VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
FLEXIBLE LATEX MODIFIED EMULSION TREATMENT (FLEXIBLE MICRO-SURFACING)
(Maintenance)

December 20, 2011

I. DESCRIPTION

This work shall include furnishing and placing a flexible latex modified emulsion to existing roadway surfaces as specified herein and as directed by the Engineer.

II. MATERIALS

A. **Emulsified asphalt** shall be a quick set latex modified cationic emulsion conforming to the requirements of Section 210 of the Specifications and the following:

1. The emulsion shall be designated CQS-1hLm cationic quick setting emulsion and shall conform to the requirements of Cationic Type CQS-1h per AASHTO M208

2. Ring and ball softening point of the residue, minimum 135 degrees F.

3. Residue by Distillation Modified Test Conditions (177 ºC (350º F) 20 Min hold) AASHTO T59 62% *minimum*

4. Penetration @ 25ºC (77º F) 100 gram 5s should be between 40-150

5. Material shall be furnished in accordance with the Departments Asphalt Acceptance Program.

B. **Aggregate** shall be non-polishing crushed stone conforming to the requirements Section 202 of the Specifications, except the soundness loss shall not exceed 18 percent.

Gradation of the aggregate shall be in accordance with the following:

SCREEN SIZE	TYPE A (% Passing)	TYPE B (% Passing)	TYPE C (% Passing)	RUTFILLING (% Passing)
No.3/8	100	100	100	100
No.4	100	90-100	70-95	70-95
No.8	65-90	65-90	45-70	45-70
No.16	45-70	45-70	32-54	32-54
No.30	30-50	30-50	23-38	23-38
No.50	18-33	18-33	16-29	16-29
No.100	10-21	10-21	9-20	9-20
No.200	5-15	5-15	5-12	5-12

C. **Mineral filler** shall be non-air entrained hydraulic cement, Type I, conforming to the requirements of Section 214 of the Specifications or hydrated lime conforming to the requirements of Section 240.02(a) of the Specifications. When requested by the Engineer, the Contractor shall furnish a

manufacturer's Certification confirming the supplied mineral filler compliance with the Specification requirements.

D. **Water** shall conform to the requirements of Section 216 of the Specifications.

E. **Latex modifier** along with emulsifiers shall be milled into the asphalt emulsion by an approved emulsion manufacturer.

F. **Additives** may be used by the Contractor to provide control of the break/set time in the field and to meet the requirements for flexiblity within the mix design tables. The types of additives shall be specified in the mix design.

G. **Sampling requirements** for gradation shall be taken from aggregate stockpiles designated by the Contractor. These stockpiles shall be located in the aggregate producer's quarry and acceptance for gradation will be based on an approved aggregate Producer's modified acceptance production control plan. Samples for Marshall tests and asphalt content shall be taken from the completed mix for testing by the Department. The frequency of sampling and testing will be established by the Engineer based upon the Department's acceptance program. The asphalt content will be determined by the Ignition Method (VTM-102) or nuclear gauge (VTM-90), as determined by the Engineer.

III. MIX DESIGN

A. The mixture shall be designed in a Department approved lab by the Contractor for the Engineer's approval. The job mix formula shall conform to the following when tested as specified:

Tests	Description	Requirements
TB 109	Excess Asphalt	538 g/m² (50 g/ft²) maximum
TB 100	Wet Track Abrasion	
	One hour soak loss	538 g/m² (50 g/ft²) maximum
	Six (6) day soak, loss	807 g/m² (75 g/ft²) maximum
VTM 60	Compatibility Test for	120 sec mini mixing time
	Slurry Seal Mixtures	30 min maximum setting time
TB 147	Loaded Wheel Test	
	Lateral Displacement	7.5% maximum
Tex-248-F[1]	Overlay Tester @ 5ºC, Ultimate Load	100 cycles minimum, 90% of the

Modified as follows: Specimen size: (H =0.5", L= 6", W=3"), Loading cycle: 60 seconds, Displacement: 0.05"

Note[1] : The Tex-248-F test specimens shall be made using similar mixture composition and mix consistency used for the TB 100 (Wet Track Abrasion) and TB 147 (Loaded Wheel Test)

specimens and shall be mixed at the recommended design contents. The mixtures are placed in molds (H=0.5", L=6", W=3") and struck off immediately to obtain three specimens for each mix composition of the appropriate size for testing. The test specimens are placed into a 60º C forced draft oven for 48 hours to cure. After the oven curing the specimens are allowed to cool to ambient laboratory temperature, removed from the molds, and tested within 48 hours. The results from the triplicate test specimens shall be deemed to pass if two of the three results are greater than 100 cycles and the test should be repeated if two of the three specimens fail.

Aggregate used in the job mix formula shall be from the same source and be the same as those material proposed by the Contractor for use on the project.

B. Proportioning of the mix design shall be within the following limits:

	Type A	**Type B**	**Type C**	**Rutfilling**
% Residual Asphalt (by wt. of dry aggr.)	5.5-10	5.5-10	5.5-10	4.5-6.5
% Mineral Filler	0.26-3.00	0.26-3.00	0.25-3.00	0.25-3.00
% Latex Modified-Solids (by wt. of residual asp.)	3.0 Min.	3.0 Min.	3.0 Min.	3.0 Min.
Additive	As Required	As Required	As Required	As Required

IV. EQUIPMENT

All equipment, including hand tools, shall be designed or suitable for the application of micro-surfacing and in good working condition.

A. **Mixing equipment** shall produce the asphalt mixture in a self-propelled, front feed, continuous loading, and mixing machine. The unit shall deliver and proportion the aggregate, emulsion, mineral filler, mixture performance additive, control setting additive and water to a revolving multi-blade shafted mixer capable of discharging the mixture on a continuous, homogeneous, and uniform basis. ~~A~~ Mobile mixing units will be permitted on areas less than 15,000 square yards provided a sufficient number of units are used to promote an efficient continuous type operation which minimizes disruption to traffic and provided the units are equipped with a twin shaft mixer capable of an operational speed of 60 feet per minute having the capacity to store and mix components to produce a minimum of 5 tons of mix. All equipment shall be capable of delivering a continuous, uniform, properly proportioned, and homogenous mixture to the spreading unit.

Individual volume or weight controls for proportioning each material shall be provided and meters or counters shall be such that the Engineer may readily and accurately determine the amount of each material used at anytime.

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 when required.

B. **Equipment calibration** shall be determined and based on the same project specific materials (source specific aggregates, emulsion, filler, and additives) to be used on the job and shall be provided by the Contractor stating the current year data for each mixing unit. Data for each unit shall be in the form of a graphic scale indicating the proportioning controls settings required to obtain the residual asphalt content as determined in the mix design. Such data shall be maintained with each unit.

C. **Spreading equipment** shall uniformly spread the paving mixture by means of a mechanical type spreader box attached to the mixer and equipped to agitate and spread the materials throughout

the box. The box shall be designed and operated so all the mixed material shall be kept homogenous and moving with no evidence of premature breaking during laydown. A front seal shall be provided to ensure no loss of the mixture at the road contact surface. The rear flexible seal shall act as a final strike off and shall be adjustable. The spreader shall be maintained to prevent the loss of the paving mixture in the surfacing of super-elevated curves. The spreader box and rear strike-off shall be so designed and operated that a uniform consistency is achieved by providing for a free flow of material to the rear strike-off without causing skips, lumps, ripples or tears in the finished surface. A secondary strike-off may be used to improve surface texture.

Rutfilling, when required, shall be accomplished by means of a box specifically designed for that purpose. The box shall be at least 5 feet in width, or one-half lane width, and have a dual chamber with an inner v configuration of augers to channel the large aggregate to the center of the rut and the fines to the edges of the rut fill pass. The box shall be equipped with dual steel strike-off to control both the width and depth of the rutfill.

D. **A pneumatic tire roller** may be required by the Engineer, at no cost to the Department, if excessive loss of aggregate is observed. The roller shall be equipped with treaded tries having an air pressure of 40 – 60 pounds per square inch (psi) and a maximum of 10 tons.

V. PROCEDURES

A. **Beginning work**, The Contractor shall notify the Engineer at least three work days prior to beginning this work. Upon request by the Department, the Contractor shall provide 6 quarts of liquid emulsion and 50,000 grams of aggregate material for the Department's use in determining asphalt content. The Contractor shall perform ignition oven calibrations and submit them with the job-mix formula (JMF) to the Department two weeks prior to the beginning of the work.

B. **Surface preparation -** Prior to applying the paving mixture, the surface shall be thoroughly cleaned of all vegetation, loose materials, dirt, mud and other objectionable materials. Prior to paving, an asphalt tack coat Type CSS-1h diluted three parts water to one part asphalt shall be applied at a rate 0.05 gallons per square yard. When required by field conditions prewetting of the tacked surface shall be applied evenly at a rate that shall uniformly dampen the entire roadway surface.

All cost for furnishing and applying the tack coat and prewetting shall be included in the price bid for "Latex Modified Emulsion Treatment".

C. **Application types and rates**

1. Rutfilling shall be placed by means of a specially designed rutfilling box that shall leave the surface crowned between 1/8 and 1/4 inch per inch of depth to allow for traffic compaction to approximately a level surface with surrounding existing pavement. The Contractor shall provide and use a ten foot straight edge to control the depth and crown.

2. Latex Modified Emulsion Treatment for leveling course shall consist of an initial application to prepare for the surface course. The minimum application rates shall be 16 pounds per square yard for Type B and 20 pounds per square yard for Type C.

3. Latex Modified Emulsion Treatment (LMET) for surface course shall consist of the final application which serves as the final pavement riding surface. The LMET shall be placed at an application rate of 16 to 20 pounds of mix per square yard for Type B and 18 to 22 pounds per square yard for Type C.

   Where neither rutfilling nor leveling is used (microsurfacing materials placed in a single lift), the mix application rates shall be 18 to 22 pounds per square yard for Type B and 20 to 24 pounds per square yard for Type C.

The Contractor shall provide to the Engineer aggregate weight tickets, a daily delivery summary, and an estimate of aggregate lost and otherwise not used in the work for each stockpile location (rutfilling aggregate shall be stockpiled and inventoried separately). When disagreements occur, the Engineer will make the final determination of such loss.

D. **Application**

The mixture shall be spread to fill minor cracks and shallow potholes and leave a high-skid resistant surface uniform in its texture and appearance. Longitudinal joints shall not overlap more than four inches, except on irregular roadway widths when approved by the Engineer; however all joints shall be neat in appearance. Pavement edges shall be reasonably straight and shall be tapered to tie in neatly at gutters, entrances, and connections. When possible, longitudinal joints shall be placed on lane lines.

During night paving operations sufficient lighting shall be provided by the Contractor to insure proper application and inspection of micro-surfacing.

Rutfilling must be compacted by traffic or by a minimum of three passes with a pneumatic tire roller (10 tons max.) not in excess of 5 miles per hour (mph) prior to application of the surface course and must be cured such that applied material is totally free of detectable water. Rutfilling or scratch courses placed at night shall not be overlaid the same night or until such time that the materials placed can be visually verified as being totally free of detectable water.

Any oversized aggregate or foreign materials shall be screened from the aggregate stockpile prior to delivery to the mixing machine. A mixing aid additive shall be used to accommodate spreading due to slow placements or high temperatures. Additionally, water in a very limited quantity may be sprayed into the spreader box to prevent build-up on the blades. All excess material shall be removed immediately from the ends of each run. Loose aggregate that is determined to be objectionable to the finished project by the Engineer shall be immediately removed without damaging the surface.

Based upon a visual examination or test results the Engineer may reject any work due to poor workmanship, loss of texture, raveling or apparent instability.

The entire area specified shall be treated and the contract quantity shall not be exceeded.

E. **Test requirements**

Samples representing a maximum of 500 tons will be taken from material produced by each mixing unit for asphalt content determination. The residual asphalt content of such samples shall be within plus or minus 1.5 percent of the approved job mix. When successive tests from a mixing unit fail or one test fails by more than 2.0 percent, that unit shall be removed from service until approved by the Engineer.

Construct a test section to verify the mix design and system performance for acceptability. Locate the test section within the limits of the project and in a location acceptable to the Engineer. Do not permit the temperature of the emulsion to exceed 125ºF. If the emulsion is above the temperature limit postpone the construction of the test strip until the emulsion temperature is under 125ºF. The system used for the test section must be identical to all parts of the proposed system. Ensure that a representative from the asphalt emulsion manufacturing company is present during the placement of the test section.

At the discretion of the Engineer, in place of construction of a test section, evidence may be submitted to the Engineer indicating successful construction of a test section on another Department project using the same mix designs, equipment, and procedures. The project must

have been constructed the same construction season and be acceptable to the Engineer in consultation with the State Materials Laboratory.

Construct a minimum 1000 ft. long, one lane width test section to be evaluated for acceptance by the Engineer. Construct the test section after dark, no sooner than one hour after sunset and no later than one hour before sunrise. The test section may be constructed during the daytime if the contract is scheduled during daytime hours. When multiple machines are planned for use, lay a test section with each machine to compare it to the other machines for variances in surface texture and appearance. In relation to each other, all machines shall produce a mixture of homogeneous surface texture and appearance. If any one machine does not produce a mixture of uniform appearance and surface texture to the other machines it may not be used unless the Contractor can make sufficient corrections to the machine to bring it into compliance in the judgement of the Engineer with this requirement. The Contractor shall ensure that the Micro-Surfacing test section is capable of carrying normal traffic within one hour after application without any damage to the finished surface occurring. The Engineer will inspect the completed test section after 12 hours of traffic to determine if the mix design is acceptable. Full production may begin after the Engineer accepts the test section. Construct a new test section when the system used in job mix changes or there is field evidence that the system is out of control. The system includes the following:

- Emulsion
- Aggregate supplier
- Type of mineral filler
- Lay down machine.

Construct the test section at no additional cost to the Department. Upon acceptance of the test section, the quantities applied during the construction will be included in the total project quantities. If the test section is not accepted by the Engineer, remove it at no additional cost to the Department. Reconstruct the test section until the Engineer deems the mix design acceptable. Only quantities applied on *accepted* test sections will be included in, and paid for, in the total project quantities. Time allotted for the construction of the test section(s) will be included in the contract completion time, which will not be adjusted upon failure of the test section.

F. **Price Adjustment**

Emulsified asphalt certified weight tickets showing the residual asphalt content shall be provided to the Engineer. Asphalt not used shall be documented and considered in determining the percent of asphalt used on the total project. Upon completion of the project, the percent of asphalt shall be determined by dividing the calculated weight of residual asphalt by the delivery ticket weight of aggregate used in the work. A one percent reduction in the unit price per ton will be applied for each one tenth of a percent the residual asphalt content is more than one percent below the approved job mix formula.

The price adjustment will be applied to the total amount of asphalt content used in the tons of flexible **latex modified emulsion treatment** for which payment is made.

G. **Weather Limitations**

Micro-surfacing shall not be applied on surfaces containing puddle water and on surfaces less than 50 degrees F, except that in the early morning the minimum surface temperature may be 40 degrees F provided the ambient temperature is expected to be above 60 degrees F and there is no forecast of ambient temperature below 32 degrees F within 24 hours from the time the material is applied.

H. **Personnel**

The Contractor shall have a Department certified Slurry Surfacing Technician on the job site to control the work.

VI. MEASUREMENT AND PAYMENT

The quantity of latex modified emulsion treatment used in the accepted portions of the work will be measured by net ticket weight of aggregate, latex modified emulsion and mineral filler delivered and incorporated in the accepted work. No deduction will be made for moisture naturally occurring in the aggregate and mineral filler.

The accepted quantity of **latex modified emulsion rutfilling** will be paid for at the contract unit price per ton.

The accepted quantity of flexible **latex modified emulsion treatment** will be paid for at the contract unit price per ton for the type material specified.

The Contractor will be paid at a rate of **$15** per hour for vegetation removal, when required. The contract price shall include each operator and the equipment necessary to remove and dispose of vegetation.

Payment will be made under:

Pay Item	**Pay Unit**
Latex modified emulsion rutfilling	Ton
*Flexible Latex modified emulsion treatment, (Type)	Ton

*(For asphalt schedule work projects the leveling and surfacing courses are shown as separate line items in the schedule of work but combined into one bid item in the schedule of items.)