600-3 RUBBERIZED EMULSION AGGREGATE SLURRY

600-3.1 DESCRIPTON: This work shall consist of formulating a mix design, removal of painted striping and legends, cleaning pavement surfaces (including oil spots from leaking vehicles), crack sealing, mixing and applying a crumb rubber asphalt slurry-seal surface treatment, and protecting the completed slurry seal until set. All work shall be in accordance with this specification, the dimension, and details shown on the plans, and as approved by the Engineer.

600-3.2 MATERIALS: Rubberized Emulsion – Aggregate Slurry (REAS) shall consist of Rubberized Polymer Modified Emulsion (RPME) and aggregate. Materials for REAS shall conform to the following, immediately prior to mixing:

6003.2.1 RUBBERIZED POLYMER MODIFIED EMULSION (RPME): The RPME shall be a slow-set or quick-set type of emulsion as determined by the Engineer. RPME shall contain asphalt, crumb rubber, and polymer modifiers.

600-3.2.2 POLYMER MODIFIER: Polymer modifier shall be latex, which is added at a minimum of two percent by weight of the RPME.

600-3.2.3 CRUMB RUBBER: The material shall be granulated scrap tire rubber free from fabric wires and other contaminants. Rubber shall be dry and free flowing. Calcium carbonate or talc may be added to a maximum of four percent by weight or rubber to prevent rubber particles from sticking together. The rubber shall have a specific gravity between 1.15 and 1.20. One hundred percent of the rubberized material shall pass a 1.18 mm (#16) sieve, 95% shall pass a 900 μm (#20) sieve, and a maximum of two percent shall pass a number 75 μm (#200) sieve. The RPME shall contain between 66 g/L (0.55 lbs/gal) and 78 g/L (0.65 lbs/gal) of crumb rubber.

600-3.2.4 QUALITY REQUIREMENTS: Manufacturers shall certify that materials meet the following requirements:

TABLE 600-3.2.4 (A)
TESTS ON RUBBERIZED POLYMER MODIFIED EMULSION

Viscosity, 25° (77°F), Brookfield, Model RVT #6 Spindle 10 RPM (Centipoise)	2,500 min.20,000 max.
Residue by Evaporation % ASTM D244	50 min.
Sieve Test % retained on #20 screen ASTM D244	2.0 max.
Weight per Liter (Gallon)	1.0 kg/L (8.33 lbs/gal) min. 1.05 kg/L (8.75 lbs/gal) max.
Penetration of Residue, 25° (77°F), 100 g, 5 sec.	20 min. – 40 max
Percent Residue Soluble in Trichloroethylene ASTM D22042	75 min.

Sieve test of original emulsion is 0.10 max.

TABLE 600-3.2.4 (B)
TEST ON POLYMER MODIFER

Total Solids (residue) ASTM D1417	60% min.

TABLE 600-3.2.4 (C)
COMPOSITION OF REAS

Aggregate Type	RPME % of Dry Aggregate Weight	Residual RPME % of Dry Aggregate Weight	Kg of Dry Aggregate per L of RPME	Pounds of Dry Aggregate per Gallon of RPME
Fine Slurry Aggregate	60 – 80	30 – 40	1.27 – 1.70	10.6 – 14.2
Type I Slurry Aggregate	50 – 75	25 – 38	1.35 – 2.0	11.3 – 17.0
Type II Slurry Aggregate	28 – 35	14 – 18	2.90 – 3.60	24 – 30

600-3.2.5 AGGREGATE: The aggregate shall consist of sound and durable natural of manufactured sand, crushed stone, or crushed stone and rock dust, or a combination thereof, free of deleterious amounts of organic material, mica, and other substances not suitable for the purpose. Smooth-textured sand of less than 1.25 percent water absorption, as tested by ASTM C128, shall not exceed 50 percent of the total combined aggregate. Aggregate retained on the 300 μm sieve (No. 50) shall be 100 percent crushed.

The combined aggregate shall meet the requirements of Table 203.5.2 (B) prior to any chemical additions.

The combined aggregate shall conform to the gradation shown in the Table 600-3.2.5 (A) when tested in accordance with ASTM C136.

TABLE 600-3.2.5 (A)
GRADATION OF AGGREGATES

SIEVE SIZE	FINE SLURRY AGGREGATE	TYPE I SLURRY AGGREGATE	TYPE II SLURRY AGGREGATE
	% BY WEIGHT PASSING SIEVES		
9.5 mm (3/8”)	100	100	100
4.75 mm (No. 4)	100	100	90-100
2.36 mm (No. 8)	95-100	90-100	65-90
1.18 mm (No. 16)	75-92	65-90	45-70
600 μm (No. 30)	50-75	40-60	30-50
300 μm (No. 50)	35-50	25-42	18-36
150 μm (No. 100)	15-30	15-30	10-24
75 μm (no. 200)	10-20	10-20	5-15

600-3.2.6 WATER: All water used in making the slurry shall be potable and free from harmful soluble salts.

600-3.2.7 ADDITIVES: Additives up to 1.5 percent of the dry aggregate weight, as approved in the mix design, may be used in the slurry to modify viscosity, setting, and curing characteristics. Field adjustments to additives may be made only if approved by the Engineer.

600-3.2.8 MIX DESIGN SUBMITTAL: Mix designs and calibration shall be per 203-5.4 and the following. Mix design results shall include any proposed additives. The completed slurry shall have a minimum skid resistance of 40 when tested per California Test No. 342. The standard Wet Track Abrasion Tests (WTAT) template may be modified to a thickness of 3.18 mm (0.125”), when using slow-set emulsion. The mix design shall include the weight per liter (lbs per gal) of REAS.

600-3.3 SLURRY MIXING AND SPREADING EQUIPMET: The REAS shall be mixed either by a continuous flow mixer per 302-4.2.2, or a central mixing plant. A central mixing plant shall not be used for quick set REAS.

If a central mixing plant is used, combining of the RPME and aggregate in the mixing tank shall be in the presence of the Engineer. The tank shall be calibrated in liters and gallons and equipped with load cells and a full sweep agitator capable of producing a homogeneous slurry mix. All storage tanks and delivery vehicles shall be equipped with an agitator. The REAS shall be delivered to the slurry site and spread directly behind the truck with a mechanical-type squeegee distributor, or the slurry may be pumped into smaller trucks equipped with mechanical-type squeegee distributors. All spreading equipment shall contain fog/water systems per 302-4.3.2. The mixing tank shall not be used to batch more than one job at a time. Storage tanks for RPME and REAS shall not be used to supply more than one job at a time.

The weight per liter (weight per gallon) of REAS delivered to the spreader box shall be within 0.11 kg/L (0.92 lbs/gal) of the mix design.

600-3.3.1 FIELD MIXING AND SPREADING EQUIPMENT CALIBRATION: Calibration shall conform to 203-5.4 and the following: Calibration shall be per International Slurry Surfacing Association (ISSA). If the tests do not meet specification requirements, additional tests shall be performed at the Contractor's expense until an acceptable mix is obtained.

6003.4 APPLICATION OF REAS: The application of REAS shall conform to 302-4.3.2. Spreading, except for the following conditions, and RPME application rates specified in Table 600-3.4 (A) REAS shall not be applied when the atmospheric temperature is less than 10°C (50°F) or when the atmospheric temperature at 7 am is 24°C (75°F) or over, and rising to a forecast high of 39°C (100°F). The total time of mixing in the slurry machine shall not exceed five minutes.

The rubberized slurry shall be applied not less than 48 hours prior to the morning of trash pick up day. The areas of rubberized slurry performed shall be per list shown in section G, "Schedule of Project Locations" indicated as SE (rubberized emulsion aggregate slurry type I) or SE-2 (rubberized emulsion aggregate slurry type II), in these Technical Provisions.

Prior to application of rubberized slurry, the Contractor shall clean the pavement surface by sweeping, flushing or other means necessary to remove all loose particles of paving, all dirt and all other extraneous material. Contractor shall seal all cracks 1/4 inch and larger as specified in the Crack Seal Bid Item.

After the application of the rubberized slurry the Contractor shall free all valve covers from the pavement and remove any loose materials that may have entered the valve covers during the slurry operations.

It is the Contractor's sole responsibility to protect his work until the rubberized emulsion aggregate slurry is thoroughly cured and set before opening section of street to traffic.

TABLE 600-3.4(A)
RPME APPLICATION RATES

AGGREGATE TYPE	APPLICATION RATE m^2/L of RPME	APPLICATION RATE ft^2/gallon of RPME
Fine Slurry Aggregate	0.86 to 0.98	35 to 40
Type I Slurry Aggregate	0.74 to 0.86	30 to 35
Type II Slurry Aggregate	0.59 to 0.78	24 to 32

600-3.5 FIELD SAMPLING: Field sampling shall conform to 302-4.3.3.

600-3.6 PUBLIC CONVENIENCE AND TRAFFIC CONTROL: Public convenience and traffic control shall conform to 302-4.4.

600.3.7 MEASUREMENT AND PAYMENT: Measurement and payment shall conform to 600-2.7.7. at the unit price per square foot. [CITY PROJECT USE ONLY]

Payment for this item at the price bid per Square Foot (S.F.) shall be considered as full compensation for doing all work as specified herein and no additional compensation will be allowed therefor. [CITY PROJECT USE ONLY]