 hours between completion of the first course and application of the second course.

Do not allow traffic on the new surface until it cures, to prevent pickup by vehicle tires. Repair traffic damage to the new chip seal surface at no additional cost to the Department.

Grind the surface and lightly apply a fog seal to eliminate bumps or poor riding surfaces caused by transverse or longitudinal construction joints from a chip seal application.

Readjust the spray bar and nozzles if longitudinal grooves or ridges in the surface cause an asymmetric appearance.

**E. Application Rates.** Apply the asphalt emulsion followed by a uniform application of coarse aggregate.

Notify the Engineer immediately if the coarse aggregate gradation, or existing pavement surface conditions, necessitate an adjustment to the JMF target rate. Document the new JMF rates by stationing.

1. **Asphalt Emulsion.** Apply asphalt emulsion from 0.39 gallons per square yard to 0.46 gallons per square yard. Apply the asphalt emulsion at a temperature from 170 °F to 190 °F.
2. **Coarse Aggregate.** Apply coarse aggregate from 20 pounds per square yard to 24 pounds per square yard.

**F. Documentation.**

1. **Daily Report.** Submit a daily report to the Engineer with the following information:
  - a. Control section;
  - b. Project number;
  - c. County;
  - d. Route;
  - e. Engineer;
  - f. Date;
  - g. Detailed weather information;
  - h. Pavement temperature;
  - i. Asphalt emulsion application temperature;
  - j. Beginning and ending stations (placement and brooming);
  - k. Notification of mix design change;
  - l. Aggregate gradation and moisture content (at least one per day); and
  - m. Signature of the Contractor's authorized representative,
2. **Miscellaneous.** Document the following as required:
  - a. Load tickets for coarse aggregates and asphalt emulsion; and
  - b. Changes in the design for intended yield.

**G. Quality Control (QC).** If the Engineer identifies conditions that cause an unsatisfactory chip seal, immediately stop production and begin corrective action, at no additional cost to the Department. Maintain QC measures until the Engineer accepts the work.

1. **Quality Control Plan.** Provide and follow a plan to maintain QC for production and construction processes, as required. Provide the Engineer a copy of the QC plan for review and approval, prior to the pre-production meeting.

Establish and maintain an effective QC plan. Ensure the QC plan, details procedures, and organization to produce the required single, double, and shoulder chip seal operations. Comply with the Engineer-approved QC plan for the duration of the project and allow the Engineer access to in-progress work for Assurance review and testing.

Ensure the QC plan addresses at least the following:

- a. Materials;
  - b. Sampling and testing methods to determine compliance with material specifications;
  - c. Equipment;
  - d. Calibration method to determine compliance with the application rates;
  - e. Procedures for pavement cleaning and preparation;
  - f. Controls implemented to ensure the chip seal material cures or sets up before opening to traffic;
  - g. Proposed procedure for monitoring initial acceptance requirements;
  - h. Dust control;
  - i. Bleeding;
  - j. Rough joints;
  - k. Surface patterns;
  - l. Procedures to ensure that both the initial and final sweeping are completed in a manner that prevents damage to vehicles; and
  - m. An action plan, demonstrating how the chip seal operation will be adjusted for adverse environmental conditions.
2. **QC Sampling and Testing.** Perform the following minimum QC tests during chip seal placement.
    - a. **Coarse Aggregate.** Determine the actual application rate by placing a tarp over 1 square yard of pavement, applying coarse aggregate to the pavement in a production run, retrieving the

aggregate placed on the tarp, and weighing the coarse aggregate. Place coarse aggregate within.

Collect one sample from the project aggregate stockpile each day of production, and perform a sieve analysis. Ensure sieve analysis results meet the requirements of Table 902-7 and fall within the quality control tolerances of Table 505-1 to substantiate the design for intended yield.

Table 505-1 Chip Seal Quality Control Tolerances	
Parameter	Tolerance
% in sieve	-5.0%
No. 4 sieve	+5.0%
Aggregate Application rate	±1 pound per square yard of the required JMF application rate
Emulsion Application Rate	±0.01 gallon per square yard of the JMF target rate

- b. **Emulsion.** Determine the actual application rate using a 1,000-foot yield check. Apply the asphalt emulsion within.

H. **Acceptance.**

1. **Field Inspection Acceptance.** Upon completion of work, schedule an inspection with the Engineer. The Engineer will note deficiencies, including areas exhibiting adhesion failure, cohesion failure, excessive stone, loss of stone, or other factors the Engineer identifies as unacceptable. Correct work the Engineer determines unacceptable.
2. **Delayed Acceptance.** At least 30 days after placing the single chip seal, double chip seal, or shoulder chip seal, the Engineer, with the Contractor, will inspect the project for surface flushing, surface patterns, or loss of stone. If the Engineer determines the work includes these deficiencies, correct the work within 7 working days of the review, or by an agreed upon date, as approved by the Engineer, and at no additional cost to the Department.

**505.04. Measurement and Payment.**

Pay Item	Pay Unit
Seal, Single Chip .....	Square Yard
Seal, Double Chip.....	Square Yard
Seal, Shoulder Chip.....	Square Yard

- A. **Price Adjustment.** The Department will not make adjustments in the unit price for chip seal if the specified application rates for asphalt

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emulsion and coarse aggregate are within the ranges specified in subsection 505.03.E.

The Department may make an adjustment for an Engineer-approved revision to the application rates of asphalt emulsion and coarse aggregate, if the rates are outside of the specified ranges. The Department will limit the unit price adjustment to the material costs outside the specified ranges.

Provide unit prices for use in determining price adjustments for asphalt emulsion and coarse aggregate at the pre-construction meeting.

**B. Seal, Single Chip.** The unit price for **Seal, Single Chip** includes the cost of placing a single application of asphalt emulsion and coarse aggregate to a pavement and the accompanying shoulders, and material sampling and testing, surface preparation, brooming, and documentation.

**C. Seal, Double Chip.** The unit price for **Seal, Double Chip** includes the cost of placing a double application of asphalt emulsion and coarse aggregate to a pavement and the accompanying shoulders, and material sampling and testing, surface preparation, brooming, and documentation.

**D. Seal, Shoulder Chip.** The unit price for **Seal, Shoulder Chip** includes the cost of placing a single application of asphalt emulsion and coarse aggregate to shoulders and material sampling and testing, surface preparation, brooming, and documentation.