VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
EMULSIFIED ASPHALT SLURRY SEAL

September 28, 2012

I. DESCRIPTION

This work shall consist of furnishing and applying an emulsified asphalt slurry seal as specified herein and as directed by the Engineer.

II. MATERIALS

A. Asphalt Emulsion: Emulsified asphalt shall conform to the requirements of Section 210 of the Specifications; except it shall be a quick setting emulsion and the following requirements shall apply:

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

2. The Cement Mixing Test will not be enforced.

3. Emulsion Setting Time - Prior to shipment of each new formulation of emulsified asphalt, the Contractor shall perform a towel test to verify that the emulsion will set quickly enough to accommodate early release of traffic. Testing for setting time shall be in accordance with VTM-89.

B. Aggregate: Aggregate shall be non-polishing crushed stone and except for locations where the posted speed limit is 15 miles per hour or less and for roadways in Traffic Groups I through VII. Aggregate shall conform to the requirements of Section 202 of the Specifications except that the loss on soundness shall not exceed 18 percent. The sand equivalent value shall not be less than 40.

Gradation shall be as follows for the type mix specified:

DESIGN RANGE TABLE

SIEVE SIZE	TYPE A (% Passing)	TYPE B (% Passing)	TYPE C (% Passing)
No.3/8	100	100	100
No.4	100	90-100	70-95
No.8	65-90	65-90	45-70
No.16	45-70	45-70	32-54
No.30	30-50	30-50	23-38
No.50	18-33	18-33	16-29
No.100	10-21	10-21	9-20
No.200	5-15	5-15	5-12
Design Asphalt Content Range*	8.0 – 10.5%	8.0 - 10.5%	7.0 - 9.5%

*Residual Asphalt content by weight of dry aggregate.

C. **Mineral Filler**: Mineral filler shall be non-air-entrained Type I hydraulic cement 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 a manufacturer's certification will be required.

D. **Water**: Water used in the mix shall conform to the requirements of Section 216 of the Specifications.

E. **Mix Design**: The Contractor shall submit the following for the Engineer's approval:

- a mix design for each type slurry on Form TL-127,
- results of the Compatibility Test per VTM-60, and
- wear loss by the Wet Track Abrasion Test (WTAT) per VTM -14 prepared by an approved testing laboratory.

The wear loss shall not be greater than 75 grams per square foot. The wear loss shall apply to the asphalt content limits designated on the job mix formula. Such limits shall be determined by selecting the optimum asphalt content from the WTAT loss curve and within the ranges shown in the Design Range Table in II.B herein and applying a tolerance of plus or minus 1.5 percent. WTATs shall then be taken only once per mix type per aggregate type.

F. **Test Strip**: The Contractor shall place a test strip prior to beginning the work for approval by the Engineer. The mix consistency shall be determined by the Contractor in accordance with current International Slurry Seal Association Technical Bulletin Number 106 and shall be 2.5 cm, plus or minus 0.5 cm. Calibration data as specified in III.B of herein shall be provided to the Engineer prior to placing the test strip.

G. **Mix Sampling and Testing Requirements**: Testing for gradation shall be based on an approved aggregate producer's modified acceptance production control plan. Gradation shall conform to the ranges specified in II.B herein.

Samples for asphalt content shall be taken from the completed mix and will be tested by the Department. The frequency of sampling and testing will be established by the Engineer based upon the Department's current acceptance program. The Engineer will determine the asphalt content by the Ignition Method (VTM-102) or nuclear gauge (VTM-90).

At the start of production samples representing a maximum of 25,000 square yards will be taken from material produced by each mixing unit for asphalt content determination in the beginning. Upon establishing the consistent production of a quality mix meeting these specification requirements, testing frequency will be reduced to a minimum of one test per 50,000 square yards.

At the discretion of the Engineer, the Contractor shall perform a minimum of two consistency tests for each day's production as specified in F herein, and shall conduct additional tests as requested.

At the discretion of the Engineer, materials from the job site will be tested for Wet Track Abrasion in accordance with VTM-14 and the Department's current acceptance program. The WTAT loss shall not be greater than 75 grams per square foot.

H. Personnel

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

III. EQUIPMENT

A. General: All equipment, including hand tools, shall be designed or suitable for the application of slurry and be in good working order. A mobile unit equipped with an accurate mineral filler feeder and a fog type spray bar is required. The unit shall be capable of an operation speed of 60 feet per minute and have the capacity to store mix components to produce a minimum of five tons of slurry seal. The unit shall be capable of delivering a continuous uniform and homogeneous mixture of aggregate, emulsion, water, and mineral filler to the spreader box. Mixing aid additive dispensers, if used, shall be capable of uniformly adding the additive to the water line prior to entering the mixing chamber.

B. Equipment Calibration: The Contractor shall provide current year data for each mixing unit utilizing materials from the same sources as those to be used on the project. Data for each unit shall be in the form of a graphic scale indicating the stone gate setting required to obtain the residual asphalt content as determined in the mix design. Such data shall be maintained with each unit.

C. Spreader: The spreader shall be equipped with a flexible type squeegee positioned in contact with the pavement surface. The spreader shall be designed to apply a uniform spread with a minimum loss of slurry. The spreader box shall be equipped with augers extending its full width that uniformly distribute the slurry mixture across the entire width of the box. The box shall be equipped with an approximately 18-inch wide burlap drag to smooth the slurry surface.

D. Suspension of Work: If during the life of this project excessive loss of cover aggregate occurs, the Engineer may suspend the work in accordance with Section 108.05 of the Specifications until the cause of the loss of cover material is corrected.

IV. PROCEDURES

A. Beginning Work: The Contractor shall notify the Engineer at least three work days prior to beginning 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 these with the job-mix formula (JMF) to the Department two weeks prior to the beginning of the work.

B. Preparation of Surface: The surface upon which slurry seal is to be applied shall be thoroughly cleaned of all loose material, vegetation, silt spots, and other objectionable materials by either brooming or the use of compressed air.

C. Application: When warranted by local conditions or when the pavement temperature is above 90 degrees F, the surface of the pavement shall be fogged with water at a rate of 0.05 gallons per square yard immediately preceding the pass of the spreader. The slurry mixture shall be of a consistency such that it "rolls" in the spreader box in a continuous mass. Slurry that segregates in the spreader box, so that flowing of liquids (water and emulsion) is evident, is not acceptable and shall not be applied. The liquid portion of a slurry mixture shall not flow from either the spreader box or the applied slurry. Evidence of such flow shall be sufficient cause for rejection of the applied material. A mixing aid

additive may be used when necessary to accommodate slow placements or high temperatures.

The slurry shall be uniformly placed on the road in full lane widths up to and including 12 feet. Excess buildup of slurry on longitudinal and transverse joints shall be corrected.

Treated areas shall not be opened to traffic until such time as the slurry seal has cured to the extent that it will no longer be damaged by traffic. Where earlier opening to traffic is necessary, such as at entrances, the Contractor may lightly sand the surface using the same aggregate as in the mix and may be required to remove excess aggregate from the roadway in curb and gutter sections. The applied slurry mixture shall be uniform in texture and shall not flush under traffic. In the event a failure occurs prior to acceptance, the Contractor shall repair or replace the failed treatment as directed by the Engineer.

Slurry Seal surface course shall not be applied on surfaces containing puddled water and on surfaces less than 50 degrees F, except that during early “AM” hours the minimum surface temperature is reduced to 40 degrees F provided the ambient temperatures are expected to be above 60 degrees F and there is no forecast of ambient temperatures below 32 degrees F within 24 hours from the time the material is applied.

Should oversize aggregate be encountered in the mix, the Contractor shall immediately cease operation until approved corrective measures have been taken.

D. **Rate of Application**: The minimum aggregate application rate shall be 16 pounds per square yard for Types A and B, and 20 pounds per square yard for Type C.

1. **Exceptions for Salem District, Henry and Patrick counties only:** Type B minimum aggregate application rate shall be 14 pounds per square yard.

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. Where disagreements occur, the Engineer shall have the final judgment of such loss.

E. **Test Failure**:

1. Asphalt Content - The Department will take samples representing a maximum of 25,000 or 50,000 square yards will be taken from material produced by each mixing unit for asphalt content determination. The asphalt content of such samples shall be within plus or minus 1.5 percent of the approved job mix. When two successive tests from a mixing unit fail or one test fails by more than two percent, that mixing unit shall be removed from service until approved by the Engineer.

2. Consistency Test - If failure occurs, adjustment shall be made in the mix immediately and rechecked. If more than two consecutive tests fail, work shall cease. The Contractor shall adjust the equipment and/or materials and such adjustments must be approved by the Engineer before proceeding.

3. Wet Track Abrasion Test (WTAT) - If failure occurs, The Contractor shall make adjustments to the mix and/or process immediately and the WTAT shall be rechecked prior to proceeding. If two or more consecutive tests fail, work shall cease until the cause is determined and remedied and approved by the Engineer.

F. Price Adjustment:

1. The Contractor shall provide the Engineer emulsified asphalt certified weight tickets showing the residual asphalt content. 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 square yard 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 (JMF).

2. Application Rate - a three percent reduction in price per square yard will be applied for each pound of aggregate per square yard less than the specified application rate. The square yards retreated, if any, shall be added to the total square yards retreated, if any, shall be added to the total square yards for calculation of application rate. The price adjustment will be applied to the total square yards for which payment is made. Material applied over the specified application rate will not be considered for extra payment.

Price adjustments under 1 and 2 herein shall apply concurrently.

V. MEASUREMENT AND PAYMENT

Emulsified asphalt slurry seal will be measured and paid for in square yards on a plan quantity basis for the type specified. Authorized increases and decreases to plan quantities will be adjusted in accordance with Section 109.02 of the Specifications. Payment will be full compensation for furnishing, applying, and testing emulsified asphalt slurry seal and for maintenance of traffic.

When vacuuming is required by the Engineer, the Contractor will be paid **$85** per hour for loose particle removal, by mobile vacuum unit with no less than an eight cubic yard capacity, which price shall include each operator and the necessary equipment, maintenance and all incidentals necessary to perform this operation.

Payment will be made under:

Pay Item	Pay Unit
Emulsified asphalt slurry seal, (Type)	Square yard

S312EM2-1110

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

August 10, 2010

I. DESCRIPTION

This work shall include furnishing and placing a 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-1h cationic quick setting emulsion and shall conform to the requirements of Cationic Type CSS-1h.

2. Ring and ball softening point of the residue, minimum = 140 degrees F.

3. Pass towel test (VTM-89) in the 30 minutes at room temperature with job materials.

4. Residue, percent by evaporation, minimum 62 percent as determined by VTM-78.

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 a manufacturers Certification will be required.

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. The type of additive 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-93), 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 and the job mix formula shall provide the following:

1. Compatibility of latex, aggregate and emulsion in accordance with the Schulze-Breuer Test procedure. Other procedures approved by the Engineer may be used. The test shall be run at the design stage and when requested by the Engineer.

2. A minimum Marshall Stability of 1800 pounds when tested in accordance with VTM-95.

3. A flow of between 6 and 16 units when tested in accordance with VTM-95.

4. An asphalt content that produces 4.7 percent voids in total mix for surface and 6.5 percent voids for rutfilling when tested in accordance with VTM-95.

Aggregate used in the job mix formula shall be from the same source and representative of the 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.)	6.5-8.5	6.5-8.5	5.0-7.5	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, control setting additive and water to a revolving multi-blade shafted mixer and discharge the mixture on a continuous and uniform basis. A mobile unit 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 and have a 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 provided by the Contractor stating the current year data for each mixing unit using materials from the same sources as those to be used on the project. 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 will 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 super-elevated curves. The spreader box and rear strike-off shall be so designed and operated that a uniform consistency is achieved and produces 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 of 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. **Pneumatic 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).

V. PROCEDURES

A. **Beginning work**, The Contractor shall notify the Engineer at least three work days prior to beginning work. Up on 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 will 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 will leave the surface crowned between 1/8 and 1/4 inch per inch depth to allow for traffic compaction to approximately a level surface. 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 pavement 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, 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 texture and appearance. Longitudinal joints shall not overlap more than four inches, except on irregular roadway widths when approved by the Engineer; however the 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 of micro-surfacing.

Rutfilling must be compacted by traffic or by a minimum of three passes with a pneumatic tire roller 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 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 sprayed 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 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 two percent, that unit shall be removed from service until approved by the Engineer.

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 tons 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 **latex modified emulsion treatment** will be paid for at the contract unit price per ton for the type material specified.

Payment will be made under:

Pay Item	**Pay Unit**
Latex modified emulsion rutfilling	Ton
*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 combine into one bid item in the schedule of items.)