**MICRO SURFACING:**

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| (7-1-95) (Rev. 3-18-25) | SPI 6-18 |

**Description**

This provision covers the micro surfacing materials, equipment, construction and application procedures for surfacing, leveling or rut filling of existing paved surfaces in accordance with the contract. The micro surfacing system shall be a mixture of cationic latex modified asphalt emulsion, mineral aggregate, mineral filler, water and other additives, properly proportioned, mixed and spread on the paved surface in accordance with this provision and as directed by the Engineer.

**Materials**

(A) Latex Modified Emulsified Asphalt

The emulsified asphalt shall be a cationic type CQS-1hLM and shall conform to AASHTO M 208 or ASTM D2397. In general, 3% polymer solids, based on asphalt weight, is considered minimum. The ring and ball softening point of the residue shall be a minimum of 135°F. It shall show no separation after mixing. The cement mixing test is waived for the latex modified CQS-1hLM.

(B) Mineral Aggregate

The mineral aggregate used shall be compatible with the latex modified emulsified asphalt and can produce a good skid resistant surface. The aggregate shall meet requirements in Article 1012-1 of the *Standard Specifications*.

(C) Mineral Filler

Mineral filler shall be any recognized brand of non-air entrained Portland cement that is free of lumps or hydrated lime meeting the requirements of ASTM D242. It may be accepted upon visual inspection.

(D) Water

The water shall be potable and shall be free of harmful soluble salts in accordance with Article 1024-4 of the *Standard Specifications*.

(E) Latex Modifier

A latex based modifier, certified from an approved source, along with special emulsifiers shall be milled into the asphalt emulsion by an approved emulsion manufacturer.

(F) Other Additives

The additives are any other materials that are added to the emulsion mix or to any of the component materials to provide the specified properties. The additives shall be supplied by the emulsion manufacturer to provide control of the set time in the field.

**Mix Design**

The Contractor is required to design the asphalt mix and to obtain an approved Job Mix Formula (JMF) issued by the Department. A mix design and proposed JMF targets for each required mix type and combination of aggregates must be submitted in electronic format to the Materials and Tests Unit for review and approval at least 10 days prior to start of asphalt mix production. The mix design shall conform to the International Slurry Surfacing Association’s ISSA A143, Section 5.2.

Compatibility of the aggregate test results and a certificate of analysis (COA) for the latex modified CQS-1hlm shall be submitted with the mix design.

Aggregate used in the job mix formula shall be of the material proposed by the Contractor for use on the project.

The gradation of the aggregate shall be in accordance with the following:

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| --- | --- | --- | --- |
| **Screen Size** | **Type II (% passing)** | **Type III (% passing)** | **Stockpile Tolerance (%)** |
| 3/8" | 100 | 100 |  |
| #4 | 90 - 100 | 70 - 90 | ± 5 |
| #8 | 65 - 90 | 45 - 70 | ± 5 |
| #16 | 45 - 70 | 28 - 50 | ± 5 |
| #30 | 30 - 50 | 19 - 34 | ± 5 |
| #50 | 18 - 30 | 12 - 25 | ± 4 |
| #100 | 10 - 21 | 7 - 18 | ± 3 |
| #200 | 5 - 15 | 5 - 15 | ± 2 |

The gradation of the aggregate stockpile shall not vary by more than the stockpile tolerance from the mix design gradation (indicated in the table above) while also remaining within the specification gradation band. The percentage of aggregate passing any 2 successive sieves shall not change from one end of the specified range to the other end. (The #200 sieve material shall not vary by more than ± 2 of the JMF value.)

The aggregate will be accepted at the job location or stockpile based on 2 gradation tests sampled according to AASHTO T 2. If the average of the 2 tests is within the stockpile tolerance from the mix design gradation, the material will be accepted. If the average of those test results is out of specification or tolerance, the Contractor will be given the choice to either remove the material or blend additional aggregate with the stockpile material to bring it into compliance. Materials used in blending shall meet the required aggregate quality test specifications in Section 1012 of the *Standard Specifications* before blending and shall be blended in a manner to produce a consistent gradation. Aggregate blending may require a new mix design. Screening shall be required at the stockpile if there are any problems created by oversized materials in the mix.

The mineral aggregate shall be weighed by means of scale approved by the Engineer before delivery to the job site. Emulsified asphalt shall be weighed by means of approved scales or be measured by volume.

Precautions shall be taken to ensure that stockpiles do not become contaminated.

Samples for gradation will be taken from aggregate stockpiles designated by the Contractor for use. Samples for asphalt content shall be taken from the completed mix. Samples of aggregate and filler will be taken at the job site. The frequency of sampling and testing will be established by the Engineer based upon the Department's current acceptance program. The asphalt content will be determined by AASHTO T 308 modified.

**Equipment**

Use equipment that meets ISSA A143 Section 6.

Each mixing unit to be used in performance of the work shall be calibrated in the presence of the Engineer before beginning the work. Submit calibration documentation to the Engineer. Any equipment replacement affecting material proportioning requires that the machine be recalibrated. No machine will be allowed to work on the project until the calibration has been accepted by the Engineer.

**Construction Methods**

(A) Weather

Place material only when the surface is dry and the atmospheric and surface temperature is at least 50°F and rising and there is no chance of temperatures below 32°F within 24 hours from the time the material is applied. Do not place the material when the atmospheric temperature is 50°F and falling or if rain is imminent.

(B) Surface Preparation

Immediately prior to applying the paving mixture the surface shall be thoroughly cleaned of all vegetation, loose materials, dirt, mud, and other deleterious materials. Protect and cover all manholes, valve boxes, drop inlets and other service entrances prior to installation of the micro surfacing. Remove all thermoplastic lines, symbols and characters in accordance with Subarticle 1205-3(I) of the *Standard Specifications*. Remove raised pavement markers and snowplowable delineation and prepare the surface for micro surfacing as directed by the Engineer. Snowplowable delineation treatments include but are not limited to polycarbonate H-shaped markers, inlaid raised pavement markers, 10' rumble skips, inlaid cradle markers and 10' inlaid pavement markings. As directed by the Engineer remove any other additional pavement markings prior to micro surfacing in accordance with Subarticle 1205-3(I) of the *Standard Specifications.*

(C) Tack Coat for Micro Surfacing

The tack coat used should conform to the manufacturer’s recommendation for the micro surfacing product being applied. The emulsified asphalt used for tack coat shall be CSS, CQS or the micro surfacing emulsion diluted to one-part emulsified asphalt to 2 or 3 parts water, as approved by the Engineer. Consult with the micro surfacing emulsion supplier to determine dilution stability. The distributor shall be capable of applying the diluted tack coat evenly at a rate of 0.05 to 0.10 gallons per square yard as required by the Engineer. Cure the tack coat sufficiently before the application of micro surfacing.

(D) Application

Always carry sufficient micro surfacing material to all parts of the spreader box so that complete coverage is obtained. Water in very limited quantity may be sprayed into the spreader box to prevent build-up on the blades to facilitate spreading without harming the mix. No lumping, balling, or unmixed aggregate shall be permitted in the finished surface. Screen any oversized aggregate or foreign materials from the aggregate prior to delivery to the mixing machine.

In restricted areas where hand spreading is necessary, slight adjustments to the mix formula may be required to slow setting time. Pour the paving mixture into a small windrow along one edge of the surface to be covered. Spread the mixture uniformly by a hand squeegee.

The seam where two passes join shall be neat in appearance and uniform.

All excess material shall be removed from ends of each run immediately on surface course.

1. Single Course

Micro surfacing, as a single course application, for the final surface course shall be placed at a dry aggregate weight of 18 to 22 pounds per square yard for Type II and 20 to 24 pounds per square yard for Type III.

1. Scratch or Leveling Course

Apply a full width scratch or leveling course with the spreader box using a stiff rubber strike-off. Spread the mixture to fill minor cracks, minor surface irregularities, and shallow potholes and leave a uniform high-skid resistant application of aggregate and asphalt on the surface. Use squeegees to hand spread the mixture in areas inaccessible to the spreader box or as directed by the Engineer.

In a Type II/Type II double course application, apply the leveling course at a dry aggregate minimum weight of 16 pounds per square yard. Apply the surface course at 16 to 20 pounds per square yard. The combined dry aggregate minimum weight shall be 32 pounds per square yard.

In a Type III/Type II double course application, apply the Type III leveling course at a dry aggregate minimum weight of 20 pounds per square yard. Apply the Type II surface course at a dry aggregate weight of 16 to 20 pounds per square yard. The combined dry aggregate minimum weight shall be 36 pounds per square yard.

In a Type III/Type III double course application, apply the leveling course at a dry aggregate minimum weight of 20 pounds per square yard. Apply the surface course at a dry aggregate weight of 20 to 24 pounds per square yard. The combined dry aggregate minimum weight shall be 40 pounds per square yard.

1. Rut Fill Course

Use Type III micro surfacing for rut filling. The rut fill box shall be 5 to 6 feet in 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. Equip the box with dual steel strike-off to control both the width and depth of the rut fill.

(E) Curing

Curing of micro surfacing shall be allowed to take place without traffic interruption for 45 – 90 minutes. The Contractor shall determine the appropriate curing time of the micro surfacing before it is opened up to traffic. Adequate means shall be provided to protect the micro surfacing from damage by traffic until the mixture has cured sufficiently so that it will not adhere to or be picked up by the tire of vehicles. Adjust mixture properties according to humidity and temperature conditions if curing is not occurring within 90 minutes. Stopping and starting traffic may require additional curing time. Cure all rut-filling and leveling courses under traffic for at least 8 hours before additional material is placed. During the curing time, the temperature cannot drop below 32ºF, this time does not count towards the curing requirements.

Any damage done by traffic to the micro surfacing shall be repaired by the Contractor.

(F) Test Strip

A test strip shall be placed with job site materials and approved by the Engineer. The test strip shall be a minimum of 500 feet and constructed at the beginning of the first day of production and after, as directed by the Engineer. The weather and time of day, day or night, during the test strip shall be similar to expected conditions during construction. If approved by the Engineer, the test section will be incorporated into the production section.

**Workmanship**

Immediately take corrective action if micro surfacing material is exhibiting evidence of poor workmanship, delayed opening to traffic, or surface irregularities, including excessive scratch marks, drag marks, tears, streaks, raveling, delamination and segregation. After immediately contacting the NCDOT Pavement Preservation Engineer in the Materials and Tests Unit, the Engineer may allow placement to continue for no more than 1 day of production while the Contractor takes corrective action and/or takes corrective action as directed by the Engineer. If workmanship issues persist after the 1-day period, the Engineer will suspend paving until corrective action is taken to the satisfaction of the Engineer.

(A) Finished Surface

Provide a finished surface with a uniform texture free from excessive scratch marks, tears, or other surface irregularities. Marks, tears, or irregularities are considered excessive if:

1. More than 1 irregularity is at least 1/4 inch wide and at least 10 feet long in any 100 foot pull
2. More than 3 irregularities are at least 1/2 inch wide and more than 6 feet long in any 100 foot pull

(3) Any are 1 inch wide or wider and more than 4 inch in length

(B) Construction Joints

Place mixture so that longitudinal joints on the surface course coincide with lane lines, or as directed by the Engineer. Provide longitudinal and transverse joints that are uniform and neat in appearance. Provide construction joints that have limited buildup and no gaps between applications. Joints with buildup will be considered acceptable if:

1. No more than 1/2 inch vertical space exists between the pavement surface and a 4 foot straightedge placed perpendicular to the longitudinal joint and
2. No more than 1/4 inch vertical space exists between the pavement surface and

a 4 foot straightedge placed perpendicular to the transverse joint.

(C) Edges

Provide an edge along the roadway centerline, lane lines, shoulder, edge of pavement, or curb line that is uniform and neat in appearance. The edge is considered acceptable when:

1. It varies no more than 3 inches from a 100 foot straight line on a tangent section and
2. It varies no more than 3 inches from a 100 foot arc on a curved section.

(D) Miscellaneous Areas

Use a single-batch-type-lay-down machine or approved method to place materials on ramps or other short sections. Apply tack coat uniformly at the rate as shown in the contract, unless otherwise directed by the Engineer. Provide uniform coverage of appearance and comparable to that produced by the spreader box.

**Measurement and Payment**

(A) When a surface or leveling course is applied, measurement and payment is as follows.

*Micro Surfacing Single Course, Type \_\_\_* and *Micro Surfacing Double Course, Type \_\_\_/Type \_\_\_\_* will be measured along the top surface of the completed work, placed and accepted as specified herein. Payment will be made at the contract unit price per square yard for the type or types specified, which price will be full compensation for all materials including modifiers and additives, emulsion, aggregate, tack coat, labor, tools, equipment, and all other incidentals necessary to complete the work.

*Removal of Pavement Marking Lines, \_\_\_"* and *Removal of Pavement Marking Symbols & Characters* will be measured and paid for in accordance with Article 1205-10.

*Removal of Raised Pavement Markers* will be measured and paid in units of each. Such price includes but is not limited to removing the raised pavement markers, preparing the surface for micro surfacing and other incidentals necessary to complete the work.

*Removal of Snowplowable Delineation* will be measured and paid in units of each. Such price includes but is not limited to removing the snowplowable delineation treatment, preparing the surface for micro surfacing and other incidentals necessary to complete the work.

(B) When a rut filling course is applied, measurement and payment is as follows.

*Micro Surfacing Rut Fill Course* will be measured along the top surface of the completed work, placed and accepted as specified herein. Payment will be made at the contract unit price per ton, which price will be full compensation for all materials including modifiers and additives, emulsion, aggregate, tack coat, labor, tools, equipment, and all other incidentals necessary to complete the work.

*Removal of Pavement Marking Lines, \_\_\_"* and *Removal of Pavement Marking Symbols & Characters* will be measured and paid for in accordance with Article 1205-10*.*

*Removal of Raised Pavement Markers* will be measured and paid in units of each. Such price includes but is not limited to removing the raised pavement markers, preparing the surface for micro surfacing and other incidentals necessary to complete the work.

*Removal of Snowplowable Delineation* will be measured and paid in units of each. Such price includes but is not limited to removing the snowplowable delineation treatment, preparing the surface for micro surfacing and other incidentals necessary to complete the work.

Micro surfacing will be measured and paid by either (A) or (B) as described herein.

Payment will be made under:

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| --- | --- |
| **Pay Item** | **Pay Unit** |
| Micro Surfacing Single Course, Type \_\_\_ | Square Yard |
| Micro Surfacing Double Course, Type \_\_\_/Type \_\_\_ | Square Yard |
| Micro Surfacing Rut Fill Course | Ton |
| Removal of Raised Pavement Markers | Each |
| Removal of Snowplowable Delineation | Each |