

## SLURRY SEAL SPECIFICATIONS – (3% Latex Minimum)

### DESCRIPTION

The Contractor shall furnish all labor, equipment, material, supplies, signage, traffic control, and other incidentals necessary to provide a Slurry Seal. 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 asphalt surface. The completed Slurry Seal shall leave a homogeneous mat, adhere firmly to the prepared surface, and have a skid-resistant surface texture throughout its service life.

### MATERIALS

**Emulsified Asphalt Material** – The liquid emulsion shall be water-based emulsified asphalt comprised of straight-run vacuum tower bottoms, synthetic SBR latex polymer, and emulsification agents. The SBR polymer shall be co-milled during the emulsification process such that a bicontinuous polymer-asphalt network is formed upon curing of the finished emulsion. The emulsion shall be pumpable and suitable for use in a Slurry Seal machine.

The emulsified asphalt shall conform to the requirements of the ASTM specification for quick set CQS with revisions as indicated in the table below. In addition, the emulsion shall contain 3% minimum SBR latex solids based on weight of asphalt cement. The slurry seal mixture shall contain an emulsion content of 10 – 20% by weight of dry aggregate which shall be determined in the laboratory by an approved mix design process. The residual asphalt content shall be 5 – 15% based on weight of dry aggregate.

Tests on CQS Emulsion	Minimum	Maximum	Test Method
Viscosity, Saybolt Furol, 25°C, sec, (a)	15	100	ASTM D 244
Storage stability, 24 hr, % max <sup>1</sup>	1	1	T 59
Particle Charge Test	Positive		ASTM D 244
Sieve Test, % (a)		0.1	ASTM D 6933
Distillation: (b)			AASHTO T 59
Residue, %	62		AASHTO T 59
<b>Polymer:</b>			
Polymer Solids Based on Weight of Asphalt, %	3		Supplier Cert.
Polymer Type:	SBR Latex		Supplier Cert.
<b>Tests on Residue (b)</b>			AASHTO T 59
Penetration, 25°C, 100g, 5s	40		ASTM D 5
Ductility, 25°C, 5 cm/min, cm	50		ASTM D 113
Solubility in Trichloroethylene, %	97.5		ASTM D 2042
Elastic Recover, 77 F, 10cm,1h, %	40		ASTM D 5976

The specification for Slurry Emulsion is in accordance with the material properties and test methods as specified by ISSA, ASTM, AASHTO, and CDOT.

- (a) This test requirement on representative samples is waived if successful application of the material has been achieved in the field.

- (b) Residue by evaporation is intended to provide rapid determination of the percent residue and to provide material for tests on residue. If the percent residue or any test on the residue fails to meet specifications, the tests will be repeated using the distillation test specified by AASHTO T59. For polymer modified emulsions, the distillation and evaporation tests will be modified to include 400F maximum temperature to be held for 15 minutes.
- (c) If the solubility of the residue is less than 97.5%, the base asphalt binder for the emulsion shall be tested. The solubility of the base asphalt binder shall be greater than 99 percent.

**AGGREGATE** - The aggregate shall consist of manufactured granite crusher fines. The smooth textured crusher fines shall have less than 1.25% water absorption. The aggregate shall be gray in color with 100% fractured faces, clean and free from organic matter or other deleterious substances and clay balls. Oversized granular material and/or presence of clay balls will require the project to be stopped and shall meet the following requirements:

**Gradation Table – Aggregate (percent passing) <sup>(a) (b)</sup>**

Sieve Size	Type II	Type III	Tolerance
3/8"	100	100	+ or - 5%
No. 4	90-100	70-90	+ or - 5%
No. 8	65-90	45-70	+ or - 5%
No. 16	45-70	28-50	+ or - 5%
No. 30	30-50	19-34	+ or - 5%
No. 50	18-30	12-25	+ or - 4%
No. 100	10-24	7-18	+ or - 3%
No. 200	5-15	5-15	+ or - 2%

- (a) Meets ISSA gradation.
- (b) If oversize material is present, screening through a ¼" screen will be required prior to delivery to the slurry machine. If clay balls are present, the aggregate may not be used.
  - Resistance to Degradation (ASTM C131grading D) 20% maximum loss
  - Soundness of Aggregate (ASTM C88) 15% maximum loss
  - Sand Equivalent (ASTM D 2419) 55% maximum
  - LA Abrasion (AASHTO T96) 20% maximum loss

**Mineral Filler:** Hydrated lime, limestone dust, 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.

**Water:** All water used shall be potable and free of dissolved materials which may affect the mix characteristics or finished characteristics of the product.

**Additives:** Additives may be used to accelerate or retard the break-set of the Slurry Seal or to improve the resulting finished surface. The use of additives in the Slurry mix (or individual materials) shall be made initially in quantities predetermined by the mix design with field adjustments, if required, after approval by the Project Manager.

**Slurry Seal Mix Design Specifications:** Before work begins, the Contractor shall submit a mix design covering the specific materials to be used on the project. The mix design shall identify the job mix formula and present test results for the required specifications verifying the compatibility of the aggregate and the modified CQS-1HL. The mix design shall follow the standards and guidelines as set forth by ISSA. The Slurry mixture shall meet the following specifications:

ISSA TEST NO.	DESCRIPTION	SPECIFICATION
ISSA TB-100	Wet-Track Abrasion Loss, six (6) day Soak	75 g/ft <sup>2</sup> (807 g/m <sup>2</sup> )
ISSA TB-109	Sand Adhesion by wheel tester	50 g/ft <sup>2</sup> Maximum
ISSA TB-105	Asphalt Content (based on dry aggregate)	5 – 15%
<b>Trial Mix Characteristics</b>		
ISSA TEST NO.	DESCRIPTION	SPECIFICATION
ISSA TB-113/3.5	Mix Characteristics	No excess free liquids in mix No excessively dry or stiff mix
ISSA TB-113/3.6	Mix Time at 77°F	180 seconds minimum
ISSA TB-113/3.6	Mix Time at 100°F	120 seconds minimum
ISSA TB-113/3.7	Set Time at 77°F Displacement	30 minutes maximum
ISSA TB-113/3.8	Clear blot	30 minutes maximum
Cured Trial Mix Evaluation (24hr-77°F cured mix from ISSA T113/3.6 - 30 second mix)		
ISSA T113/4.1	Surface Examination	No tackiness No Shininess
ISSA T113/4.2	Fines Flotation	No fines flotation
ISSA T113/4.3	Internal Adhesion	95% minimum coating, all size particles securely held in mix, no asphalt/aggregate segregation
Wet Stripping Test - modified to a 10 minute boiling period (24hr 77°F cured mix from ISSA T113/3.6 - 30 second mix)		
ISSA T114	Coated aggregate integrity	95% minimum coating report solid, broken, crumbly, etc.
ISSA T139	Cohesion Value at 77°F	30 min 12 kg-cm min 60 min report 2 hr report 4hr report 24hr solid spin (26 in-lb)

**Composition of mixture:** The owner shall approve the design mix and all Slurry Seal materials and methods prior to use and shall designate the proportions to be used within the following limits:

- Residual Asphalt: 5% – 15% by dry weight of aggregate.
- Emulsion Content: 10% - 20% by dry weight if aggregate.
- Mineral Filler: 0.5% to 2% by dry weight of aggregate.
- Polymer Content: 3% minimum based on weight of asphalt cement.

Water (Potable): As required to provide proper consistency.

Application Rate of Dry Aggregate (average): 16 lbs. +/- ½ lb. per square yard (Type II)

**Equipment:** The material shall be mixed by either a truck mounted or self propelled micro-surfacing mixing machine. The machine shall employ continuous flow mixing and be able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler and water to a revolving multi-blade mixer and discharge the mixed product on a continuous flow basis. The machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral filler and water to maintain an adequate supply to the proportioning controls.

Individual volume or weight controls for proportioning each material to be added to the mix shall be provided. Each material control device shall be calibrated and properly marked. The aggregate feed to the mixer shall be equipped with a revolution counter or similar device so the amount of aggregate used may be determined at any time. The emulsion pump shall be a heated positive displacement type and shall be equipped with a revolution counter or similar device so that the amount of emulsion used may be determined at any time.

The mixing machine shall be equipped with a water pressure system and nozzle type spray bar to provide a water spray immediately ahead of and outside the spreader box. The mixing machine shall be equipped with an approved fines feeder that shall provide a uniform, positive, accurately metered, predetermined amount of the specified mineral filler.

**Spreading Equipment:** The paving mixture shall be spread uniformly by means of a mechanical type squeegee box attached to the mixer, equipped with paddles and/or augers to agitate and spread the materials throughout the box. A front seal shall be provided to insure no loss of the mixture at the road contact surface. The rear seal shall act as final strike off and shall be adjustable. The mixture shall be spread to fill cracks and minor surface irregularities and leave a uniform skid resistant application of aggregate and asphalt on the surface. 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. No "burlap" will be permitted to be drug behind the squeegee box except along the seams where a 2' to 3' wide burlap "blanket" will be permitted to be drug to the extent necessary to achieve an acceptable finish at the seams as determined by the owner. Rut filling equipment will require adjustable steel strike-off plates. The seam where two spreads join shall be neat appearing and uniform. All excess material shall be removed from ends of each job site immediately.

**Calibration:** Each mixing unit to be used during performance of the work shall be calibrated in the presence of the Project Manager prior to construction. Previous calibration documentation covering the exact materials to be used may be acceptable, provided they were made during the same calendar year. The documentation shall include an individual calibration of each material at various settings, which can be related to each machine's metering devices. No machine will be allowed to work on the project until all calibrations have been completed and/or accepted by the Project Manager.

**Lines:** 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.

**Handwork:** Approved hand squeegees, with burlap drags, shall be used to spread Slurry in areas not accessible to the Slurry spreader box. Care shall be exercised in leaving no unsightly appearance from handwork.

**Curing:** Areas receiving Slurry Seal will be allowed to cure from three to five hours or until the treated pavement will not be damaged by traffic. The Contractor will protect the area with suitable barricades or markers for the full curing period. Areas damaged within 24 hours of application of Slurry, or prior to moving to new work locations, shall be repaired by the Contractor at their expense.

**Surface Preparation:** 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 Project Manager shall approve the surface preparation prior to surfacing.

**Weather Limitations:** 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 temperatures are above 45°F (7°C) and rising. No Slurry Seal shall be applied when air temperatures will be below freezing within 24 hours. The mixture shall not be applied when weather conditions prolong opening to traffic beyond a reasonable time.

**Notification:** All homeowners and businesses affected by the paving shall be notified 24 hours in advance of the surfacing. Suitable tow-away signs may be posted prior to the surfacing. Should work not occur on the specified day, a new notification will be distributed. The notification shall be in a form of written posting, stating the time and date that the surfacing will take place.

**Traffic Control:** Suitable methods shall be used by the contractor to protect the Slurry Seal from damage from all types of vehicular traffic. Opening to traffic does not constitute acceptance of the work. The Project Manager shall be notified of the methods to be used. In areas that are subject to an increased rate of sharp-turning vehicles, additional time may be required for a more complete cure of the Slurry Seal mat to prevent damage. Slight tire marks may be evident in these areas after opening but will diminish over time with rolling traffic. If these areas are not severely rutted, they should be considered as normal characteristics of a Slurry Seal.

**Clean Up:** All areas, such as man-ways, gutters and intersections, shall have the Slurry Seal removed as specified by the Project Manager. The Contractor shall remove any debris associated with the performance of the work on a daily basis.

**Payment:** The Slurry Seal shall be measured and paid for by the square yards on the work completed and accepted by the buyer. The price shall be full compensation for furnishing all materials; for preparation, mixing and applying these materials; and for all labor, equipment, tools, test design, cleanup and incidentals necessary to complete and warrant the job as specified herein.

**PAY ITEM**  
Slurry Seal

**PAY UNIT**  
S.Y.