

SECTION 02505

EMULSIFIED ASPHALT SLURRY SEAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This is a material specification and application specification for emulsified asphalt slurry seal.

1.02 REFERENCES

- A. ASHTO T-27: Standard Method for Sieve Analysis of Fine and Coarse Aggregate.
- B. AASHTO T-2: Sampling Mineral Aggregates.
- C. AASHTO T-11: Materials Finer than No. 200 in Mineral Aggregate.
- D. AASHTO 176: Sand Equivalent Value of Soils and Fine Aggregate.
- E. AASHTO T-84: Specific Gravity and Absorption of Fine.
- F. AASHTO T-19: Unit Weight Aggregate.
- G. AASHTO T-96: Resistance to Abrasion of Small Size Coarse Aggregate by use of the Los Angeles Machine.
- H. AASHTO T-37: Sieve Analysis of Mineral Filler.
- I. AASHTO T-40: Sampling Bituminous Materials.
- J. AASHTO T-59: Testing Emulsified Asphalt.
- K. AASHTO M-140: Specification for Emulsified Asphalt.
- L. AASHTO T-49: Penetration 100 gm at 5 sec. 77°F(25°C).
- M. ASTM D242: Mineral Filler for Bituminous Paving Mixtures.

1.03 DEFINITIONS

- A. The slurry seal shall consist of a mixture of an approved emulsified asphalt, mineral aggregate, water and specified additives, proportioned, mixed and uniformly spread over a properly prepared surface. The completed slurry seal shall leave a homogeneous mat, adhere firmly to the prepared surface, and have a friction resistant surface texture throughout its service life.

1.04 SUBMITTALS

- A. Mix Design: Submit each proposed mix design 14 days prior to use in the Work.

PART 2 PRODUCTS

2.01 EMULSIFIED ASPHALT

- A. The emulsified asphalt shall conform to Grade CQS-1H as specified in AASHTO M140. The asphalt emulsion shall be CQS-1H. Each shipment of emulsified asphalt shall be accompanied by a certificate of analysis / compliance from the manufacturer.
- B. POLYMER MODIFIED EMULSION (Optional, if specified) The emulsified asphalt shall be CQS-1HL, CQS-1HP, QS-1HL, or QS-1HP. The polymer modifier shall be either a solid synthetic rubber or latex material. The polymer modifier shall be combined with the base asphalt or asphalt emulsion at a minimum rate of 3% solids by weight of asphalt prior to loading at the manufacturing plant. The polymer modified emulsion shall be compatible with the mix design developed for the conventional slurry seal.

2.02 AGGREGATES - MATERIALS

- A. The mineral aggregate shall be manufactured (100% crushed) stone such as granite, slag, limestone, chat, or other high quality aggregate that is free from dirt, organic matter, clay balls, adherent films of clay, dust, or other objectionable matter.
- B. The Contractor shall insure that all oversize aggregate and other objectionable matter are removed from the mineral aggregate utilized in the slurry seal mixture. Screening shall be required at the stockpile if there are problems created by oversize materials in the mixture.

2.03 AGGREGATES - GRADING BAND LIMITS

- A. Gradation Type II will be used unless otherwise specified.
- B. The following gradations describe the total percent passing by weight, AASHTO T-27, and is based on fine and coarse aggregate having approximately the same bulk specific gravities.

GRADING BAND LIMITS							
Sieve Size	DENSE MIXTURES					Stockpile Tolerance	
	Type I		Type II		Type III		
	Min	Max	Min	Max	Min	Max	
3/8"	100	-----	100	-----	100	-----	
# 4	100	-----	90	100	70		+ or - 5%
# 8	90	100	65	90	90		+ or - 5%
# 16	65	90	45	70	45	70	+ or - 5%
# 30	40	65	30	50	28	50	+ or - 5%
# 50	25	42	18	30	19	34	+ or - 4%
# 100	15	30	10	21	12	25	+ or - 3%
# 200	10	20	5	15	7	18	+ or - 2%
					5	15	

2.04 AGGREGATES - JOB-CONTROL GRADING BAND LIMITS

- A. The job mix gradation shall be within the gradation band for the desired type. After the target gradation has been submitted, then the percent passing each sieve shall not vary by more than the stockpile tolerance and still remain within the gradation band.

2.05 MINERAL FILLER

- A. Portland Cement, hydrated lime, limestone dust, flyash, Aluminum sulfate, or other approved filler meeting the requirements of ASTM D242 shall be used if required by the mix design. They shall be considered as part of the dry aggregate. The quantity and type of filler, if required, shall be determined by the job mix design. It shall be used for one or more of the following reasons only: to improve the gradation of the aggregate to provide improved stability and workability of the slurry, or the increase the durability of the cured slurry.

2.06 WATER

- A. Water for the slurry mixture shall be clear, potable, free from harmful soluble salts, and compatible with the slurry mixture. If the water is obtained from a source other than sanitary systems, such as a river, stream, or pond, a sample of the water must be tested and approved by the laboratory performing the mix design.

2.07 MIX DESIGN

- A. The mix design shall be made with the same aggregate gradation that the Contractor will provide on the project. Sources of all materials shall be selected prior to the time when the mix design is prepared and the materials are required to be used in the work. Slurry seal mixture shall not be placed until a mix design, submitted by the Contractor, has been approved by the Project Manager. The exact proportions of asphalt emulsion, aggregate, mineral filler, additives, and water to be used in the preparation of the slurry seal shall be determined by an approved testing laboratory experienced in slurry seal mix design procedures.

The approved slurry mix shall be a homogeneous mixture, sufficiently stable during the entire mixing/spreading period so that the emulsion does not break, there are no segregation of the fines from the coarse aggregate, and the liquid portion of the mix does not float to the surface. The amount and type of asphalt emulsion to be blended with aggregate shall be determined by the laboratory mix design. The set control additive shall be introduced into the slurry seal mixture by an approved method that will assure uniform distribution and proper control. The exact amount shall be determined by conditions in the field and indicated in the mix design. A minimum amount of water shall be used as necessary to obtain a workable and homogeneous mixture. The slurry seal mixture shall show no signs of uncoated aggregate or premature breaking of emulsion when applied to the pavement surface.

- B. The mix design and all slurry seal materials shall be approved by the City Engineer prior to use. The component materials shall be within the following limits:

1.	Residual Asphalt	Type I: 10% - 16%
		Type II: 7.5% - 13.5%
		Type III: 6.5% - 12%
		Based on dry weight of aggregate
2.	Mineral Filler	0.5% - 2.0%
		Based on dry weight of aggregate
3.	Additives	As needed
4.	Water	As needed to achieve proper mix consistency

2.06 ADDITIVES

- A. Additives may be used to accelerate or retard the break-set of the slurry seal, or improve the resulting finished surface. The quantity and type of set control additive, if required, shall be determined by the job mix design and conform to the applicable sections of ASTM D3910 and ISSA T102. The use of additives in the slurry mix shall be made initially in quantities predetermined by the mix design with field adjustments if required, after approval by the City Engineer.

PART 3 EXECUTION

3.01 EQUIPMENT - GENERAL

- A. All equipment, tools, and machines used in performance of this work shall be maintained in satisfactory working condition.

3.02 MIXING EQUIPMENT

- A. Mixing Unit. The slurry seal shall be mixed and applied with a machine designed and manufactured to lay slurry seal with a minimum aggregate capacity of eight (8) cubic yards to reduce the number of transverse joints. The slurry seal mixing machine shall be a continuous flow mixing unit, capable of delivering accurately predetermined proportions of aggregate, asphalt emulsion, and mineral filler (if required) to a revolving spiraled multi-blade mixer and of discharging the thoroughly mixed product on a continuous basis. The mixing unit shall be capable of thoroughly blending all ingredients together without violent action. The mixing machine shall be equipped with an approved fines feeder that provides an accurate metering device or method of introducing a predetermined proportion of mineral filler to the aggregate. The fines feeder shall be used only when mineral filler is part of the mix design. The mixing machine shall be equipped with a water pressure system and fog type spray bar. The machine shall be capable of mixing materials at preset proportions regardless of the speed of the machine and without changing machine settings.

Each mixing unit to be used in performance of the work shall be calibrated prior to construction. Previous calibration documentation covering the exact materials to be used may be accepted, provided it was made during the current calendar year. The documentation shall include an individual calibration of each material at various settings which can be related to the machine metering device(s).

Attached to the mixing machine shall be a mechanical squeegee distributor (spreader box) having a rubber-like material in contact with the surface to prevent unwanted egress of slurry. It shall prevent loss of slurry on varying grades and crown by adjustments to assure uniform spread. An appropriate mechanical device for lateral distribution of the slurry shall be operated within the spreader box. There shall be a steering device, a flexible strike-off, and a burlap or other approved drag. The spreader box shall be adjustable to widths from eight (8) to fifteen (15) feet to minimize the number of longitudinal joints. Broken slurry seal mixture shall not be allowed to collect in the spreader box or on the flexible strike-off.

3.03 SPREADING EQUIPMENT

- A. The mixture shall be spread uniformly by means of a conventional surfacing spreader box attached to the mixer and equipped to agitate and spread the material evenly throughout the box. A front seal shall be provided to insure no loss of the mixture at the road contact point.

3.04 WEATHER LIMITATIONS

- A. The slurry seal shall not be applied if either the pavement or air temperature is below 50°F(10°C) and falling, but may be applied when both pavement and air temperature are above 45°F(7°C) and rising. No slurry seal shall be applied when there is danger that the finished product will freeze before 24 hours. The mixture shall not be applied when weather conditions prolong opening to traffic beyond a reasonable time.

3.05 NOTIFICATION AND TRAFFIC CONTROL

- A. All homeowners and business affected by the paving shall be notified one day in advance of the surfacing. Should work not occur on the specified day, a new notification will be distributed.
- B. Suitable methods shall be used by the contractor to protect the slurry seal from all types of vehicular traffic without damage. Opening to traffic does not constitute acceptance of the work. Traffic control shall in accordance with the MUTCD manual.

3.06 SURFACE PREPARATION

- A. Immediately prior to applying the slurry seal the surface shall be cleared of all loose material, oil spots, vegetation, and other objectionable material. Any standard cleaning method will be acceptable. If water is used, cracks shall be allowed to dry thoroughly before slurry surfacing. Manholes, valve boxes, drop inlets and other service entrances shall be protected from the slurry seal by a suitable method. The City Engineer shall approve the surface preparation prior to surfacing.
- B. It is advisable to pre-treat cracks in the pavement surface with an acceptable crack sealer prior to application of the slurry seal.

3.07 APPLICATION

- A. When required by local conditions, the surface shall be pre-wetted by fogging ahead of the spreader box.
- B. The slurry seal shall be of the desired consistency upon leaving the mixer. A sufficient amount of material shall be carried in all parts of the spreader at all times so that a complete coverage is obtained.
- C. No streaks, such as those caused by oversized aggregate shall be left in the finished surface.
- D. No excess buildup, uncovered areas, or unsightly appearance shall be permitted on longitudinal or transverse joints. The Contractor shall provide suitable width spreading equipment to produce a minimum number of longitudinal joints throughout the project. When possible, longitudinal joints shall be placed on lane lines. Half passes and odd width passes will be used only in minimum amounts. If half passes are used, they shall not be the last pass of any paved area. A maximum of six inches (6") shall be allowed for overlap of longitudinal lane line joints.
- E. Areas which cannot be reached with slurry seal machines shall be surfaced using hand squeegees to provide complete and uniform coverage. The area to be handworked shall be lightly dampened prior to mix placement and the slurry worked immediately. Care shall be exercised to leave no unsightly appearance from handwork. The same type finish as applied by the spreader box shall be required. Handwork shall be completed during machine applying process.
- F. Care shall be taken to insure straight lines along curbs and shoulders. No runoff on these areas will be permitted. Lines at intersections will be kept straight to provide good appearance.

G. All areas, such as manways, gutters and intersections, shall have the slurry seal removed as specified by the City Engineer. The Contractor shall remove any debris associated with the performance of the work on a daily basis.

H. Rate of Application:

APPLICATION RATE	
Type I	8-12#/SY
Type II	12-20#/SY
Type III	18-30#/SY

I. The longitudinal joint between adjacent lanes shall have no visible lap, pinholes, or uncovered areas. Thick application caused by overlapping shall be smoothed immediately with hand squeegees before the slurry seal mixture breaks. When possible, longitudinal joints shall be placed on lane lines. The Contractor shall provide suitable spreading equipment to minimize the number of longitudinal joints. Overlays that occur at transverse joints shall be smoothed before the slurry seal mixture breaks, so that a uniform surface is obtained.

J. Care shall be taken to insure straight lines along curbs and shoulders. No runoff on these areas will be permitted. Lines at intersections shall be kept straight to provide a good appearance.

3.08 SAMPLING AND TESTING

A. Suitable sized samples of aggregate, asphalt emulsion, and mineral filler (if required) shall be submitted, when requested by the Project Manager, for approval not less than ten (10) days before the work starts. All samples of materials shall be supplied by the Contractor at his expense, and all tests necessary to determine conformance with requirements specified shall be performed without cost to the Contractor. Additional samples of materials shall be furnished as directed by the Project Manager during progress of the work. The owner will notify the Contractor immediately if any test fails to meet the specifications.

If it is established that a satisfactory slurry seal mixture meeting the requirements specified herein cannot be produced from the materials furnished, the materials shall be rejected and the Contractor shall submit new samples.

END OF SECTION