SECTION 02513

MICRO-SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rehabilitation of asphaltic concrete pavement by application of a seal coat utilizing a polymer-modified asphaltic micro-surfacing product.

1.02 MEASUREMENT AND PAYMENT

A. Unit Price Contracts: Measurement for micro-surfacing is on a square yard (SY) basis. This price is full compensation for preparing the existing surface (including removal of all vegetation, loose aggregate and soil, and removing existing raised pavement parkers); protecting existing utility features (including manholes, valve boxes, inlets and other service entrances); furnishing, hauling, preparing, and placing materials; and equipment, labor, tools, and incidentals to furnish and install the micro-surface mixture complete and in-place. The composite micro-surfacing mixture is defined as the asphalt emulsion, aggregate, and mineral filler.

B. Stipulated Price (Lump Sum) Contract. If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 – Submittals.

B. Submit a mix design conforming to the proportions shown in Table 3 and meeting the requirements shown in Table 4 of Section 2.01 – Material.

C. Submit weight tickets, certified by supplier with each bulk delivery of aggregate or polymer-modified asphalt emulsion delivered to the construction site.

PART 2 PRODUCTS

2.01 MATERIAL

A. Cationic Polymer-Modified Asphalt Emulsion: Provide CSS-1P in accordance with TxDOT Item 300, Section 2.D. “Emulsified Asphalt.”

B. Mineral Aggregate: Provide a crushed aggregate from a single source meeting the requirements of Table 1 and Table 2. Unless otherwise shown on the plans, furnish aggregate with a minimum “B” Surface Aggregate Classification (SAC) as defined in TxDOT’s Bituminous Rated Source Quality Catalog (BRSQC). Include the amount of mineral filler added to the mix in determining the total minus No. 200 aggregate fraction.

Table 1
Aggregate Gradation Requirements
Tex-200-F, Part II (Washed)
Cumulative % Retained

Sieve Size	Type I	Type II
½"	0	0
3/8"	0	0 – 1
#4	0 – 10	6 – 14
#8	10 – 35	35 – 55
#16	30 – 55	54 – 75
#30	50 – 70	65 – 85
#50	70 – 82	75 – 90
#100	79 – 90	82 – 93
#200	85 – 95	85 – 95

Table 2
Aggregate Quality Requirements

Property	TxDOT Standard Laboratory Test Method	Requirement
Magnesium sulfate soundness, %, max.[1]	Tex-411-A	30
Sand equivalent value, %, min.	Tex-203-F	70
Los Angeles abrasion, %, max	Tex-410-A	30

1. Use design gradation for the soundness test.

C. Mineral Filler: Provide mineral filler that is free of lumps and foreign matter consisting of non-air-entrained cement meeting the requirements of DMS-4600, "Hydraulic Cement," or hydrated lime meeting the requirements of DMS-6350, "Lime and Lime Slurry." The type and amount of mineral filler needed 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 (1%) may be permitted when the micro-surfacing is being placed if it is found to be necessary for better consistency or set times.

D. Water: Provide water that is potable and free of harmful soluble salts.

E. Other Additives: Use approved additives as recommended by the emulsion manufacturer in the emulsion mix or in any of the component materials when necessary to adjust mix time in the field.

F. Job-Mix Formula (JMF): Provide a mix design conforming to the proportions shown in Table 3 and meeting the requirements shown in Table 4. The mix design is subject to verification using laboratory produced mixes or trial batch mix before approval.

Provide emulsion and aggregate that are compatible so that the mixing process will completely and uniformly coat the aggregate. Design the mix so that the mixture will have sufficient working life to allow for proper placement at the predicted ambient temperature and humidity.

Table 3
JMF Proportions

Material	Proportion
Residual Asphalt	6.0 to 9.0% by wt. of dry aggregate
Mineral Filler (Hydraulic Cement or Hydrated Lime)	0.5 to 3.0% by wt. of dry aggregate
Field Control Additive	As required to provide control of break and cure
Water	As required to provide proper consistency

Table 4
JMF Requirements

Property	TxDOT Standard Laboratory Test Method	Requirement
Wet track abrasion, g/sq. ft., max. wear value	Tex-240-F, Part IV	75
Gradation (aggregate and mineral filler)	Tex-200-F, Part II (Washed)	Table 1
Mix time, controlled to 120 sec.	Tex-240-F, Part I	Pass

G. Rate of Application: The micro-surfacing mixture shall be of the proper consistency at all times so as to provide the application rate required by the surface condition. Suggested application rates are based upon the weight of dry aggregate in the mixture. Application rates are affected by the unit weight of the aggregate.

Micro-surfacing is often put down in two full-width passes in place of rut-filling when the rutting or deformation is not severe. When two passes are used, the first pass (scratch course) is made using a metal or stiff rubber strike-off and applying only what the surface demands for leveling. The second course is typically applied at 15 - 30 lb/yd2.

Unless a specific aggregate type and application rate are shown in the plans, the following recommended aggregate types and average single application rates are suggested for the various street classifications and situations:

Table 5

Aggregate Type	Suggested Placement Locations	Suggested Application Rate
Type I	Local Streets	10 - 20 lb/yd^2 (5.4 - 10.8 kg/m^2)
Type II	Collectors and Arterials Wheel Ruts	15 - 30 lb/yd^2 (8.1 - 16.3 kg/m^2) See Section 239.4.K., “Ruts”

PART 3 EXECUTION

3.01 EQUIPMENT

A. Maintain equipment in good repair and operating condition.

B. Micro-surfacing Machine: Furnish a self-propelled micro-surfacing mixing machine with:

1. self-loading devices to promote continuous laying operations;

2. sufficient storage capacity for mixture materials;

3. individual volume or weight controls that will proportion each material to be added to the mix;

4. continuous flow mixing with a revolving multi-blade mixer capable of discharging the mixture on a continuous flow basis;

5. opposite side driving stations;

6. full hydrostatic control of the forward and reverse speed during operation;

7. a water pressure system and nozzle-type spray bar immediately ahead of the spreader box and capable of spraying the roadway for the width of the spreader box;

8. a mechanical-type spreader box equipped with paddles or other devices capable of agitating and spreading the materials throughout the box;

9. a spreader box with devices capable of providing lateral movement or side shift abilities; and

10. a spreader box with a front seal, adjustable rear strike-off, and an adjustable secondary rear strike-off.

Calibrate and properly mark each control device that proportions the individual materials. Equip the aggregate feed with a revolution counter or similar device capable of determining the quantity of aggregate used at all times. Provide a positive-displacement-type emulsion pump with a revolution counter or similar device capable of determining the quantity of emulsion used at all times. Provide an approved mineral filler feeding system capable of uniformly and accurately metering the required material.

C. Scales: Scales used for weighing aggregates and emulsion must meet all requirements of TxDOT Item 520, “Weighing and Measuring Equipment.” The weighing equipment for aggregates may be either a suspended hopper or a belt scale.

D. Asphalt Storage and Handling Equipment: When storage tanks are used, furnish a thermometer in each tank to indicate the asphalt temperature continuously. Keep equipment clean and free of leaks. Keep asphalt materials free from contamination.

3.02 PROTECTION

A. Aggregate Storage: Stockpile materials in a manner that will prevent segregation or contamination. Remix stockpiles with suitable equipment when necessary to eliminate segregation. Use a scalping screen while transferring aggregates to the mixing machine to remove oversize material.

B. Mineral Filler Storage: Store the mineral filler in a manner that will keep it dry and free from contamination.

C. Asphalt Material Storage: Keep asphalt materials free from contamination.

3.03 INSTALLATION

A. General: Produce, transport, and place micro-surfacing as specified in this Section or on the plans. Ensure that the finished surface has a uniform texture, and the micro-surface mat is fully adhered to the underlying pavement.

B. Weather Limitations: Place the material when the atmospheric temperature is at least 50°F and rising and the surface temperature is at least 50°F. Cease placement when the atmospheric temperature is below 60°F and falling, when weather is foggy or rainy, or when rain is imminent as determined by the Engineer. Cease placement 24 hr. before forecasted temperatures below 32°F.

C. Surface Preparation: Thoroughly clean the surface of all vegetation, loose aggregate, and soil. Remove existing raised pavement markers. When existing surface conditions require, provide a water spray immediately ahead of the spreader box. Apply water at a rate that will dampen the entire surface without any free-flowing water ahead of the spreader box. If water is used, cracks shall be allowed to dry thoroughly before applying micro-surfacing.

Manholes, valve boxes, drop inlets and other service entrances shall be protected from the micro-surfacing by a suitable method. The Contractor shall cover all raised pavement markers in a manner to protect and insure the integrity of the markers prior to placing the micro-surfacing and shall remove such covers after the completion of micro-surfacing so that the markers will remain fully functional. Any markers damaged by the Contractor's operations shall be repaired or replaced at no cost to the City.

The Engineer shall approve the surface preparation prior to surfacing. No dry aggregate either spilled from the lay-down machine or existing on the road, will be permitted.

If shown on the plans, pre-treat the cracks in the surface with an acceptable crack sealer prior to the application of the micro-surfacing. No separate payment will be made for crack sealing, and shall be considered incidental to the placement of the micro-surfacing.

D. Material Transfer: Minimize construction joints by providing continuous loading of material while placing micro-surfacing. Ensure that oversized material has been removed prior to transferring the aggregates to the mixing machine.

E. Placing: Spread the mixture uniformly to the lines and grades shown on the plans or as directed by means of a mechanical type spreader box. Shift the spreader box when necessary to maintain proper alignment. Clean the spreader box as necessary to minimize clumps. Set and maintain the spreader box skids to prevent chatter in the finished mat. Prevent loss of material from the spreader box by maintaining contact between the front seal and the road surface. Adjust the rear seal to provide the desired spread. Adjust the secondary strike-off to provide the desired surface texture.

F. Curing: Protect the finished mat from traffic until the mix cures and will not be damaged by traffic. Adjust mixture properties according to humidity conditions and ambient air temperatures to allow uniformly moving traffic on completed travel lanes within 1 hr. after placement with no damage to the surface. Protect other locations subject to sharp turning or stopping and starting traffic for longer periods when necessary.

G. Production Testing: Provide access to the mixing unit discharge stream for sampling purposes. Produce a micro-surfacing mixture that will meet the tolerances specified in Table 6. Remove and replace or use other approved means to address material that does not meet these requirements, at no additional cost.

Table 6
Production Test

Property	TxDOT Standard Laboratory Test Method	Requirement
Asphalt content, % by wt.	Tex-236-F1 or asphalt meter readings	Design target ±0.5% and within limits of Table 1
Gradation, % retained	Tex-200-F, Part II (washed)[1]	#8 sieve and larger: ±5 from design gradation. #16 sieve and smaller: ±3 from design gradation.[2]

H. Workmanship: Remove and replace micro-surfacing material exhibiting evidence of poor workmanship at no additional cost.

1. Finished Surface: Provide a finished surface that has a uniform texture free from excessive scratch marks, tears, or other surface irregularities. Marks, tears, or irregularities are considered excessive if:

    a. more than 1 is at least ¼ in. wide and at least 10 ft. long in any 100 ft. of machine pull,

    b. more than 3 are at least ½ in. wide and more than 6 in. long in any 100 ft. of machine pull, or

    c. any are 1 in. wide or wider and more than 4 in. in length.

2. Construction Joints: Place longitudinal joints on lane lines unless otherwise directed. Provide longitudinal and transverse joints that are uniform and neat in appearance. Provide construction joints that have limited buildup and that have no gaps between applications. Joints with buildup will be considered acceptable if:

    a. no more than ½ in. vertical space exists between the pavement surface and a 4-ft. straightedge placed perpendicular to the longitudinal joint and

    b. no more than ¼ in. vertical space exists between the pavement surface and a 4-ft. straightedge placed perpendicular to the transverse joint.

3. 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:

    a. it varies no more than ±3 in. from a 100-ft. straight line on a tangent section and

    b. it varies no more than ±3 in. from a 100-ft. arc on a curved section.

4. Miscellaneous Areas: Use a single-batch-type lay-down machine or other approved method to place materials on ramps or other short sections. Lightly dampen the surface before placing the mix. Provide 100% coverage that is uniform in appearance and comparable to that produced by the spreader box.

5. Ruts: When shown on the plans, fill ruts, utility cuts, and depressions in the existing surface in a separate pass from the final surface. Fill ruts as follows:

    a. Fill irregular or shallow ruts less than ½ in. deep with a full-width scratch coat pass. Use a rigid primary strike-off plate unless otherwise approved.

    b. Fill ruts ½ in. deep or deeper independently using a rut-filling spreader box that is at least 5 ft. wide. Crown the spreader box to compensate for traffic compaction.

    c. Fill ruts deeper than 1-½ in. in multiple placements unless otherwise approved.

END OF SECTION