Section 506. SLURRY SEAL

506.01 Description. This work consists of surface preparation and application of a properly proportioned slurry seal mixture.

506.02 Materials. Slurry seal mixture shall consist of a blend of asphalt emulsion, fine aggregate, Portland cement, water and other additives. The materials shall meet the following requirements.

Type I Portland Cement 901
Fine Aggregates, 2FA 902
Asphalt Emulsions, CSS-1h* 904
Water 911

* The cement mixing test is waived.

A. **Mix Design Requirements.** At least 10 working days prior to start of production the Contractor shall submit to the Engineer a complete mix design prepared and certified by an MDOT approved laboratory. Additives may be included in the mix to provide additional control of the quick set properties and to increase adhesion. Any additive used must be included as part of the mix design. A change in aggregate or asphalt emulsion source will require a new mix design.

The compatibility and proportions of the fine aggregate, asphalt emulsion, portland cement, and additives shall be verified by the mix design. From this mix design, a job mix formula (JMF) shall be developed by the laboratory showing the individual proportions of each of the materials that, when combined, will meet the ASTM D 3910 specifications for consistency, set time, cure time, and wet track abrasion. The JMF shall be within the following limits.

Asphalt binder content (residual): 9.0 - 11.0 percent of dry weight of aggregate, 2FA.

Cement: 0.5 - 3.0% of dry weight of aggregate, 2FA.

1. **Mix Design Format.** The final mix design shall contain the following information.

   a. Source of each individual material. (Name and pit no.)

   b. Aggregate.
      - Gradation
      - Sand equivalence
      - Angularity index (A.I.)

   c. ASTM D 3910 tests.
      - Consistency test
      - Set time
      - Cure time
      - Wet track abrasion

d. Interpretation of results and determination of a job mix formula (JMF).

- Cement (minimum and maximum), percent
- Water, including aggregate moisture (minimum and maximum), percent
- Additive (if required), percent
- Emulsion, percent
- Residual content of emulsion
- Residual, percent

e. Mix designer's signature and date.

B. **Quality Control.** The Contractor shall produce a mixture that will be in compliance with the JMF and the quality control tolerances shown in Table 506-1. If the Contractor's test results exceed any quality control tolerance, then the Engineer shall be notified immediately and mixture production shall stop. The Contractor shall identify the cause of the excessive deviation and determine the corrective action necessary to bring the mixture into compliance. The Engineer must give approval prior to the resumption of work.

The following are minimum measures to be taken by the Contractor to verify and document quality control.

1. **Fine Aggregate.** Randomly sample from the mixer and test for gradation at a rate of one test per 500 tons of aggregate used. A minimum of one test per day of mixture production must be conducted.

Table 506-1: Slurry Seal Quality Control Tolerances

Aggregate Gradation Tolerances							
Sieve Size	# 4	# 8	# 16	# 30	# 50	# 100	# 200
Tolerance	± 5.0%	± 5.0%	± 5.0%	± 5.0%	± 4.0%	± 3.0%	± 2.0%

General Quality Control Tolerances	
Paramater	**Tolerance**
Asphalt Cement Content Single Test	± 0.5 % from JMF
Asphalt Cement Content Daily Average	± 0.2 % from JMF

2. **Asphalt Content.** At least three times per day, on a random basis, calculate the percent asphalt content of the mixture using the equipment counter readings.

3. **Documentation.** The Contractor shall provide a daily report to the Engineer, within one working day, with the following information:

a. Control section, project number, county, route, project/resident engineer

b. Date, air temperature

c. Control settings, calibration values

d. Unit weight of emulsion (lbs/gal), percent residue in emulsion

e. Beginning and ending stations

f. Counter readings (beginning, ending, and total)

g. Length, width, area (syds), pounds of aggregates placed, gallons of emulsion placed

h. Percent of each material, percent of asphalt cement, application rate

i. JMF (percent Portland cement, percent emulsion, gradation, percent AC)

j. Contractor's authorized signature

k. Calibration forms

l. Aggregate gradations

m. Aggregate certification or Shipment of Tested Stock Report (Form 1922)

n. Asphalt emulsion bill of lading and Shipment of Tested Stock Report (Form 1922)

NOTE: If truck mounted machines are used, a separate daily report is required for each machine.

506.03 Construction.

A. **Equipment.** Equipment shall be safe, environmentally acceptable and capable of producing a specification product.

1. **Slurry Seal Mixer.** The slurry seal mixing machine shall be a continuous-flow mixing unit with automated controls capable of delivering predetermined proportions of aggregate, water and asphalt emulsion to the mixing chamber and of discharging the thoroughly mixed product on a continuous basis. No violent mixing will be permitted. Each mixing machine shall be equipped as follows.

a. Easy to read metering devices that accurately measure all raw material prior to entering the pugmill.

b. System to pre-wet the aggregate in the pugmill immediately before it is mixed with the emulsion.

c. A fines feeder with a metering device, or other approved means, located so the proper amount of mineral filler is dropped onto the aggregate before entering the

mixing machine. The fines feeder shall be used whenever mineral filler is a part of the aggregate blend.

d. A water pressure system and a fog-type spray bar to completely fog the surface immediately ahead of the spreading equipment. Water fog application rate shall be 0.03 to 0.06 gallons per square yard.

e. Capable of a minimum speed of 60 feet per minute. Speed shall not exceed 180 feet per minute while in operation.

f. Sufficient storage capacity to properly mix a minimum of 7 tons of slurry seal.

g. A method of measuring all materials used in each slurry seal batch. This method must be approved by, and made accessible to, the Engineer. The slurry seal mixer shall be checked weekly to assure it is in proper working condition. The Engineer may use the recorders and measuring facilities of the slurry seal unit to determine application rates, asphalt emulsion content, and mineral filler content of individual loads.

2. **Spreading Equipment.** A mechanical type single squeegee distributor shall be attached to the mixing machine. This distributor shall be equipped with flexible material in contact with the road surface to prevent loss of slurry and shall be adjustable to ensure a uniform application of slurry on varying grades and crowns. It shall be steerable and adjustable in width with a flexible strike-off.

   The spreader box shall not leave grooves in the applied slurry. It shall be kept clean, and build-up of material on the spreader will not be permitted.

   The burlap or other textile drag will be approved by the Engineer. It shall be cleaned or changed as needed or as required by the Engineer. The drag shall be wetted at the beginning of each application.

3. **Calibration requirements.** Prior to construction, each slurry seal mixer shall be calibrated according to the *Asphalt Institute Manual Series No. 19, Second Edition*. The Contractor will provide documentation to the Engineer for the calibration of each material metering device at various settings. The Contractor shall supply all materials and equipment, including scales and containers necessary for calibration. After calibration of each mixing machine, the Contractor will demonstrate the machine's ability to mix all components together so as to simulate an end product. A change in aggregate or asphalt emulsion source will require recalibration.

4. **Miscellaneous Equipment.** Hand squeegees, shovels, and other equipment shall be used as necessary to perform the work. Cleaning equipment including, but not limited to, power brooms, air compressors, water flushing equipment, and hand brooms shall be adequate for surface preparation.

5. **Lights on Equipment.** Power brooms, distributors and truck mounted spreader/ mixers shall be equipped with at least one approved, flashing, rotating or oscillating amber light

that is visible in all directions. Continuous mixer/spreader units shall be equipped with one such light on each side of the machine.

B. **Pre-Paving Meeting.** A pre-paving meeting between the Contractor and Engineer will be held on-site prior to beginning work to discuss the following.

1. Contractor's detailed work schedule
2. Traffic control plan
3. Calibration of equipment
4. Mix design previously submitted to the Engineer
5. Equipment inspection, including transport units
6. Surface preparation and pre-treatment
7. Permit to Place (Form 1125)
8. Availability of materials

C. **Surface Preparation.** All loose materials, vegetation, dirt, mud and other objectionable materials shall be removed from the surface by the Contractor prior to placing the mixture. Animal remains shall be removed and the surface thoroughly washed prior to placing the mixture.

Prior to placement of slurry seal, all visible cracks should be pre-treated with overband crack fill according to section 505.

If a bond coat is required, it shall consist of one part CSS -1h emulsified asphalt and three parts water, applied at a rate of 0.05 gallons per square yard. The bond coat shall be allowed to cure before placement of mixture.

D. **Traffic Control.** Traffic shall not be allowed on the mixture until it has cured sufficiently to prevent pickup by vehicle tires. Any damage by traffic to the mixture shall be repaired by the Contractor at no expense to the Department.

E. **Weather Limitations.** The mixture shall be placed when the air and pavement temperatures are at least 45 °F and rising. Placement is not permitted if there is rain or threatening weather and temperatures are forecast to be below 32 °F within 24 hours of completion of work. Placement of mixture is not permitted before May 1 or after October 1 in the Lower Peninsula, or before June 1 or after September 15 in the Upper Peninsula.

F. **Delayed Acceptance.** A minimum of 30 days after completion of the slurry seal, the Engineer shall inspect the project with the Contractor for surface flushing and loss of material. If these deficiencies are found, corrective work is required. All corrective work shall be completed within seven working days of this review, or by an agreed upon date.

The Contractor shall furnish all materials, equipment and labor to make the identified corrections to the satisfaction of the Engineer at no additional cost to the Department.

506.04 Measurement and Payment.

Contract Item (Pay Item)	**Pay Unit**
Seal, Slurry	Square Yard

Seal, Slurry includes cleaning existing pavement surface, application of a bond coat if required, and the placement of mix. Traffic control is also included in this item of work.

Overband crack fill pre-treatment will be paid for separately according to section 505.04 when shown on the plans.