SECTION 32 12 36

SLURRY SEAL

PART I – GENERAL

1.01 WORK INCLUDED
Work on this Section includes placement of slurry seal on roadways, streets, and parking lot areas.

1.02 RELATED REQUIREMENTS
Not used.

1.03 REFERENCE STANDARDS
A. American Association of State Highway Transportation Officials (AASHTO)
B. State Standard Specifications

1.04 QUALITY ASSURANCE
Not used.

1.05 MEASUREMENT AND PAYMENT
A. Measurement and payment for provision of slurry seal will be made on either a square foot or square yard basis based on the actual area receiving slurry seal application.
B. Payment will include costs for all work and materials specified herein.

PART 2 – PRODUCTS

2.01 LATEX MODIFIED ASPHALT EMULSION
Latex emulsified asphalt shall be a quick traffic, quick cure (QT-QC) type, shall be homogeneous and show no separation after thorough mixing, shall break and set on the aggregate within five (5) minutes and shall be ready for cross-traffic within fifteen (15) to forty-five (45) minutes. The latex asphalt emulsion shall conform to the following Table:

Test On Emulsion	Method of Test	Requirements
Viscosity, SSF, @ 77 degrees F, sec	ASTM D244	15 - 100
pH		2 +/- 1
Distillation Residue %, Minimum		60
Test on Residue from Distillation Test	**Method of Test**	**Requirements**
Penetration, 77 degrees F, 100g, 5s	ASTV D5	40-50
Softening Point (Ring & Ball), degrees F	ASTM	130+
Ductility, 77 degrees F (25C. 5cm/Min. Minimum)	ASTM D113	25
Fraass-Breaking Point (degrees C)	DIN 52012	- 18 Min

2.02 WATER

Water shall be potable, free of soluble salts and shall be of such quality that the asphalt will not separate from the emulsion before the slurry seal is in place.

2.03 AGGREGATE

Aggregate shall consist of sound, durable, crushed stone or crushed gravel and approved mineral filler. The material shall be free from vegetable matter and other deleterious substances. Aggregates shall be 100% crushed material with no rounded particles and shall be volcanic in origin and black in color. supplied by George Reed, Table Mountain Plant, Sonora, CA., or equal. **The use of gray or light-colored aggregate will not be allowed**. The percentage composition by weight of the aggregate shall conform to the following grading:

Percentage Passing

Sieve Sized	Type II
3/8" (9.5 mm)	100
No. 4 (4.75 mm)	90-100
No. 8 (2.36 mm)	65-90
No. 16 (1.18 mm)	40-70
No. 30 (600 mm)	25-50
No. 200 (75 mm)	5-15

The aggregate also shall conform to the following quality requirements:

Test	Method of Test	Requirements
Sand Equivalent	State Method 217 Or ASTM D2419	60 Min
Durability Index	State Method 229	55 Min

2.04 POLYMER LATEX

Styrene butadiene rubber latex shall be added to the water/soap phase by injection prior to the mill manufacture of the asphalt emulsion by the emulsion producer. The latex shall be BASF NX 1118 or approved equal. The amount of latex solids shall be between 3 and 4 percent of the asphalt residual content and shall be certified by the emulsion producer for each load of emulsion delivered to the job site. No supplementary field addition of polymer latex will be allowed. Samples of latex shall be provided and shall conform to the following requirements.

Test	Requirements
Total Solids, min %	60
Bound Styrene %	24 - 60
PH at 25 Degrees C	4.2 – 5.2
Brookfield Viscosity RVT	1000 - 4000
Residual Monomer %	0.08 Max

2.05 MINERAL FILLER

The mineral filler either shall be Portland Cement or other approved mineral filler, if required. Portland cement if used, shall be commercially available Type I or Type II, and shall be free of lumps and clods.

2.06 MIX DESIGN

A. At least 7 working days before slurry seal placement commences, the Contractor shall submit to the engineer for approval a laboratory report of tests and proposed mix design covering the specific materials to be used on the project.
   1. The percentage of asphalt emulsion in the mix design and application rate shall be as specified below:

Asphalt Emulsion Content (% of Type II dry aggregate)	**15 - 17**
Application Rate (pounds/ square yard)	**14 - 18**

B. The tests and mix design shall be performed by a laboratory capable of performing the applicable International Slurry Seal Association (ISSA) tests. The proposed slurry seal mixture shall conform to the requirements specified when tested in accordance with the following tests:

Test	ISSA Test Method	Requirements
Slurry Seal Consistency, cm	T106	3 max
Wet Stripping	T114	Pass
Compatibility	T115	Pass (a)
Cohesion Test (b). kg – cm within 1 hour	T139	20 min.
Wet Track Abrasion, g/sq. ft.	T110	75 max.

1. Mixing test must pass at the maximum expected air temperature at the project site during application.
2. Using project source aggregate asphalt emulsion and set-control agents if used.

C. The laboratory report shall be signed by the laboratory that performed the tests and mix design and shall show the results of the tests on individual materials, comparing the test results to those required by the specifications. The report shall clearly show the proportions of aggregate, filler (as determined from the tests, minimum and maximum), water (minimum and maximum), asphalt solids content based on the dry weight of aggregate, and set-control agent usage. Previous laboratory reports covering the same materials may be accepted provided they are made during the same calendar year.

2.07 PROPORTIONING

A. Asphalt emulsion shall be added at a rate determined by the mix design and in the range of the table above. A job mix design shall be submitted by the Contractor for approval by the engineer that conforms to the specification limits, and that is suitable for the traffic, climate conditions, curing conditions and final use. This will include recommended application rate of slurry to suit the job conditions.

B. The Slurry Seal mixture shall be proportioned by the operation of a single start/stop switch or lever, which automatically sequences the introduction of aggregate, emulsified, asphalt, admixtures, if used, and water to the pug mill.

C. Calibrated flow meters shall be provided to measure both the addition of water and liquid additives to the pug mill. If necessary for workability, a retarding agent, that will not adversely affect the seal, may be used.

D. Water, and retarder if used, shall be added to ensure proper workability and (a) permit uncontrolled traffic on the slurry seal no more than three (3) hours after placement without the occurrence of bleeding, raveling, separation or other distress; and (b) prevent development of bleeding, raveling, separation of other distress within fifteen (15) days after placing the slurry seal.

2.08 MATERIAL SAMPLING

A. The minimum acceptable sampling frequency shall be as follows:
   1. Asphalt Emulsion – minimum once daily
   2. Mineral Aggregate – minimum once weekly
   3. Application mixture – minimum once daily

B. All Samples of asphalt emulsion and aggregate for slurry seal shall be captured from the storage tank of the slurry seal application truck in use on the work. Inspector shall observe the sampling of 1 gallon of the emulsion, 10 lbs. of the slurry seal aggregate and 1 gallon of the mixture. Contractor shall provide the samples and containers to the Inspector. The Engineer or his representative shall be permitted to take samples of materials from the project at anytime. The agency may elect to perform testing on the samples to verify compliance of the materials with the specifications.

C. Testing shall be undertaken by the Engineer whenever deemed necessary. The Engineer, or his representative, may suspend the application of the slurry seal whenever changes in the materials or quality of the applied slurry are noted. Work shall resume only when the noted deficiencies are corrected to the

satisfaction of the Engineer. When work is suspended for this reason, samples will be taken immediately.

D. The City may send samples to a testing laboratory. Testing will be at the City's expense unless deficiencies are verified by the testing. The Contractor shall reimburse the City for the cost of any testing required by deficient materials or application of the slurry mix.

PART 3 – EXECUTION

3.01 MIXING AND SPREADING EQUIPMENT

A. The slurry seal shall be mixed in a self-propelled mixing machine equipped with a continuous flow pug mill capable of accurately delivering and automatically proportioning the aggregate, emulsified asphalt, water and additives to a double shafted, multi-blade pug mill mixer capable of minimum speeds of 200 revolutions per minute.

B. A minimum of two operational mixing machines of 12 cubic yard capacity, or larger, shall be maintained on the project. The slurry seal retention time in the pug mill shall be less than three seconds. No retention of mixed slurry seal shall be allowed within the pug mill by gate shut-off or other mechanical means. The mixing machine shall have sufficient storage capacity of aggregate, emulsified asphalt, and water to maintain an adequate supply to the proportioning controls.

C. The mixing machine shall be equipped with hydraulic controls for proportioning the material by volume for the mix. Each material control device shall be calibrated, properly marked, present and lockable at the direction of the engineer. The mixing machine shall be equipped with a water pressure system and nozzle type spray bars to provide a water spray immediately ahead of the spreader box.

D. The mixing machine shall be equipped with an approved fines feeder that provides a uniform, positive, accurately metered, pre-determined amount of a mineral filler, if used, at the same time and location that the aggregate is fed.

E. The slurry mixture shall be uniformly spread by means of a controlled spreader box conforming to the following requirements:

1. The spreader shall be capable of spreading a traffic lane width and shall have strips of flexible rubber belting or similar material on each side of the spreader box and in contact with the pavement to prevent loss of slurry from the box. The box shall have baffles, or other suitable devices, to insure uniform application on super elevated sections and shoulder slopes. Spreader boxes shall be maintained in such a manner as to prevent chatter (wash boarding) or other surface defects that will affect the esthetic value of the finished slurry seal mat.
2. The rear flexible strike-off blade shall make close contact with the pavement and shall be capable of being adjusted to the various crown shapes so as to apply a uniform slurry seal.
3. Slurry mixture, to be spread in areas inaccessible to the controlled spreader box, may be spread by other approved methods.

3.02 PREPARATION

A. Prior to application of slurry seal, all cracks ¼" wide and wider shall be sealed in accordance with requirements of Section 17.
B. After crack sealing and immediately prior to the application of the slurry seal, the surface area shall be cleaned of all foreign materials such as, but not limited to leaves, sand, gravel, dirt, motor oil, paint, thermoplastic striping and vegetation. Contractor shall protect existing hydrant and lane line delineators by covering with temporary plastic or other means. The City shall approve surface preparation before sealing proceeds.

3.03 APPLICATION

A. Slurry seal shall conform to the provisions in Section 37-2, *"Slurry Seal"* of the State Standard specifications and shall not be placed when the atmospheric temperature is less the 55ºF or during unsuitable weather, which includes but not limited to rainy and windy conditions.
B. The application of slurry shall not commence until after 8:30 a.m. and shall be sufficiently cured to be open to traffic by 4:00 p.m. The streets to be sealed shall be closed from the time the application begins until the engineer determines the mixture has achieved sufficient sit to be opened to traffic. Work will not be considered complete until all utility boxes and manholes are exposed.
C. Temporary pavement markers shall be placed at locations of existing striping on all slurry sealed street, if the permanent striping is not installed before the end of the workday affecting such markers and markings.

3.04 CORRECTIVE WORK

Slurry sealed areas which have been improperly prepared, are not uniform in color, have been improperly sealed, or have failed for any other reason prior to final acceptance shall be removed and redone at Contractor's expense to the satisfaction of the engineer. Slurry seal deposited on other than asphalt concrete surfaces shall be cleaned to the satisfaction of the City.

3.05 PUBLIC CONVENIENCE AND TRAFFIC CONTROL

A. At least seven working days prior to commencing the work, the Contractor shall submit his work schedule so that it will impose the least inconvenience to the public. Based upon the spreading schedule, the City shall notify residents and businesses of the proposed work by hand-distributing fliers.
B. The Contractor shall be responsible for adequate barricading of the work area and controlling of traffic in the vicinity of the project.
C. When necessary to provide vehicular or pedestrian crossings over the fresh slurry, the engineer may direct the Contractor to spread sufficient sand or rock dust on the affected area or place a wood walkway to eliminate tracking or damage to the slurry. Sand or rock dust used for this purpose shall be included in the price of the slurry seal.
D.

-END OF SECTION-