WARRANTED MICRO-SURFACING

The Standard Specifications are revised as follows:

SECTION 411, BEGIN LINE 1, INSERT AS FOLLOWS:

SECTION 411 – WARRANTED MICRO-SURFACING

411.01 Description. *This work will consist of furnishing of materials and the construction of warranted micro-surfacing in accordance with 105.03.*

The Contractor will be responsible for the warranted micro-surfacing for a period of three (3) years after the date all warranted micro-surfacing is completed and open to unrestricted traffic.

A Quality Control Plan in accordance with 411.16 shall be prepared and submitted to the Engineer at least 15 days prior to commencing micro-surfacing operations.

MATERIALS

411.02 Materials. *Materials shall be in accordance with the following.*

*Asphalt Emulsion ..... As Defined **
Fine Aggregates ** 904
Portland Cement, Type I..... 901.01(b)
Water..... 913.01*

** Polymer Modified Asphalt Emulsion shall be a quick-set, CSS-1h emulsion in accordance with AASHTO M 208 except the cement-mixing test is waived. The polymer material shall be milled or blended into the emulsion or blended into the emulsifier solution prior to the emulsification process. The minimum polymer solids content will be 3.0% based on the residual of the emulsion. Mix set additives shall be added as required to provide control of the quick-set properties. Additional requirements shall be in accordance with the following.*

Characteristic	*Test Method*	*Requirement*
Residue (Note 1)	*AASHTO T 59*	*62+*
Softening Point, °C (°F)	*AASHTO T 53*	*60+ (140+)*
Viscosity @ 60°C, (140°F) Poises	*AASHTO T 202*	*8000+*

Note 1. The temperature for this test shall be held below 82°C (180°F). The sample is oven evaporated on a glass plate at 25°C (77°F) for 24 h (forced draft oven). Material is then scraped from the plate with a razor blade tool.

*** The fine aggregate shall also meet 95% crushed particle requirements. Determination of crushed particles shall be made from the weight (mass) of material retained on the 4.75 mm (No. 4) sieve in accordance with ASTM D 5821. Dolomite may only be used when blended equally (by volume) with slag. The gradation for leveling and rut filling warranted micro-surfacing shall be in accordance with the following.*

Sieve Sizes	Leveling	Rut Filling
9.5 mm (3/8 in.)	100	100
4.75 mm (No. 4)	85-100	70-90
2.36 mm (No. 8)	50-80	45-70
1.18 mm (No. 16)	40-65	28-50
600 μm (No. 30)	25-45	19-34
300 μm (No. 50)	13-25	12-25
150 μm (No. 100)	7-18	7-18
75 μm (No. 200)	5-15	5-15

The Contractor will establish the Job Mix Formula (JMF) and select all materials

411.03 Design Mix Formula. *The manufacturer of the polymer-modified emulsion shall submit a Design Mix Formula (DMF) for the specific materials to be used on the project to the Engineer one week prior to use. The DMF shall state the following (all percentages are based on the dry weight of the aggregate):*

1. *source of each individual material*
2. *aggregate gradation*
3. *percentage of aggregate*
4. *percentage of mineral filler (minimum and maximum)*
5. *percentage of water (minimum and maximum)*
6. *percentage of mix set additives (if required)*
7. *percentage of polymer modified CSS-1h emulsified asphalt*
8. *state the quantitative effects of moisture content on the unit weight of the aggregate*
9. *results for the tests in the following*

Characteristic	Test Method ISSA *	Requirement
Wet Cohesion 30 Minutes, Min. (Set Time) 60 Minutes, Min. (Traffic)	TB-139 **	 12 kg-cm 20 kg-cm
Wet Stripping, Min.	TB-114	90%
Wet Track Abrasion Loss 60 Minutes Soak, Max.	TB-100	 536 g/m^2
Saturated Abrasion Compatibility, Max.	TB-144	 3g loss
Mix Time @ 25°C (77°F)	TB-113 **	Controllable to 120 seconds
Mix Time @ 40°C (104°F)	TB-113 **	Controllable to 35 seconds

* International Slurry Surfacing Association

** The TB-139 (set time) and TB-113 (mix time) tests shall be checked at the highest temperature expected during construction. For the TB-113 test at 40°C (104°F), all ingredients and containers shall be preheated.

411.04 Pre-Paving Coordination. *A pre-paving meeting between the Contractor and Engineer will be held on-site prior to beginning work. The agenda for this meeting will include as a minimum:*

1. *Contractor's detailed work schedule*

2. *Traffic control plan*
3. *Calibration of equipment*
4. *Design Mix Formula/Job Mix Formula*
5. *Inspection and evaluation of the condition and adequacy of equipment, including units for transport of materials*
6. *Conflict resolution team members*

CONSTRUCTION REQUIREMENTS

411.05 Preparation of Surfaces. *The Contractor is responsible for all surface preparation including cleaning, removal of any paint or plastic markings, and any other work that may affect the performance of warranted micro-surfacing. Drainage structures, monument boxes, water shut-offs, etc., shall be protected during application of material.*

411.06 Opening to Traffic. *The latex modifier shall be capable of producing an emulsified asphalt paving mixture that cures at a rate, which shall permit traffic on the pavement within one hour after application without damaging the pavement surface.*

411.07 Finished Pavement Properties. *The surface area shall not contain ripples greater than 3 mm (1/8 in.) measured by a 1 m (3 ft) straight edge. The surface shall not exhibit tear marks greater than 13 mm (1/2 in.) wide and 100 mm (4 in.) long, or a mark greater than 25 mm (1 in.) wide and 25 mm (1 in.) long.*

The longitudinal construction joints and lane edges shall coincide with the proposed painted lane lines. Longitudinal joints shall be constructed with less than a 75 mm (3 in.) overlap on adjacent passes and no more than 6 mm (1/4 in.) overlap thickness as measured with a 3 m (10 ft) straight edge in accordance with 409.03(f). If applicable, place overlapping passes on the uphill side to prevent ponding of water. Construct neat and uniform transverse joints with no more than a 3 mm (1/8 in.) difference in elevation across the joint as measured with a 3 m (10 ft) straight edge. The edge shall be neat and uniform with no more than 50 mm (2 in.) of horizontal variance in any 30 m (100 ft).

For a multiple course applications, the surface of a lane shall not deviate more than 6 mm (1/4 in.) in the wheelpath when measured transversely with a 3 m (10 ft) straight edge.

411.08 Warranty. *Upon completion of all warranted micro-surfacing and opening to unrestricted traffic, the Warranty Bond will be in effect for a total of three (3)-years. The warranty bond must be properly executed by a surety company satisfactory to the Department and be payable to the State of Indiana and submitted with the bid.*

The warranty bond is an amount equal to 100% of the contract total for the warranted micro-surfacing excluding patching or other work included in the contract. The bond is intended to insure completion of required warranty work, including

payments for all labor, equipment, materials and closure periods used to remediate any warranted distresses.

Upon the final acceptance of the project, the contractual obligations of the Contractor are satisfied as long as the micro-surfacing continues to meet or exceed the warranted values as defined herein.

All warranty work will be accomplished in accordance with 411.10. At the end of the warranty period, the Contractor will be released from further warranty work or responsibility, provided all previous warranty work has been satisfactorily completed and approved by the Department.

411.09 Conflict Resolution Team. *The scope of the Team includes all issues concerning the warranted pavement relative to the quality control plan, material selection, warranted pavement evaluations, distress indicators, remedial action, and remediation plans.*

The Team will consist of two Contractor representatives, two Department (District and Central Office) representatives, and a fifth person mutually agreed upon by both the Department and the Contractor. Any costs for the fifth person will be equally shared between the Department and the Contractor. The Team members will be identified in writing at the pre-construction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the measurement and calculation of pavement distress. Should any impasse develop, the Team will render a final recommendation to the Chief Engineer by a majority vote. Each member has an equal vote.

411.10 Warranty Work. *During the warranty period remedial work will be performed at no cost to the Department and will be based on the results of pavement distress surveys. Remedial work to be performed and materials to be used will be a decision of the Contractor with approval of the Department. Prior to proceeding with any warranty work or monitoring, a Miscellaneous Permit shall be obtained from the Department.*

During the warranty period, the Contractor may monitor the warranted micro-surfacing using nondestructive procedures. All proposed remedial action(s) shall be coordinated with the Department.

Coring, milling or other destructive procedures may not be performed by the Contractor, without prior consent of the Department. The Contractor will not be responsible for damages to the pavement as a result of coring, milling or other destructive procedures conducted by the Department.

The Contractor will have the first option to perform the remedial work. If, in the opinion of the Department, the problem requires immediate attention for safety of the traveling public and the Contractor cannot perform the remedial work within twenty-four (24) hours, the Department has the option to have the remedial work

performed by other forces. The Contractor will be responsible to pay for all the costs incurred. Remedial work performed by other forces will not alter the requirements, responsibilities, or obligations of the warranty.

411.11 Pavement Distress Indicators, Thresholds, and Remedial Action. *The Department will use the following pavement distress indicators throughout the warranty period:*

- *Rutting – displacement of the micro-surfacing transversely to create a rut*
- *Delamination – physical separation of the micro-surfacing*
- *Raveling – wearing away of the micro-surfacing*
- *Skid Resistance – friction number*

The Department procedures contained in the manual "Measurement and Calculation of Pavement Distress Indicators for Warranted Asphalt Pavements" will be used for measurement of rut depth and friction number.

The threshold values for each 100 m (300 ft) evaluation section are as follows:

Rut Depth …… 6 mm
Delamination…… 0.1%
Raveling …… 0.1%
Friction Number…… average 35, no value less than 25

The Department will monitor the warranted micro-surfacing during the warranty period. The final condition survey will occur by (mm,dd,yyyy). The Contractor will be notified in writing, of any required warranty work.

If any of the threshold levels are met or exceeded, the Contractor will recommend remedial action to the Department. After the remedial action is approved, the Contractor will perform the remedial work.

Remedial action will be performed on all segments of the project where the threshold levels are met or exceeded. If areas of warranted pavement, which are not within the measured area, are suspected of meeting or exceeding a threshold level, the Department will conduct a distress survey to see if a threshold level has been met or exceeded.

Remedial action will be taken by October 1 of the same calendar year as the Contractor is notified that a threshold level has been met or exceeded. If, anytime during the warranty period, 30% or more of the project segments require, or have received remedial action, then the entire project will receive a remedial action as determined by the Contractor and the Department. If an impasse develops, the Team will make a final recommendation.

If remedial action work or elective/preventive action work performed by the Contractor necessitates a corrective action to the pavement markings, adjacent lane(s)

or roadway shoulders, then such corrective action to the pavement markings, adjacent lane(s) and shoulders will be the responsibility of the Contractor.

Warranty requirements for all remediation work will be limited to the life of the original contract warranty.

If any of the threshold levels are met or exceeded and the Contractor does not agree to the pavement distress survey results or, the Department does not agree with the proposed remedial action, the Team will provide a recommendation within 30 days.

The Contractor will not be held responsible for distresses that are caused by factors beyond the control of the Contractor. For example, the Contractor will be relieved of the responsibility for the rutting threshold if the cause is not transverse movement of the micro-surfacing. The Contractor will be responsible for mixture and placement problems.

411.12 Elective/Preventive Action. *Elective/preventive action will be the Contractor's option with the concurrence of the Department.*

411.13 Department Maintenance. *The Department will perform routine maintenance during the warranty period such as plowing, applying de-icing chemicals, repairs to safety appurtenances, pavement markings, mowing and sign maintenance. The Department during the warranty period will perform no routine pavement surface maintenance activities.*

411.14 Method of Measurement. *The quantity for warranted micro-surfacing, completed and accepted in place, will be paid by the square meter (square yard). The width of the pavement course will be the width that is placed. The length will be measured along the centerline of each roadway or ramp.*

411.15 Basis of Payment. *The costs of furnishing materials, equipment, labor, and tack coat, if required, and all incidentals will be included in the cost of this work. Payment for accepted quantities, complete in place, will be made at the contract unit price for:*

Payment will be made under:

Pay Item	***Metric Pay Unit Symbol (English Pay Unit Symbol)***
Micro-Surfacing, Warranted ……	*m2 (SYD)*

411.16 Quality Control Plan for Warranted Micro-Surfacing. *The Contractor shall produce a mixture that will be in compliance with the JMF and the quality control tolerances. The methods described in this section shall be used by the Contractor to measure compliance. Contractor shall maintain all quality control documentation and make a copy available to the Engineer upon request or at completion of work.*

a. Fine Aggregate. *The Contractor shall sample from the project stockpile and test for gradation at a rate of one per 500 Mg (500 T) of aggregate used, or a minimum of one per day of mixture production. The quality control tolerances from the JMF are as follows:*

Sieve Size	*Tolerance*
4.75 mm	*± 5.0%*
2.36 mm	*± 5.0%*
1.18 mm	*± 5.0%*
600 um	*± 5.0%*
330 um	*± 4.0%*
150 um	*± 3.0%*
75 um	*± 3.0%*

b. Sand Equivalent Test. *ASTM D 2419 shall be performed with each applied aggregate gradation. Quality control tolerance ± 7% of the JMF as established in the mix design.*

c. Asphalt Content. *The Contractor shall calculate the percent asphalt content of the mixture from the equipment counter readings randomly, a minimum of three times a day. The quality control single test tolerance is ± 0.5% and the average daily asphalt content is ± 0.2% from the JMF.*

d. Application Rate. *The Contractor shall calculate the yield of the course being placed from the equipment counter readings randomly, a minimum of three times a day. The quality control tolerance from the specified application rate is ± 1 kg/m².*

e. Documentation. *Contractor shall maintain a daily report, providing the following information:*

- *Control Section*
- *Job Number*
- *Route*
- *Date*
- *Air Temperature*
- *Control Settings (Calibration Values, Unit Weight of Emulsion, Percent Residue of Emulsion)*
- *Beginning and Ending Intervals*
- *Counter Readings (and Beginning, and Ending, and Total)*
- *Length, Width, Total Area, Aggregate Quantity, Emulsion Quantity*
- *Percent of Each Material, Percent of Asphalt Cement, Application Rate, Combined Application Rate*
- *Contractor's Authorized Signature*
- *Aggregate Gradations*
- *Aggregate Delivery Tickets*
- *Asphalt Emulsion Bill of Lading*

- *Sand Equivalent Value*

A statement that all material certification, production test reports, quality control charts, test equipment certifications and calibrations, and any other material and/or design or production related records shall be maintained for a period to include the terms of the warranty. The records, either electronic and/or hard copies, shall be maintained in a readily accessible location for access by the Department at any time. Upon completion of the placement, and the opening of the warranted micro-surfacing to traffic, a copy of all records shall be provided to the Department.