

PART 1 GENERAL

1.1 SCOPE:

- A. This section covers the work necessary for construction of Type I, II, and/or III Emulsified Asphalt Slurry Seal including materials, labor, performance, testing measurement and payment.

1.2 DESCRIPTION:

- A. 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 as directed by the Engineer.
- B. The completed slurry seal shall leave a homogenous mat, adhere firmly to the prepared surface, and have a friction resistant surface texture throughout its service life.

PART 2 PRODUCTS

2.1 GENERAL:

- A. Before work begins, the contractor shall submit a signed mix design covering the specific materials to be used on the project. This design will be performed by a laboratory that has experience in designing emulsified asphalt slurry seal surfacing.
- B. After the mix design has been approved, no substitution will be permitted by the engineer.

2.2 MIX DESIGN:

- A. The contractor shall submit to the engineer for approval a complete mix design prepared and certified by the laboratory. Compatibility of the aggregate, emulsion, mineral filler, and other additives shall be verified by the mix design. The mix design shall be made with the same aggregate gradation that the contractor will provide on the project.

2.3 EMULSIFIED ASPHALT

A. GENERAL

- 1. Emulsified asphalt shall be Grade CSS-1h and further conform to AASHTO M208/ASTM D2397.

2.4 AGGREGATE

- A. Mineral aggregate used shall be the type and grade specified for the particular use of the slurry seal. The aggregate shall be manufactured crushed stone such as granite, slag, limestone, chat, or other high quality aggregate, or combination thereof as approved by the Engineer.
- B. To assure the material is totally crushed, 100 percent of the parent aggregate will be larger than the largest stone in the gradation to be used.

C. GRADATION

1. When tested in accordance to AASHTO T27/ASTM C136 and AASHTO T11/ASTM C117 mix design aggregate gradation, including the mineral filler, shall be within one of the following bands

ISSA BAND TOLERANCES				
	TYPE I	TYPE II	TYPE III	
Sieve Size	Percent Passing	Percent Passing	Percent Passing	Stockpile Tolerance
3/8	100	100	100	+/- 5%
#4	100	90-100	70-90	+/- 5%
#8	90-100	65-90	45-70	+/- 5%
#16	65-90	45-70	28-50	+/- 5%
#30	40-65	30-50	19-34	+/- 5%
#50	25-42	18-30	12-25	+/- 5%
#100	15-30	10-21	7-18	+/- 5%
#200	10-20	5-15	5-15	+/- 5%

2. 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.
3. The aggregate will be accepted at the job location or stockpile. The stockpile shall be accepted based on five gradation tests according to AASHTO T2/ASTM D75. If the average of the five tests is within the gradation tolerances, then the materials will be accepted. If the tests show the material to be out, the contractor will be given the choice to either remove the material or blend other aggregates with the stockpiles material to bring it into specifications. Materials used in blending must meet the quality test before blending and must be blended in a manner to produce a consistent gradation. This may require a new mix design.
4. Screening shall be required at the stockpile if there are any problems created by having oversize materials in the mix.

2.5 MINERAL FILLER:

- A. 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. They shall be considered as part of the dry aggregate.

<u>APPLICATION RATE</u>		
TYPE I	8 - 12 lbs/sy	3.63 - 5.44 kgs/m ²
TYPE II	12 - 20 lbs/sy	5.44 - 9.07 kgs/m ²
TYPE III	18 - 30 lbs/sy	8.16 - 13.6 kgs/m ²

2.6 WATER:

- A. The water shall be free of harmful salts and contaminants.

2.7 ADDITIVES:

- A. 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 shall be made initially in quantities predetermined by the mix design with field adjustments if required, after approval by the Engineer.

PART 3 EXECUTION

3.1 RATE OF APPLICATION:

- A. The slurry seal mixture shall be of proper consistency at all times so as to provide the application rate required by the surface condition. The average application rate, as measured by the engineer, shall be in accordance with the following table.
- B. Application rates are affected by the unit weight of the aggregate, the gradation of the aggregate and the demand of the surface to which the slurry seal is being applied in accordance with ISSA technical bulletin 112.

3.2 TOLERANCES:

- A. Tolerances for individual materials as well as the slurry seal mixture are as follows;
1. After the design residual asphalt content is determined, 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 $\nabla 0.5$ cm from the job mix formula after field adjustments.
5. The rate of application shall not vary more than $\nabla 2$ lbs/sy, while remaining within the design application rate.

3.3 EQUIPMENT:

A. GENERAL

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

B. MIXING EQUIPMENT

1. The machine shall be specifically designed and manufactured to lay slurry seal. The material shall be mixed by a self-propelled slurry seal mixing machine or either truck mounted or continuous run design. Continuous run machines are those that are equipped to self-load material while continuing to lay slurry seal. Either type shall be able to accurately deliver and proportion 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. 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.
2. If continuous run equipment is used the machine shall be equipped to allow the operator to have full control of the forward and reverse speed during application of the slurry seal. It shall be equipped with a self-loading device, opposite side driver stations, and forward and reverse speed controls.
3. The engineer shall approve of the mixing equipment on site.

C. PROPORTIONING DEVICES

1. Individual volume or weight controls for proportioning each material to be added to the mix (i.e. aggregate, mineral filler, emulsified asphalt and additive) shall be provided and properly marked.
2. The proportioning devices are usually revolution counters or similar devices and are used in material calibration and determining the material output at any time.

D. SPREADING EQUIPMENT

1. 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. The rear seal shall act as final strike-off and shall be adjustable. The spreader box and rear strike-off shall be so designed and operated that a uniform consistency is achieved to produce a free flow of material to the rear strike-off. The spreader box shall have suitable means provided to side shift the box to compensate for variations in the pavement geometry. A burlap drag or other approved screed may be attached to the rear of the spreader box to provide a uniform mat.

E. AUXILIARY EQUIPMENT

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

3.4 CALIBRATION:

- A. Each mixing unit to be used in performance of the work shall be calibrated in accordance with the manufacturer's directions. Certification of calibration shall be given to the engineer for any or all calibrations of equipment. Calibrations shall be accomplished prior to start of this project. In lieu of certified calibrations the contractor may calibrate the equipment in the presence of the engineer.
- B. Previous calibration documentation covering the exact materials to be used may be acceptable, provided they were made during the calendar year. The documentation shall include an individual calibration of each material at various settings, which can be related to the machines metering devices. No machine will be allowed to work on the project until calibration has been completed and accepted.

3.5 TEST STRIP:

- A. Test strip will be made by each machine after calibration and prior to construction. Test strips shall be a portion of the project. Samples of the slurry seal will be taken and verification made as to mix consistency and proportioning. Verification of the rate of application will also be made.
- B. Upon failure of any of these tests, additional test strips, at no cost to the owner, will be required until each unit is authorized to work. Any unit failing to pass the tests after the third trial will not be permitted to work on the project. Test strips must be accepted or rejected within 24-hours after application.

3.6 WEATHER LIMITATIONS:

- A. The slurry seal shall not be applied if either the pavement or air temperature is below 50⁰F (10⁰C) and falling, but may be applied when both pavement and air temperature are above 45⁰F (7⁰C) 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.

3.7 NOTIFICATION OF RESIDENTS:

- A. The City will notify the residence and/or businesses affected by slurry operations within a minimum of 24-hours prior to commencement of operations.
- B. The contractor shall notify the engineer three working days prior to slurry operations in writing to allow time for City to notify affected citizens.

3.8 TRAFFIC CONTROL:

- A. Contractor shall supply a plan to the Engineer for directing and detouring traffic during application operations and for protection of newly applied slurry.
- B. Opening to traffic does not constitute acceptance of the work.
- C. Traffic control shall in otherwise conform to Section 2200 of the Standard Construction Specifications.

3.9 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 is applied.
- B. Manholes, valve boxes, drop inlets and other service entrances shall be protected from the slurry seal by a suitable method.
- C. The engineer shall approve surface prior to application of slurry surfacing.

3.10 TACK COAT:

- A. Normally tack coat is not required unless the surface to be covered is extremely dry and raveled or is concrete or brick.
- B. If required the tack coat should consist of one part emulsified asphalt and three parts water. The emulsified asphalt should be the same as used in the mix. The distributor shall be capable of applying the dilution evenly at a rate of 0.05 to 0.10 gallons per square yard (0.15 to 0.35 liters per square meter). The tack coat shall be allowed to cure before application of the slurry seal.

3.11 CRACKS:

- A. When required cracks shall be sealed prior to slurry seal application in accordance with Section 4220 of these specifications.

3.12 APPLICATION:

A. GENERAL

1. When required by local conditions, the surface shall be pre-wetted by fogging ahead of the spreader box.
2. The rate of application of the fog spray shall be adjusted during the day to suit temperatures, surface texture, humidity, and dryness of the pavement.
3. 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. Overloading of the spreader shall be avoided.
4. No lumping, balling, or unmixed aggregate shall be permitted
5. No streaks, such as those caused by oversized aggregate shall be left in the finished surface. If excess oversize develops, the job will be stopped until the contractor proves to the engineer that the situation has been corrected. Some situations may require screening the aggregate just prior to loading it into the units going from the stockpile to lay down operation.

3.13 JOINTS:

- A. 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.
- B. Half passes and odd width passes are used, they shall not be the last pass of any paved area. A maximum of six inches shall be allowed for overlap of longitudinal lane line joints.

3.14 MIX STABILITY:

- A. The slurry seal shall pose 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. It shall be free of excess water and emulsion and free of segregation of the emulsion and aggregate fines from the coarser aggregate. Spraying of additional water into the spreader box will not be permitted.

3.15 HAND WORK:

- A. 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 handwork 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.

3.16 LINES:

- A. 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.

3.17 ROLLING:

- A. Rolling is not required for application to City Street resurfacing projects.

3.18 CLEAN-UP:

- A. All areas, such as man ways, gutters and intersections, shall have the slurry seal removed as specified by the engineer. The contractor shall remove any and all debris associated with the performance of the work on a daily basis.

3.19 MEASUREMENT AND PAYMENT:

- A. Payment will be made to the nearest 0.1 SY for slurry seal constructed and field measured.

PART 4 TESTING

4.1 MATERIALS:

- A. The contractor shall permit the engineer to take samples of the aggregate and asphalt emulsion used on the project at the Engineer's discretion. Gradation and sand equivalent tests may be run on the aggregate and residual asphalt content tests on the emulsion. Test results will be compared to specifications. Tests will be run at the expense of the City.

4.2 SLURRY SEAL:

- A. Samples of the slurry seal will be taken directly from the slurry unit(s) at a minimum rate of one sample per mixing unit per each days use. Consistency and residual asphalt content tests may be made on the samples and compared to the specifications. Tests will be run at the expense of the City. The City shall notify the contractor as soon as results of test(s) are known if any test fails to meet specifications.
- B. The Engineer may use the recorders and measuring facilities of the slurry seal unit to determine application rates, asphalt emulsion content, mineral filler and additive(s) content for an individual load.
- C. It is the responsibility of the contractor to check stockpile moisture content and to set the machine accordingly to account for aggregate bulking.

4.3 NON-COMPLIANCE:

- A. If any two successive tests fail on the stockpile material, the job shall be stopped. It is the responsibility of the contractor, at his own expense, to prove to the engineer that the conditions have been corrected.

- B. If any two successive tests on the mix from the same machine fail, the use of the machine shall be suspended. It will be the responsibility of the contractor, at his own expense, to prove to the engineer that the problems have been corrected and that the machine is working properly.

END OF SECTION