

## SECTION 02715

### SLURRY SEAL

#### PART 1 - DESCRIPTION

##### 1.01 General

Slurry Seal shall consist of a mixture of an approved modified asphalt, mineral aggregate, water, specified additives, proportioned, mixed and uniformly spread over a properly prepared surface as directed by the Engineer. The completed slurry seal shall leave a homogeneous mat, adhere firmly to the prepared surface and have a friction resistance surface texture through out its service life.

#### PART 2 - MATERIALS

##### 2.01 Materials

###### A. Emulsified Asphalt

Emulsified Asphalt shall be a Quick Set Mixing Grade as specified in AASHTO M140 or M208 depending on aggregate selected for the Job Mixture. Grade shall be determined from proposed mix design supplied by the Contractor. Each load of Emulsified Asphalt shall be accompanied by certification of compliance from the manufacturer for assurance that it is the same as used in the Mix Design.

<u>Quality</u>	<u>Reference</u>	<u>Limits</u>
Residue after Distillation	AASHTO T59, ASTM D244	60% min.
Test On Residue Penetration at 77°F (25°C)	AASHTO T49, ASTM 2397	40%-100%

###### B. Aggregate

1. Mineral Aggregate shall be 100% crushed rock. Aggregate shall be clean, hard, sound, durable, uniform in quality and free from any detrimental quality of soft, disintegrated material, organic material, oil, alkali or other deleterious substance. In order to insure that all material is crushed, 100% of the parent material shall be larger than the largest stone in the gradation used.

<u>Quality</u>	<u>Reference</u>	<u>Limits</u>
Sand Equivalent	AASHTO T176, ASTM D2419	45 min.
Soundness	AASHTO T104, ASTM C88	15% max. using Na <sub>2</sub> SO <sub>4</sub> or 25% max. using MgSO <sub>4</sub>
Abrasion Resistance	AASHTO T96, ASTM C131	35% max.

2. The abrasion test shall be run prior to crushing the aggregate. Aggregate shall meet approved polishing values.

C. Gradation

1. When tested in accordance with AASHTO T27 (ASTM C136) and AASHTO T11 (ASTM C117) the total aggregate blend including mineral filler shall be within the appropriate band.

	TYPE I	TYPE II	TYPE III	
Sieve Size	% Passing	% Passing	% Passing	Stockpile Tolerance
3/8" (9.5 mm)	100	100	100	-----
#4 (4.75 mm)	100	90-100	70-90	±5%
#8 (2.36 mm)	90-100	65-90	45-70	±5%
#16 (1.18 mm)	65-90	45-70	28-50	±5%
#30 (600 µm)	40-65	30-50	19-34	±5%
#50 (330 µm)	25-42	18-30	12-25	±4%
#100 (150 µm)	15-30	10-21	7-18	±3%
#200 (75 µm)	10-20	5-15	5-15	±2%

2. The target job mix gradation for the Mix Design shall fall within the appropriate band. Any variation in gradation shall be approved by the Engineer. Once the target job mix gradation has been submitted and approved as part of the Mix Design, aggregate used throughout the Project shall not vary more than the Stockpile tolerances for each sieve and shall remain within the gradation band.
3. Aggregate will be accepted at the job site or stockpile. Stockpiled aggregate shall be accepted on the basis of five (5) gradation tests performed according to AASHTO T2 (ASTM D75). Materials will be accepted if an average taken from all five (5) tests fall within the gradation tolerances. In the case where the averaged test results proves to be out of tolerance, the Contractor shall either remove the unacceptable material and replace it with acceptable material or blend other aggregate with the stockpiled material to bring it into gradation tolerances. New material to be used in blending shall meet all quality tests prior to blending. Blended aggregate shall produce a consistent mix. In either case, whether aggregate is replaced or blended, a new Mix Design shall be submitted.
4. Stockpiles shall be screened if problems in application occur due to oversize material in the mix.
5. Contractor shall be responsible for performing gradation tests and submitting the results to the Engineer for acceptance. Gradation testing shall be considered incidental to the project and no additional pay shall be granted for meeting this requirement.

D. Mineral Filler

1. Portland cement, hydrated lime, limestone dust, fly ash, or other approved filler meeting the requirements of ASTM D242 shall be used if required by the Mix Design. Mineral filler shall be considered as part of the dry aggregate.

E. Water

1. Water shall be free of harmful salts and contaminants.

F. Additives

1. Additives may be used to accelerate or retard the break-set of the slurry seal, or improve the resulting finished surface. The use of additives in the slurry mix or in individual materials shall be made initially in quantities predetermined by the Mix Design with field adjustments. Approval of any additive must be obtained from the Engineer prior to its use.

**2.02 Laboratory Evaluation By Contractor**

A. Mix Design

1. Prior to beginning work, the Contractor shall submit a Mix Design for approval by the Engineer. The Mix Design shall be the basis for the Job Mix Formula of the Slurry Seal to be used on the project. The Mix Design shall cover the materials to be used in the Slurry Seal used on the Project. The Mix Design shall be performed by a qualified laboratory who is experienced in designing Emulsified Asphalt Slurry Seal Surfacing. The submitted Mix Design shall be signed and certified by that laboratory. Once the project Mix Design has been approved by the Engineer, no substitutions shall be permitted unless approved by the Engineer.
2. Compatibility of aggregate, emulsion, mineral filler and other additives shall be verified by the Mix Design. All component materials used in the Mix Design shall be representative of those proposed by the Contractor for use on the project.
3. Testing

<b>Test</b>	<b>Reference</b>	<b>Specification</b>
Slurry Seal Consistency	ISSA T106	
Wet Cohesion – 30 min. (set)	ISSA TB-139 (quick traffic systems)	12 kg-cm min.
Wet Stripping	ISSA TB-114	Pass (90% min.)
Wet Track Abrasion Loss – one hour soak	ISSA TB-100	75 g/ft <sup>2</sup> (807 g/m <sup>2</sup> )
*Mix Time	ISSA TB-113	Controllable to 180 sec. min.

\* Mixing Test and Set Time Test shall be performed at the highest temperature expected during construction.

#### 4. Proportioning

Proportioning of the Mix Design shall be within the following limits:

RESIDUAL ASPHALT (based on the dry weight of the aggregate)	TYPE I: 10% - 16% TYPE II: 7.5% - 13.5% TYPE III: 6.5% - 12%
MINERAL FILLER (based on the dry weight of the aggregate)	0.5% - 2.0%
ADDITIVES	As needed
WATER	As needed to achieve proper mix consistency

#### 5. Mix Design Report

- a. Prior to construction, the Contractor shall submit to the Engineer for approval a laboratory report showing the Mix Design of Slurry Seal to be used on the Project. The laboratory report of the Mix Design shall contain the following:
  - i All testing results
  - ii Quantitative effects of moisture content on the unit weight of the aggregate.
  - iii Aggregate Composition and Gradation
  - iv Proportions (as percentages of the total mix):
    - v Aggregate
    - vi Mineral filler (min. and max.),
    - vii Water (min. and max.),
    - viii Additives (usage),
    - ix Asphalt Emulsion
  - x Recommended Application Rate for the aggregate selected, aggregate gradation and surface to which Slurry Seal is to be applied.

### **PART 3 - EXECUTION**

#### **3.01 Field Tolerances**

A. Tolerances for individual materials as well as the slurry seal mixture are as follows:

1. After the designed residual asphalt content is determined, a plus or minus one percentage point variation will be permitted.
2. The percentage of aggregate passing each sieve shall be within stockpile tolerance range as stated.

3. The percentage of aggregate passing shall not go from the high end to the low end of the specified range of any two successive sieves.
4. The slurry consistency shall not vary more than  $\pm 2$  inches ( $\pm 5$  cm) from the job mix formula after field adjustments.
5. The rate of application shall not vary more than  $\pm 2$  lb/yd<sup>2</sup> ( $\pm 0.91$ kg/m<sup>2</sup>) while remaining within the design application rate.

### **3.02 Equipment**

#### **A. General**

1. All equipment, tools and machines used in the performance of this work shall be maintained in satisfactory working order at all times in order to insure a high quality product.

#### **B. Mixing Equipment**

1. Machines used on the project shall be specifically designed and manufactured for the mixing and application of Slurry Seal. Machines shall be self propelled, either truck mounted or continuous in design, capable of accurately delivering and proportioning the aggregate, emulsified asphalt, mineral filler, control setting additive, and water to a revolving mixer and discharge the mixed product on a continuous flow basis.
2. The Machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral filler, control additive and water to maintain an adequate supply to the proportioning controls.

#### **C. Proportioning Devices**

1. Individual volume or weight controls for proportioning each material to be added to the mix shall be provided and properly marked.
2. Proportioning devices shall be equipped with revolutionary counters or similar device for each material to be added to the mix so that material output can be determined at any time.

#### **D. Spreading Equipment**

1. Spreading equipment shall be capable of uniformly spreading the Slurry Seal mixture. This shall be accomplished by means of a conventional surfacing spreader box attached to the mixer equipped to agitate and spread the mixture evenly throughout the box. A front seal shall be provided to insure no loss of the mixture at the road contact point. The rear seal shall act as a final strike-off and shall be adjustable.

2. The spreader box and rear strike-off shall be designed and operated in a manner that will insure that a uniform consistency is achieved to produce a free flow of material to the rear strike-off. The spreader box shall be capable of shifting to the side in order to compensate for variations in the pavement surface geometry.
3. The spreader box shall be kept clean and free of asphalt and aggregate build up. An approved drag or screed attached to the rear of the spreader box may be required by the Engineer in order to produce a uniform, textured mat. If a drag or screed is used, it shall be kept clean or replaced as necessary to insure that slurry mix accumulations do not cause scores or streaks in the new mat.

#### E. Auxiliary Equipment

1. Suitable surface preparation equipment, traffic control equipment, hand tools and any other support equipment shall be provided by the Contractor as necessary to perform the work.

### 3.03 Calibration

- A. Each mixing unit used in the performance of the work shall be calibrated in the presence of the Engineer or his representative. Previous calibration documentation covering the exact materials to be used on the project may be accepted, provided they were made during the same calendar year. Documentation shall include an individual calibration of each material at various settings, which can be related to the metering devices on the machine. No machine shall be used on the project until calibration has been completed and accepted.

#### B. Verification

1. At minimum, five (5) days prior to construction and after calibration, each machine to be used on the project shall install a test strip. All test strips shall be within the project area.
2. At the time test strips are being applied, samples of the slurry seal shall be taken by the Contractor's laboratory in order to verify mix consistency and proportioning. The rate of application shall also be verified.
3. In the event the test strip is not in compliance with project requirements due to the failure of any test, the Contractor shall make corrections and place another test strip at no additional cost to the Owner. Any unit failing to meet project requirements after three (3) trials shall not be permitted to operate on the project. Construction shall not commence until an acceptable test strip is placed.
4. The Owner reserves the right to obtain an outside testing firm to verify any and all testing results. Any outside testing shall be paid for by the Owner.

### 3.04 Weather Limitations

- A. Both pavement and air temperature shall be 45°F and rising prior to the application of Slurry Seal.
- B. Slurry Seal shall not be applied when there is a danger of freezing within 24 hours of application.
- C. Slurry Seal shall not be applied when weather conditions prolong opening traffic beyond a reasonable time (2-3 hours). The Contractor shall use his judgment when rain, freezing or any inclement weather is forecast.
- D. Any slurry seal damaged by inclement weather shall be repaired by the Contractor at his expense.

### **3.05 Surface Preparation**

#### **A. General**

- 1. Immediately prior to the application of Slurry Seal, the Contractor shall clean the surface of all loose material with the use of a power broom, oil spots with the use of a surface grinder, vegetation, and any other objectionable material. Any standard cleaning method that thoroughly cleans the surface will be acceptable. If water is used, cracks shall be allowed to dry thoroughly before the application of slurry seal. Dust produced by cleaning operations shall be controlled by sprinkling the surface with water as directed by the Engineer. Contractor shall notify Engineer 48 hours prior to slurry seal application for approval of roadway surface.
- 2. All manhole lids, catch basin grates, water and gas valve lids, survey monuments, and any other such street appurtenances shall be protected prior to the application of slurry seal. Protection shall allow the slurry seal application without adverse effect to the final finish.

#### **B. Application**

- 1. No slurry seal shall be applied until the engineer approves the cleanness of the roadway. No roadway shall be approved for slurry seal unless 48 hours of notice were provided to the City of Lakeland Engineering Department.
- 2. The surface to be slurry sealed shall be pre-wetted by fogging ahead of the spreader box. The rate of application of the fog spray shall be adjusted periodically to suit temperatures, surface texture, humidity, and dryness of the pavement.
- 3. The slurry seal mixture shall be the desired consistency upon leaving the mixer. A sufficient amount of material shall be carried in all parts of the spreader at all times to attain complete coverage. Overloading of the spreader shall be avoided.

4. Lumping, balling, or unmixed aggregate shall not be permitted.
5. Streaks left in the finished surface shall not be permitted. If excess oversize develops, construction shall be halted and the situation corrected by the Contractor. Work shall not resume until the Contractor satisfies the Engineer that corrections have been made. The Contractor shall screen the aggregate prior to using in the lay down operation as directed by the Engineer.

#### C. Joints

1. The Contractor shall provide a spreading machine of suitable width to produce a minimum number of longitudinal joints in the project area.
2. Joints showing excess buildup, uncovered areas, or unsightly appearance shall not be acceptable.
3. Whenever possible, longitudinal joints shall be placed on lane lines. Odd width passes and half passes shall be kept to a minimum.
4. Overlap of longitudinal joints shall not exceed six inches (6").

#### D. Mix Stability

1. Slurry Seal shall possess sufficient stability so that premature breaking of the material in the spreader box does not occur. The mixture shall be homogeneous during and following mixing and spreading.
2. The mixture shall be free from excess water and emulsion and free of segregation of the emulsion and aggregate fines from coarser aggregate. Spraying additional water into the spreader box shall not be permitted.

#### E. Hand Work

1. Areas that cannot be surfaced with the slurry seal machine shall be surfaced manually using hand squeegees to provide uniform coverage.
2. Areas requiring handwork shall be lightly dampened prior to the application of slurry seal mix and the mix worked immediately. All handwork shall be accomplished at the same time as the machine application.
3. Surfaces done by hand shall have the same finish as those applied by the spreader box. The Contractor shall take care not to leave unsightly handwork.

#### F. Lines



1. The Contractor shall insure straight lines along curbs and shoulders. Runoff in these areas shall not be acceptable. Lines at intersection shall be kept straight to provide good appearance.

G. Clean Up

1. All areas, such as concrete flatwork, manhole covers, water and gas valve covers, and any surface where slurry seal should not be applied, shall be removed as directed by the Engineer.
2. During cleaning operations, excess Slurry Seal shall not be allowed to run into any storm sewer system.
3. The Contractor shall clean up the project site and remove any debris associated with the project on a daily basis.

**END OF SECTION**