



## Iowa Department of Transportation

### SUPPLEMENTAL SPECIFICATIONS FOR POLYMER-MODIFIED MICROSURFACING

Effective Date  
November 19, 2013

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SUPPLEMENTAL SPECIFICATIONS AND THEY PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

#### 12006.01 DESCRIPTION.

Applying a properly proportioned, mixed, and uniformly spread mixture of polymer-modified emulsified asphalt, mineral aggregate, mineral filler, water, and necessary additives on existing roadway surfaces.

#### 12006.02 MATERIALS.

##### A. Polymer-Modified Emulsified Asphalt.

1. Use a blend of emulsified quick-set polymer-modified CSS-1H asphalt and latex-based polymer.
2. Use a polymer material milled or blended into asphalt or blended into emulsifier solution prior to emulsification process.
3. The laboratory performing the mix design is to determine the amount and type of latex-based polymer modifier based on the percent of asphalt by weight (mass) of asphalt, with 3% polymer solids as the minimum. Provide the Engineer, at the time of delivery, a certification from the emulsion manufacturer that 3% minimum polymers have been added to the emulsion.
4. Use CSS-1H polymer-modified emulsified asphalt complying with the requirements of AASHTO M 208, with the following modifications and additions:
  - a. The storage stability and cement mixing test is not required for this emulsion.

<u>TEST</u>	<u>QUALITY</u>	<u>REQUIREMENTS</u>
AASHTO T 59	Residue after distillation	62% minimum

- b. Modify the standard distillation procedure as follows:

Slowly bring the temperature on the lower thermometer to 350°F +/- 10°F (177°C +/- 5°C) and maintain at this level for 20 minutes. The total distillation shall be completed in 60 minutes +/- 5 minutes from the first application of heat.

**TEST ON RESIDUE**

AASHTO T 53

Ring and Ball Softening Point

135°F (57°C) minimum

**B. Aggregate.**

1. Use mineral aggregate composed of a combination of crushed stone and mineral filler meeting the following requirements based on the friction classification specified in the contract documents. Aggregate source frictional classifications can be found in Materials I.M. T-203.

**a. Friction Classification L-2.**

Use Friction Type 2 crushed stone complying with the following:

- Table 4124.03-1 of the Standard Specifications with the following exceptions:
  - Maximum abrasion loss of 30%, and
  - Sand equivalence of not less than 60.
- Objectionable materials limits in Table 12006.02-01.

**b. Friction Classification L-4.**

Use Friction Type 4 or better crushed stone complying with the following:

- Table 4124.03-1 of the Standard Specifications, and
- Objectionable materials limits in Table 12006.02-01.

**c. No Special Friction Requirement.**

Use Friction Type 5 or better crushed stone complying with the following:

- Table 4124.03-1 of the Standard Specifications, and
- Objectionable materials limits in Table 12006.02-01.

**Table 12006.02-01: Maximum Permissible Amounts of Objectionable Material**

Objectionable Materials	Maximum Percent Allowed	Test Method
Unsound chert particles retained on No. 4 (4.75 mm) sieve	0.5	Materials I.M. 372
Total of all unsound chert, shale, coal, and iron combined	1.0	Materials I.M. 372
Clay Lumps/Friable Particles	0.5	Materials I.M. 368
Organic Materials, except coal	0.1	Office of Materials Test Method No. Iowa 215

1. ~~Crushed stone from sources that will produce aggregate complying with the following: An abrasion loss no more than 30% and a freezing and thaw loss of no more than 10 (Iowa Materials Laboratory Test Method 211, Method A) when tested using aggregate crushed to 3/4 inch (19 mm) maximum size.~~

~~Free of deleterious materials.~~

~~Type 2 or Type 3 friction classification according to Materials I.M. T-203.~~

~~Sand equivalent of not less than 60, as determined according to AASHTO T 176.~~

2. The job mix (target) gradation within the gradation band specified below. The percent passing shall not go from the high end to the low end of the range for any two consecutive screens.

Sieve Size	Percent Passing
3/8" (9.5 mm)	100
#4 (4.75 mm)	90-100
#8 (2.36 mm)	65-90
#16 (1.18 mm)	45-70
#30 (600 µm)	30-50
#50 (300 µm)	18-30

#100 (150 µm)	10-21
#200 (75 µm)	5-15

**C. Mineral Filler.**

Free of lumps and meeting the requirements for Type I Portland Cement according to Section 4101 of the Standard Specifications.

**D. Water.**

Comply with Section 4102 of the Standard Specifications.

**E. Additives.**

Additives may be added to the emulsion mix or any of the component materials to provide control of the quick-set properties and increase adhesion. Additives must be included as part of the mix design and be certified as to their compatibility with other components of the mix.

**F. Composition and Quality of Mixture.**

1. An approved mix design will be required prior to beginning placement of the microsurfacing mixture. Designing and proportion the mixture. Comply with the following:  
 Mix design prepared by a laboratory having three or more years experience in designing microsurfacing.  
 Microsurfacing mixture designed according to the International Slurry Surfacing Association (ISSA) guidelines.  
 Submit the proposed mix design to the Materials Bituminous Engineer in the Central Laboratory for approval with a copy to the District Materials Engineer. The Central Laboratory will review the mix design within 14 calendar days.  
 Along with the proposed mix design include all test results, proportions of all ingredients of the mixture, and gradation of the aggregate proposed for use.
2. Ensure the mix design designates the proportions to be used within the following limits:  
 Mineral aggregate for microsurfacing: 10-20 pounds per square yard (dry weight) (5-11 kg/m<sup>2</sup> (dry mass)).  
 Polymer-Modified Emulsified Asphalt, P.M. CSS-1H: residual asphalt 6% to 12% by dry weight (mass) of aggregate.  
 Mineral Filler: 0.5% to 3.0% by dry weight (mass) of aggregate.  
 Water: as needed to provide proper consistency.
3. For the microsurfacing mixture, meet the following requirements:

<u>TEST</u>	<u>DESCRIPTION</u>	<u>REQUIREMENTS</u>
ISSA TB-139	WET COHESION	
	@ 30 minutes (set)	10 lb-in (12 kg-cm) minimum
	@ 60 minutes (traffic)	17 lb-in (20 kg-cm) minimum
ISSA TB-109	Excess Asphalt by LWT	50 g/ft <sup>2</sup> (538 g/m <sup>2</sup> ) maximum
ISSA TB-114	Wet Stripping	Pass (90% minimum)
ISSA TB-100	Wet Track Abrasion Loss	
	One hour soak	50 g/ft <sup>2</sup> (538 g/m <sup>2</sup> ) maximum
	Six Day Soak	75 g/ft <sup>2</sup> (807 g/m <sup>2</sup> ) maximum
ISSA TB-147A	Lateral Displacement	5% maximum

	Specific Gravity after 1000 cycles of 125 lbs. (57 kg)	2.10 maximum
ISSA TB-144	Classification	(AAA, BAA)
	Compatibility	11 grade points minimum
ISSA TB-113	Mix Time @ 77°F (25°C)	Controllable to 120 sec. minimum

### **12006.03 CONSTRUCTION.**

#### **A. Equipment.**

1. Use a spreading machine designed and manufactured to perform microsurfacing work, including prewetting the surface. To mix the material, use an automatic sequenced, self-propelled microsurfacing mixing machine, able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, control setting additive and water to a revolving multi-blade double shafted mixer, and discharge the mixed product on a continuous flow basis. Use a mixing machine with sufficient storage capacity for aggregate, emulsified asphalt, mineral filler, control additive and water to ensure a constant flow of a homogeneous slurry mixture.
2. Use equipment providing individual volume or weight controls for proportioning each material to be added to the mix. Calibrate and properly mark each material control device.
3. Equip the aggregate feed to the mixer with a revolution counter or similar device so that the amount of aggregate used may be determined at any time.
4. Use equipment with a positive displacement type emulsion pump equipped with a revolution counter or similar device so that the amount of emulsion used may be determined at any time.
5. Use a mixing machine equipped with a pressurized water system and a nozzle-type spray bar to provide water spray to the roadway surface immediately ahead of and outside the spreader box.
6. Use a mixing machine equipped with fines feeder that delivers a uniform, positive, accurately-metered, predetermined amount of mineral filler at the same time and location that the aggregate is fed.
7. Calibrate the mixing unit in the presence of the Engineer prior to the start of construction.
8. Provide nurse trucks to ensure that legal axle loads are maintained and a steady rate of progress in the laying of the microsurfacing is made.

#### **B. Weather Limitations.**

1. Spread microsurfacing material only when the temperature on a shaded portion of the existing surface is 50°F (10°C) and rising and when the weather is not foggy or rainy.
2. Do not place Microsurfacing material after October 1 without the Engineer's written permission.

#### **C. Materials Handling.**

Furnish samples of individual materials and the microsurfacing mixture as specified in the contract documents.

**1. Stockpiling of Aggregate.**

Screen and weigh the mineral aggregate at the stockpile prior to job site delivery. Do not allow stockpiles to become contaminated with oversized rock, clay, and silt. Excess moisture which would interfere with the amount of asphalt required in producing the desired homogeneous mixture will not be permitted. Keep the stockpile in areas that drain readily. Segregation of the aggregate will not be permitted.

**2. Storage of Emulsion.**

Weigh the polymer-modified emulsified asphalt on approved scales. As an option, polymer-modified emulsified asphalt may be measured by volume. Provide suitable storage facilities for the polymer-modified emulsified asphalt that meet the following requirements:

Equipped to prevent water from entering the emulsion.

Adequately heated to prevent freezing of the polymer-modified emulsified asphalt.

**D. Preparation of Surface.**

Immediately before placing microsurfacing, thoroughly clean the area to be microsurfaced of all vegetation, loose aggregate, soil tracked onto the roadway, and other objectionable material.

**E. Test Strip.**

Prior to commencing paving operations:

Construct a minimum 300 foot (100 m) test section (a portion of which is at least 0.75 inch (19 mm) thick) to determine surface characteristics and set time.

Obtain the Engineer's approval for the test section.

**F. Spreading.****1. General.**

a. When required by local conditions, prewet the surface at a rate to dampen the entire surface without any free-flowing water ahead of the spreader box. Adjust the rate of application of the fog spray during the day to suit temperatures, surface texture, humidity, and dryness of the pavement.

b. Use a mechanical type spreader box (normally 10 to 13 feet (3 to 4 m) wide, equipped with rotating paddles or spiral augers to agitate and spread the material uniformly throughout the box) to spread the microsurfacing mixture homogeneously and uniformly. Meet the following requirements:

Flexible seals are in contact with the road to prevent loss of the mixture from the box.

A secondary strike off is provided to improve the surface texture.

The spreader is maintained to prevent the loss of the microsurfacing mixture during the surfacing of superelevated curves.

The mixture is spread to fill all crack and minor surface irregularities and leave a neat appearing uniform non-skid application of the aggregate and asphalt on the surface.

c. Remove all excess material that overruns in gutters, or squeegee the material back onto the surface. Immediately remove all excess material from ends of each day's run.

**2. Application Rate.**

Place surface treatment at a minimum application rate of 20 pounds per square yard (11 kg/m<sup>2</sup>).

**3. Finished Surface.**

The Engineer will make inspections of the finished surface at any time. On any 30 square yards (25 m<sup>2</sup>) of surface area inspected, comply with the following:

No more than four tear marks greater than 0.5 inch (13 mm) wide and/or 4 inches (100 mm) long.

No tear marks greater than 1 inch (25 mm) wide and 3 inches (75 mm) long.

No transverse ripples or longitudinal streaks of 0.25 inch (6 mm) or more in depth.

**4. Joints.**

Construct longitudinal and transverse joints without any buildups, uncovered areas or unsightly appearance, complying with the following requirements:

Longitudinal joints on lane lines are placed with less than 2 inches (50 mm) overlap on adjacent passes and no more than 0.25 inch (6 mm) difference in elevation between the adjacent passes.

Transverse joints are constructed with no more than 0.125 inch (3 mm) difference in elevation across the joint.

**5. Edges.**

Place edges in the following manner:

Neatly and uniformly along the roadway lane, shoulder, and curb lines.

Flush with curbs.

No more than +/- 2 inches (50 mm) horizontal variance in any 100 foot (30 m) segment along roadway lane and shoulder (at locations where feathered microsurfacing is identified in the contract documents, +/- 2 inches (50 mm) edge variance is not required).

**G. Opening to Traffic.**

1. Allow microsurfacing to cure sufficiently so that it will not deform or be picked up by vehicle tires. Provide signs, barricades, and flaggers necessary to control traffic around the areas under construction. Repair damage to the microsurfacing due to premature opening to traffic at no additional cost to the Contracting Authority.
2. Place microsurfacing treatment to sustain traffic within 1 hour after placement. Schedule microsurfacing placement to ensure traffic lanes are opened to traffic 30 minutes before sundown of the same working day. When traffic is maintained, keep the entire roadbed free of construction equipment during non-working hours.

**12006.04 METHOD OF MEASUREMENT.**

Measurement will be as follows:

**A. Aggregate for Microsurfacing.**

Weight (mass) of the individual loads in tons (megagrams) of aggregate, of the frictional classification specified, used in accepted portions of work. No deductions will be made for moisture naturally occurring in the aggregate. The quantity of mineral filler will be included with the aggregate quantity.

**B. Preparation of Surface for Microsurfacing.**

Plan quantity for the length of pavement prepared according to the contract documents.

**C. Emulsified Asphalt for Microsurfacing.**

Volume of emulsified asphalt including polymer latex modifier used in accepted portions of work. No deductions will be made for water in approved emulsion. The volume will be corrected for temperature to 60°F (16°C).

Materials wasted after being used for calibration purposes will be included in quantities measured for payment, not to exceed 5 tons (5 Mg) of aggregate and 100 gallons (375 L) of emulsified asphalt. The quantities of materials used for construction of a test strip will be included in the quantities of the respective bid items.

**12006.05 BASIS OF PAYMENT.**

Payment will be the contract unit price as follows:

**A. Aggregate for Microsurfacing.**

Per ton (megagram) for the number of tons (megagrams) of aggregate, of the frictional classification specified, used. Payment is full compensation for furnishing all labor, equipment, and materials (except emulsified asphalt) to complete the work and construction of the test strip.

**B. Preparation of Surface for Microsurfacing.**

Per mile (kilometer) for the length of pavement shown in the contract documents prepared for microsurfacing according to the contract documents.

**C. Emulsified Asphalt for Microsurfacing.**

Per gallon (liter) for the number of gallons (liters) of emulsified asphalt used. Payment is full compensation for furnishing the emulsified asphalt.