

## **MICRO SURFACING FOR RUMBLE STRIPING (REV 3-12-20)**

The following new Section is added:

### **SECTION 335RS MICRO SURFACING FOR RUMBLE STRIPING**

#### **335-1 Description.**

Construct a micro surfacing mixture for placement into rumble striping depressions with the type of mixture specified in the Contract Documents. Micro surfacing is a mixture of polymer-modified emulsified asphalt, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed and spread on a paved surface.

The mix shall be capable of being spread into the depressions of ground-in rumble stripes which, after curing and initial traffic consolidation, resists compaction throughout the entire design tolerance range of asphalt binder content and variable thickness to be encountered. The end product shall maintain a skid-resistant surface in variable thick sections throughout the service life of the micro surfacing.

The mix shall be a quick-traffic system that will be able to accept straight rolling traffic one hour after application.

#### **335-2 Materials.**

##### **335-2.1 Emulsified Asphalt:**

**335-2.1.1 General Requirements:** Provide a quick-traffic, polymer-modified emulsified asphalt conforming to the requirements specified in AASHTO M316 for CQS-1hP. For the residue by distillation test (AASHTO T 59), maintain the test temperature at 350°F (177°C) for 20 minutes. The cement mixing test shall be waived for this product.

The polymer material shall be co-milled into the asphalt or added to the emulsifier solution prior to the emulsification process. The amount of polymer modifier shall not be less than 3.0% polymer solids based on the asphalt content (by weight) and will be certified by the emulsified asphalt supplier.

**335-2.1.2 Sampling, Certification, and Verification:** For the first load of emulsified asphalt produced for the project, the supplier shall submit a sample to the Engineer for testing before use. Do not proceed with construction until the Engineer has completed testing and has approved the material for use.

At any time during application, the Engineer may sample and test all subsequent loads of emulsified asphalt delivered to the project to verify and determine compliance with specification requirements. Where these tests identify material outside specification requirements, the Engineer may require the supplier to cease shipment of that pre-tested product. Further shipment of that pre-tested product will remain suspended until the cause of the problem is evaluated and corrected by the supplier to the satisfaction of the Engineer.

##### **335-2.2 Aggregate:**

**335-2.2.1 General:** Use an aggregate consisting of 100% crushed granite. To assure the material is 100 percent crushed, the parent aggregate will be larger than the largest stone in the gradation used. Use aggregate sources from the list of "granitic" aggregates available on the Florida Department of Transportation's website and also meeting the requirements of this

Specification. The URL for obtaining the list of "granitic" aggregates is: <https://mac.fdot.gov/smreports>. Select the third link on the left "Approved Aggregate Products For Friction Course".

**335-2.2.2 Aggregate Quality Tests:** In addition to the requirements of FDOT Standard Specification Sections 901 and 902, meet the minimum aggregate requirements of Table 335-1.

Table 335-1 Quality Tests for Aggregate		
AASHTO Test No.	Aggregate Property	Specification Requirements
AASHTO T 176	Sand Equivalent	65 Minimum
AASHTO T 104	Soundness	15% Maximum using Na <sub>2</sub> SO <sub>4</sub> or 25% Maximum using MgSO <sub>4</sub>
AASHTO T 96	Abrasion Resistance <sup>(1)</sup>	30% Maximum
1. The abrasion test will be performed on the parent aggregate.		

**335-2.2.3 Gradation Requirements:** When tested in accordance with FM 1-T027 and FM 1-T011, the target (mix design) aggregate gradation, including the mineral filler, shall be within the gradation range for a Type II mixture shown in Table 335-2, Column II.

Table 335-2 Mix Design Gradation Requirements		
Sieve Size	Type II Mix Design Range Percent Passing	Stockpile Tolerance from Mix Design Percent Passing
3/8 inch	100	N/A
No. 4	90 – 100	± 5%
No. 8	65 – 90	± 5%
No. 16	45 – 70	± 5%
No. 30	30 – 50	± 5%
No. 50	18 – 30	± 4%
No. 100	10 – 21	± 3%
No. 200	5 – 15	± 2%

The aggregate will be accepted from the stockpile located at the project. The stockpile will be accepted based on five quality control gradation tests conducted in accordance with FM 1-T002. If the average of the five gradation tests is within the stockpile tolerances shown in Table 335-2, Column III, for all the sieve sizes, then the stockpile is accepted. If the average of the five gradation tests is not within the stockpile tolerances shown in Table 335-2, Column III, for any sieve size, remove the stockpiled material and replace it with new aggregate or blend other aggregate sources with the stockpiled material. Aggregates used in blending must meet the quality tests shown in Table 335-1 before blending and must be blended in a manner to produce a consistent gradation and sand equivalent value. If new aggregate is obtained or blending of aggregates is performed resulting in an aggregate that is not represented by the mix design, submit a new mix design to the Engineer for approval prior to production of the mix.

The Engineer may obtain stockpile samples at any time. If the average of five gradation tests conducted in accordance with FM 1-T002 is not within the gradation tolerances shown in Table 335-2, Column III, for any sieve size, cease production until the problem is corrected to the satisfaction of the Engineer.

Screen all stockpiled aggregates at the stockpile area prior to delivery to the paving machine to remove oversize material and non-desirable particles.

**335-2.3 Mineral Filler:** If mineral filler is utilized in the mix design, use non-air-entrained portland cement or hydrated lime that is free from lumps. The Engineer will accept the mineral filler by visual inspection. The type and amount of mineral filler shall be determined by a laboratory mix design and will be considered as part of the aggregate gradation. An increase or decrease of less than one percent mineral filler may be permitted during production if it is found to result in better consistency or set times. Any changes to the percentage of mineral filler must meet the requirements of Table 335-4.

**335-2.4 Water:** Use water that is potable and free of harmful soluble salts, reactive chemicals, or any other contaminants.

**335-2.5 Additives:** Additives may be added to the mixture or any of the component materials to provide control of quick-trafficking properties. The additives to be used should be indicated on the mix design and must be compatible with the other components of the mix.

### **335-3 Personnel Qualifications.**

As part of the Bid, submit a list of at least three projects, completed within the last three years, where the work included micro surfacing. For each project listed, include a brief description of the project, project owner's name, and the name, title and current phone number of a project owner representative. Include documentation that verifies the Specification criteria for each project was met.

### **335-4 Mix Design.**

Before work begins, submit a mix design to the Engineer. The mix design must have been developed using the specific materials to be used on the project. The mix design shall be developed by a laboratory that is endorsed by the International Slurry Surfacing Association (ISSA) and has experience in designing micro surfacing mixtures.

Include supporting test data indicating compliance with all mix design criteria to the Engineer. Allow the Engineer a maximum of two weeks to either conditionally verify or reject the mix design.

Meet the requirements provided in Table 335-3. After the mix design has been approved, no substitutions to the mix design will be permitted, unless approved by the Engineer. The Engineer will consider inadequate field performance of a mix as sufficient evidence that the properties of the mix related to the mix design have changed, and the Engineer will no longer allow the use of the mix design. The project will be stopped until it is demonstrated that those properties, or issues, have been sufficiently addressed.



Table 335-3 Mix Design Testing Requirements		
ISSA(1) Test No.	Property	Specification Requirements
ISSA TB-139(2)	Wet Cohesion: @ 30 Minutes, Minimum (Set) @ 60 Minutes, Minimum (Traffic)	12 kg-cm Minimum 20 kg-cm Minimum or Near Spin
ISSA TB-109	Excess Asphalt by Loaded Wheel Tester (LWT) Sand Adhesion	50 g/ft <sup>2</sup> Maximum
ISSA TB-114	Wet Stripping	90% Minimum
ISSA TB-100	Wet-track Abrasion Loss: One-hour Soak Six-day Soak	50 g/ft <sup>2</sup> Maximum 75 g/ft <sup>2</sup> Maximum
ISSA TB-147	Lateral Displacement after 1,000 Cycles of 125 lb. Specific Gravity	5% Maximum 2.10 Maximum
ISSA TB-113(2)	Mix Time @ 77°F (25°C)	Controllable to 120 Seconds Minimum
1. ISSA = International Slurry Surfacing Association 2. The Cohesion test and Mixing Time test should be checked and reported for the highest temperatures expected during construction.		

The mix design must clearly show the proportions of aggregate, emulsified asphalt, mineral filler, water, and additive usage based on the dry weight of the aggregate. Meet the mix design component material requirements provided in Table 335-4.

Table 335-4 Mix Design Component Material Requirements	
Component Materials	Specification Requirements
Residual Asphalt	5.5 to 10.5% (by dry weight of aggregate)
Mineral Filler	0.5 to 3.0% (by dry weight of aggregate)
Polymer-based Modifier	Minimum of 3.0% (solids based on asphalt weight content)
Additives	As needed
Water	As required to produce proper mix consistency

The materials (aggregates, emulsion, mineral filler, and additives) must be from the same source, grade, and type used to develop the approved mix design. Any substitutions or alternate supplies must be preapproved by the Engineer. Changes in the aggregate source or emulsion source requires re-validating the mix design and the performance properties. Do not blend, commingle or otherwise combine materials from two or more sources, grades, or types not noted in the approved mix design. Aggregate stockpiles and emulsion material should be located at or near the job site in sufficient quantity for the job or designated parts of the job.

### 335-5 Equipment.

**335-5.1 General:** Maintain all equipment, tools, and machines used in the performance of this work in satisfactory working condition at all times to ensure a high-quality product.

**335-5.2 Mixing Equipment:** Use a machine specifically designed and manufactured to place micro surfacing. Truck mounted and self-loading continuous machines are acceptable. Mix the material with an automatic-sequenced, self-propelled, micro surfacing mixing machine. It shall be a continuous-flow mixing unit able to accurately deliver and proportion the mix components through a revolving multi-blade, double-shafted mixer and to discharge the mixed product on a continuous-flow basis. The machine shall have sufficient storage capacity for all mix components to maintain an adequate supply to the proportioning controls.

Self-loading continuous machines shall be capable of loading materials while continuing to lay micro surfacing, thereby minimizing construction joints. Self-loading continuous machines shall be equipped to allow the operator to have full control of the forward and reverse speeds during applications of the micro surfacing material and shall be equipped with opposite-side driver stations to assist in alignment. The self-loading device, opposite-side driver stations, and forward and reverse speed controls shall be original equipment-manufacturer design.

**335-5.3 Proportioning Device:** Provide and properly mark individual volume or weight controls for proportioning each material to be added to the mix (i.e., aggregate, mineral filler, emulsified asphalt, additives, and water).

**335-5.4 Spreading Equipment:** Provide a front seal to ensure no loss of the mixture at the road contact point. The rear seal shall act as a final strike-off and shall be adjustable. The spreader box and rear strike-off shall be so designed and operated that a uniform consistency is achieved and a free flow of material is provided to the rear strike-off. Provide a secondary strike-off to improve surface texture.

**335-5.5 Auxiliary Equipment:** Provide suitable surface preparation equipment, traffic control equipment, hand tools, and any other support and safety equipment necessary to perform the work.

### **335-6 Calibration.**

Calibrate each mixing unit to be used in the performance of the work in the presence of the Engineer prior to the start of construction. Document the individual calibration of each material at various settings, which can be related to the machine metering devices. Do not use any mixing unit on the project until the calibration has been completed and approved by the Engineer. Any component replacement affecting material proportioning requires that the machine be recalibrated.

### **335-7 Weather Limitations.**

Do not apply micro surfacing if either the pavement or air temperature is below 50°F. Do not apply micro surfacing when there is the possibility that the finished product will freeze within 24 hours. Do not apply micro surfacing in the rain or when there is standing water on the pavement. The mixture shall not be applied when weather conditions prevent opening to traffic within a reasonable amount of time, as determined by the Engineer.

### **335-78 Surface Preparation.**

**335-8.1 General:** Utilize water blasting to roughen the surface of any thermoplastic striping materials from both the surface of the pavement and from the rumble striping depressions to the satisfaction of the Engineer. Remove any raised pavement markers in the areas to be micro surfaced. Provide temporary striping as necessary to comply with Contract Document requirements. Immediately prior to applying the micro surfacing, clear the surface of

all loose material, silt spots, vegetation, and other material that will negatively affect the quality of the micro surfacing, utilizing any standard cleaning method. If water is used for cleaning, allow any unsealed cracks to dry thoroughly before applying micro surfacing. Protect manholes, valve boxes, drop inlets and other service entrances from the micro surfacing mixture by a suitable method. The Engineer will approve the surface preparation prior to micro surfacing. No loose aggregate, either spilled from the lay-down machine or existing on the road, will be permitted.

**335-8.2 Tack Coat:** Place a tack coat on all pavement prior to constructing a micro surfacing course. Use a non-tracking tack coat listed on the Department's Approved Products List (APL). It may consist of one-part emulsified asphalt to three parts water and should be applied with a standard distributor. The distributor shall be capable of applying the tack evenly at an emulsion rate of 0.05-0.15 gallons per square yard.

### **335-9 Application.**

**335-9.1 General:** The micro surfacing shall be of the desired consistency upon leaving the mixer. Carry a sufficient amount of material in all parts of the spreader box at all times so that complete coverage is obtained. Avoid overloading of the spreader box. Do not allow lumping, balling, or unmixed aggregate in the micro surfacing mixture.

Do not permit transverse ripples of 1/8 inch in depth or greater within the rumble stripe.

**335-9.2 Application Rate:** Fill in the rumble stripe depressions completely in one pass so that when the micro surfacing material is cured, the material will be flush with the surface of the surrounding pavement but no more than 1/8 inch higher than the surface of the pavement surrounding the rumble stripe. Do not exceed a spread width greater than 5 inches each side of the rumble stripe. Maintain the spread width of the micro surfacing down the longitudinal length of application material within 2 inches. In addition, maintain the centerline of the spread width of the micro surfacing within plus or minus 2 inches of the center of the rumble stripes.

For situations where the depths of the rumble stripe depressions are too deep to be filled in one pass while assuring mixture stability within one hour, two passes may be used with the approval of the Engineer. Prior to placing the second pass of micro surfacing, assure that the first pass has cured sufficiently to the point where the first pass of material will not shove or distort if loaded.

**335-9.3 Mix Stability:** Produce a micro surfacing mixture that possesses sufficient stability so that premature breaking of the material in the spreader box does not occur. The mixture shall be homogeneous during and following mixing and spreading. The mixture shall be free of excess water or emulsified asphalt and free of segregation of the emulsified asphalt and aggregate fines from the coarser aggregate. Do not spray water directly into the spreader box while applying micro surfacing material under any circumstances.

**335-9.4 Handwork:** Utilize hand squeegees to provide complete and uniform coverage of micro surfaced areas that cannot be reached with the mixing machine. Lightly dampen the area to be hand worked prior to mix placement, if necessary. Care shall be exercised to leave no unsightly appearance from handwork. When performing handwork, provide the same type of finish as that applied by the spreader box.

**335-9.5 Cleanup:** Remove micro surfacing mixture from all areas such as manholes, gutters, drainage structures, and as otherwise specified by the Engineer. On a daily basis, remove any debris resulting from the performance of the work.



**335-9.6 Post Sweeping:** Broom the surface of any loose material within 48 hours after the completion of the micro surfacing. If directed by the Engineer, perform this operation again approximately seven to ten days after completion of the micro surfacing. Additionally, clean the

### 335-10 Quality Control

**335-10.1 Material Monitoring:** Provide a computerized material monitoring system with integrated material control devices that are readily accessible and positioned so the amount of each material used can be determined at any time. Ensure the computer system is functional at the beginning of work and during each calibration. Provide a back-up electronic materials counter that is capable of recording running count totals for each material being monitored. Equip the mixer with a radar ground measuring device. The computer system shall have the capability to record, display and print the following information:

1. Individual sensor counts for emulsion, aggregate, cement, water, and additive.
2. Aggregate, emulsion, and cement output in pounds per minute.
3. Ground travel distance.
4. Spread rate in pounds per square yard.
5. Percentages of emulsion, cement, water, and additive.
6. Cumulative totals of aggregate, emulsion, cement, water, and

Additive.

7. Scale factor for all materials.

**335-10.2 Sampling and Testing:** Obtain one sample of micro surfacing mixture for each day of production. Obtain the sample by taping a piece of tar paper approximately 2 feet wide by 3 feet long at the end of the production run in the path of the micro surfacing machine. Allow the material to set up on the tar paper prior to removing from the roadway. Other means of obtaining the sample may be used if approved by the Engineer.

Using a laboratory approved by the Department, test each sample in accordance with FM 5-563 and FM 1-T030 to determine the residual asphalt content and the gradation of the sample. Evaporate any residual water from the sample prior to testing. Determine the deviation of the test results for each sample from the mix design target values. Compare the deviation from the mix design to the mixture control tolerances shown in Table 335-6. Remove and replace micro surfacing material not meeting the acceptance limits for residual asphalt content of mixture, unless approved to remain in place by the Engineer or unless the Engineer agrees to evaluate the material in place. For material not meeting the gradation acceptance limits, adjust the micro surfacing process to correct the problem. If two consecutive days production have gradation test results not meeting the acceptance limits in Table 335-6, cease production and determine the cause of the problem. Do not resume production until receiving approval from the Engineer.

Table 335-6 Aggregate and Emulsified Asphalt - Acceptance Limits	
Aggregate	Tolerance from Mix Design Target Values
Percent Passing No. 4 Sieve	± 6 percent
Percent Passing No. 8 Sieve	± 7 percent
Percent Passing No. 50 Sieve	± 6 percent
Percent Passing No. 200 Sieve	± 3.0 percent
Emulsified Asphalt	

Table 335-6 Aggregate and Emulsified Asphalt - Acceptance Limits	
Aggregate	Tolerance from Mix Design Target Values
Residual Asphalt Content of Mixture	± 0.6 percent

### 335-11 Quality Acceptance.

**335-11.1 Sampling and Testing:** The Engineer shall obtain one sample of micro surfacing mixture on the first day of production and every second day of production after the first day. The Contractor will obtain the sample for the Engineer by taping a piece of tar paper approximately 2 feet wide by 3 feet long at the end of the production run in the path of the micro surfacing machine. Allow the material to set up on the tar paper prior to removing from the roadway. Other means of obtaining the sample may be used if allowed by the Engineer.

Test each sample in accordance with FM 5-563 and FM 1-T030 to determine the residual asphalt content and the gradation of the sample. Evaporate any residual water from the sample prior to testing. Determine the deviation of the test results for each sample from the mix design target values. Compare the deviation from the mix design to the mixture control tolerances shown in Table 335-6. Remove and replace micro surfacing material not meeting the acceptance limits for residual asphalt content of mixture, unless approved to remain in place by the Engineer or unless the Engineer agrees to the Contractor evaluating the material in place.

For material not meeting the acceptance limits for aggregate gradation, adjust the micro surfacing process to correct the problem. If two consecutive gradation test results (does not have to be the same sieve size), do not meet the acceptance limits in Table 335-6, cease production and determine the cause of the problem. Do not resume production until receiving approval from the Engineer.

**335-11.2 Application Rate:** Control the application rate for micro surfacing per 335-9.2. Correct any areas not meeting these requirements. The correction plan must be approved by the Engineer prior to the commencement of corrections.

### 335-12 Method of Measurement.

The quantity to be paid for micro surfacing filling edgeline rumble stripe will be the length, in miles, completed and accepted. Measure right and left edgelines separately.

The quantity to be paid for micro surfacing filling of centerline rumble striping will be the length, in miles, completed and accepted.

### 335-13 Basis of Payment.

Price and payment will be full compensation for performing all micro surfacing work specified in this section.

Payment will be made under:

Item No. 917-335- Microsurfacing - per mile